UNIVERSIDAD CARLOS III DE MADRID

Tesis doctorales

DEPARTAMENTO DE HISTORIA ECONÓMICA E INSTITUCIONES

"NATURAL RESOURCES, SETTLER ECONOMIES AND ECONOMIC DEVELOPMENT DURING THE FIRST GLOBALIZATION: LAND FRONTIER EXPANSION AND INSTITUTIONAL ARRANGEMENTS"

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September, 2011


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Acknowledgements

I would like to thank the Instituto Laureano Figuerola, Universidad Carlos III, Madrid, for its financial support, and I am grateful for the constant support and advice of the members of the Department of Economic History and Institutions. I am especially grateful for the comments, suggestions and advice from my supervisor, Leandro Prados de la Escosura, who improved the results of my research significantly. I would like to express my gratitude to Antonio Tena Junguito, Stefano Battilossi and Joan Rosés for their constant encouragement and guidance, and Stefan Houpt, Juan Carmona and Carlos Álvarez for their useful suggestions and warm consideration. Additionally, I am extremely thankful to two special people that offered their thoughts and kindness not only as colleagues, but also as friends; they are Juan Huitzilihuitl Flores and Cecilia Font. Likewise, I am thankful for the help of Luis Bértola, who encouraged the carrying out of the project with his generous recommendations and was closely involved from the very beginning. In addition, I am grateful to the Globalizing Europe Economic History Network (Globaleuronet) for providing the financial support to attend three summer schools –in Tartu (Estonia), Paris (France), and Lisbon (Portugal)– and a research visit at the University of Groningen (The Netherlands). I am also grateful to Universidad Carlos III, Madrid, for promoting and financing my visit at University of Barcelona during two months. Finally, I would like to thank the Instituto de Economía, Universidad de la República, Uruguay, and the members of two projects where I participated –"Historical Patterns of Development and Underdevelopment: Origins and Persistence of the Great divergence (HI-POD)" and "Nuevas Interpretaciones sobre la Integración Económica de las Periferias Europeas y Latino Americanas entre 1850-1950" (UC3M)– for providing me with an excellent space for working and for fruitful debate.

For Chapter 2, I was fortunate enough to count on the collaboration of Gregorio Mednik, Jonatan Saúl and Pablo Berger for the derivation and discussion of the analytical model. Pablo Berger also collaborated on the calibration and numerical resolution of the model.

For Chapter 3, I had the support of Eugenia Riaño in the application of GIS tools and for the construction of the indicators of land frontier expansion. I would also like to express my gratitude for the advice of Virginia Fernández and the answers of Klein Goldewijk about the database.

For Chapter 4, Javier Rodríguez Weber collaborated on the estimates of income distribution in Chile and Jorge Álvarez participated in several stages of the research.

For Chapter 5, I counted on the support of Carolina Román for the econometrics exercises.

Richard Manning corrected the final English version of the document.

I would also like to thank the participants of seminars and conferences where I presented advances and preliminary results of my Thesis. I would especially like to mention Leticia Arroyo Abad, Marc Badía-Miró, Jörg Baten, Reto Bertoni, Gustavo Bittencourt, Albert Carreras, Anna Carreras Marin, Sergio Espuelas, Sebastián Fleitas, Ewout Frankema, Jordi Guilera, Alfonso Herranz, Herman de Jong, Zoe Kuehn, Julio Martinez-Galarraga, María Inés Moraes, Esteban Nicoloni, Alan Olmstead, Vicente Pinilla, Blanca Sánchez, Isabel Sanz, Enric Tello, Jeffrey Williamson, Pieter Woltjer, César Yañez, and Jan Luiten van Zanden.

Finally, for their support (and patience!), I would like to thank the many friends, my mother and, especially, Carolina, who followed the successive stages of this research project and attentively read the document in all of its different versions.

Resumen

Los tres rasgos principales que caracterizan al período de la Primera Globalización –desde mediados del siglo XIX hasta, al menos, la Primera Guerra Mundial (PGM)– son la expansión de la economía atlántica, desde la Europa industrial (*the core*) hacia la periferia occidental de reciente colonización europea; la incorporación de regiones "nuevas" en la economía global; y la creciente integración de los mercados de bienes y factores a escala mundial. La presente investigación se focaliza, precisamente, en las regiones de reciente asentamiento europeo (*settler economies*) –Argentina, Australia, Canadá, Chile, Nueva Zelanda y Uruguay– durante ese período, al constituir sociedades cuyos desarrollos recorrieron sendas similares que las transforman en un grupo de economías comparable. Se trata de un *club* con abundancia de recursos naturales, sujeto a dinámicas semejantes en términos de olas de inmigración, marginalización de poblaciones nativas, flujos de capital europeo, trabajo libre (al menos, desde la segunda mitad del siglo), instituciones social y políticamente funcionales a la expansión económica y con la constitución de una suerte de culturas "neo-europeas" que caracterizarían sus pautas de desarrollo de largo plazo. Los resultados fueron variados. Canadá y Australia se transformaron en economías exitosas y Nueva Zelanda, pese a su pequeño mercado interno y la elevada participación de *commodities* en su pauta exportadora, también logró posicionarse en el grupo de países de alto bienestar. Por su parte, las economías del Cono Sur Sudamericano fueron menos afortunadas, comportaron trayectorias irregulares y quedaron rezagadas frente a los líderes mundiales. En estos términos, ellas constituyen el "fracaso" de aquel *club* que, hacia finales del siglo XIX, mostraba promisorias expectativas de desarrollo dentro de un patrón de desenvolvimiento aparentemente común. De todos modos, y sin discutir la veracidad de esto último, al interior del *club* se evidenciaban discrepancias que no resultaban ajenas, incluso, para los contemporáneos. Las economías de ascendencia anglosajona eran más ricas –en cuanto a producto per cápita–, tenían una mayor presencia de las manufacturas en la estructura productiva y estaban sujetas a un proceso de deterioro en la distribución del ingreso menos intenso en comparación con los *settlers* asociados a la tradición española.

Es usual en la literatura recurrir a las diferencias institucionales entre un grupo de economías y el otro para explicar el dispar comportamiento. Se contrasta el *set* de organizaciones, derechos y privilegios, la estabilidad económica y política, así como el *enforcement* de los derechos de propiedad de las excolonias españolas y británicas. Repetidamente aparece el *disorder* de las primeras contra el *order* de las segundas (en los trabajos de Douglas North) o los desarrollos a la "*South American way*" de las primeras (como señalara David Landes). La motivación inicial de esta investigación es, precisamente, avanzar en el conocimiento de estas diferencias al interior de un

club cuyos miembros parecen similares en cuanto a trayectorias históricas y perfiles productivos, pero que han mostrado desenvolvimientos tan dispares en el largo plazo.

Muchas regiones de Sudamérica, Oceanía y África se beneficiaron de las consecuencias de la Segunda Revolución Industrial –la extensión del ferrocarril, mejoras técnicas referidas a la refrigeración y la caída en el coste de los transportes interoceánicos– y, gracias a sus tierras fértiles y clima templado, se posicionaron como ricas proveedoras de producción agropecuaria para los centros industriales del mundo. La abundancia de recursos naturales les permitió ingresar en una senda de crecimiento sostenido en las décadas previas a la PGM hasta alcanzar niveles de ingreso per cápita similares a los de las economías del *core*. La "bendición" de los recursos naturales aparece, en estos términos, como un argumento casi inapelable y, como tal, constituyó una explicación clave del desempeño de estas economías durante largo tiempo. Sin embargo, desde los años noventa (del siglo XX), se ha desarrollado una nueva literatura dentro de la Teoría del Desarrollo que se identifica con la que se denomina la hipótesis de la "maldición de los recursos naturales", una suerte de compleja paradoja en la cual los países ricos en capital natural presentarían tasas de crecimiento menores a la de países pobres en ese tipo de recursos. La discusión se ha ido trasladando hacia un campo en el cual se admiten influencias mixtas y donde se ha trascendido la sola consideración del crecimiento económico para incorporar tópicos más próximos a la noción de desarrollo como pobreza, educación y distribución del ingreso. Dentro de este renovado enfoque, varios procesos son considerados como condicionales a la estructura institucional, dentro de un contexto en el cual la "maldición" ha dejado de ser un efecto inevitable, sino propio de determinadas circunstancias. En este sentido, las *settler economies*, caracterizadas por su abundancia de recursos naturales y dominadas por la ocurrencia de procesos que la literatura identifica con los hechos estilizados del período –fuerte expansión económica liderada por las exportaciones, primarización de la estructura productiva y deterioro en la distribución del ingreso– constituyen una suerte de "experimento natural" donde utilizar el debate "maldición-bendición" como línea argumental.

La literatura reciente sobre la expansión de la economía atlántica durante la Primera Globalización utiliza el teorema de Stolper-Samuelson, dentro la teoría de comercio de Heckscher-Ohlin, para explicar la performance de las economías del "Nuevo Mundo" (particularmente, los trabajos de Jeffrey Williamson y sus seguidores). Esta estructura conceptual resulta útil para explicar aquellos tres hechos estilizados, aunque poco permite argumentar respecto a la dispar evolución al interior de los países miembros del *club*. Dentro de un patrón similar durante el período, pone el énfasis en las relaciones económicas internacionales y la formación de precios, pero sin prestar mayor atención a las condiciones domésticas. Por esa razón, en esta investigación

se utiliza un enfoque analítico alternativo, en la tradición de la *staple thesis* para complementar aquella visión y articularla con la denominada *appropriability hypothesis* que se deriva de la literatura de la *curse of the natural resources* en su enfoque institucional.

Esta aproximación propone un enfoque diferente al estándar en la literatura y permite discutir aspectos claves de la Primera Globalización en términos de la expansión endógena de la frontera de tierra, diferenciales de productividad intersectoriales y distintas evoluciones en la distribución (funcional) del ingreso. La "contribución doméstica" al crecimiento económico fue, precisamente, la incorporación de tierra (de calidad variable) a la producción y ello tuvo consecuencias determinantes en el cambio estructural, la evolución de las tasas de retribución a los factores productivos y en la cantidad e intensidad de su utilización. Sin embargo, las dotaciones de recursos naturales y su efectiva explotación no representan la historia completamente. La expansión de la frontera estuvo estrechamente relacionada con la constitución y distribución de los derechos de propiedad sobre la tierra y, en consecuencia, con la conformación de las reglas de juego y los mecanismos de incentivos que regularían la actividad agropecuaria. Por lo tanto, la calidad de la tierra y la calidad de las instituciones (ligadas con ésta) constituyen ejes centrales de la argumentación. En este sentido, la idea fuerza es que la mera existencia de abundantes recursos naturales no explica el éxito o la prosperidad de los miembros del *club*. En efecto, no fue solamente el descubrimiento de recursos naturales o de oportunidades comerciales para su utilización sino también la intensidad de su explotación y la distribución de las rentas asociadas a ello las que crearon (o no) un escenario apropiado para el desarrollo. En este sentido, la argumentación procura indagar en las condiciones que convierten a los recursos naturales en un proceso endógeno al desenvolvimiento económico.

De acuerdo a esta estructura conceptual y a la revisión bibliográfica realizada, y prestando especial atención a los hechos estilizados de la Primera Globalización para las economías de reciente asentamiento europeo de clima templado, se propone focalizar la investigación en tres cuestiones principales: (i) la expansión endógena de la frontera; (ii) la influencia de la calidad de la tierra en el desempeño económico; y (iii) la interacción entre la abundancia de recursos naturales y la calidad institucional. Para avanzar sobre estos tópicos, se plantea trabajar en tres direcciones: (i) diseñar un modelo analítico apropiado para abordar las preguntas e hipótesis; (ii) operacionalizar dos de los principales conceptos y variables de interés: la expansión de la frontera y la distribución funcional del ingreso; (iii) proponer ejercicios empíricos y descripciones detalladas para entender las relaciones entre recursos naturales y calidad institucional (hipótesis de apropiabilidad).

El Capítulo 2 está dedicado a la presentación del marco conceptual y el modelo de análisis. Trabajando dentro de la tradición de los modelos de factores específicos y tomando una propuesta

de Ronald Findlay y Mats Lundahl de 1994, se la extiende para incorporar la calidad de la tierra como elemento adicional en la argumentación, dentro de una lógica de expansión endógena de la frontera (esto es, de incorporación de abundantes recursos naturales a la producción) y reglas de decisión pautadas por el coste de oportunidad de esa expansión. Se asumen formulaciones específicas de las ecuaciones del modelo y se propone un análisis numérico para representar los cambios en el producto (total y sectorial), la especialización productiva y la distribución funcional del ingreso ante modificaciones en los precios relativos de los productos o en las dotaciones de factores productivos (trabajo y capital). Bajo estas condiciones, es posible explicar desempeños dispares entre economías similares que se diferencian en la intensidad de incorporación de tierra de diferente calidad y que, por lo tanto, rinde diferenciales de retribución a sus propietarios. La ampliación de la brecha entre rentas de la tierra y salarios que caracterizó al período –y que tan bien ha sido reportada en la literatura reciente– depende, precisamente, de la efectiva existencia de tierras capaces de generar esos retornos para ser apropiados y cuyo volumen resultaría mayor cuanto mejores (de más alta calidad) fueran éstas. Sin embargo, la captura de rentas por parte de los agentes está sujeta al sistema de propiedad de la tierra imperante y, para su análisis, se propone utilizar la *appropriability hypothesis*. Se entiende este concepto en cuanto al contexto que ambienta la capacidad que tiene un agente innovador de apropiarse de las rentas de una innovación y que, en nuestros términos, significa interpretar al sistema de propiedad de la tierra como el marco de actuación de los agentes que incorporan tierra "nueva" y se hacen de las rentas –antes inexistentes– que ella genera. En otras palabras, además de la existencia de tierra capaz de generar rentas diferenciales respecto a la retribución de otros factores productivos, se requiere de una estructura institucional que legitime esa apropiación, la que tendrá, por razones técnicas e institucionales, consecuencias particulares en los miembros del *club*.

De la discusión propuesta en el Capítulo 2, dos cuestiones son claves para el análisis: la expansión de la frontera y la evolución en la distribución del ingreso, y se dedican los próximos dos capítulos para la operacionalización de ambos conceptos.

En el Capítulo 3, se presentan distintas nociones y medidas de la expansión de la frontera durante el período para identificar "patrones de asentamiento" en el territorio. La medición del proceso se realiza a través de sistemas de información georeferenciada (*GIS*, por su sigla en inglés) y la elaboración de índices de expansión denominados "extensivos", "intensivos" y "de contribución". Estos indicadores recogen la disponibilidad de activos potencialmente utilizables (ofrecen una medida de riqueza) en la producción agropecuaria, considerando diferentes aptitudes ("alta", "media" y "baja") para la producción de pasturas (*grassland*) y distancia (únicamente evaluado para el caso de Argentina). Se identifica dos patrones de asentamiento. En el Cono Sur Sudamericano,

las tierras que realizaron las mayores contribuciones a la expansión fueron las de alta calidad y, por lo menos en el Río de la Plata, se trataron de procesos sostenidos en el tiempo. Esta dinámica contrastó con la de Australia y Canadá. En el primer caso, la expansión fue previa al boom de precios (de la última década del siglo) y transcurrió, fundamentalmente, por tierras de baja calidad. En el segundo, recién fue notorio hacia el cambio de siglo y abarcó, con similar intensidad, a todos los tipos de tierra. Por su parte, Nueva Zelanda comportó rasgos de ambos patrones. Al igual que en Australia, el proceso fue más intenso antes de la mejora sistemática de los términos de intercambio y, como en Canadá, los tres tipos de tierra estuvieron involucrados en la expansión. Por lo tanto, y atendiendo a nuestro marco conceptual, los efectos más notorios de la Primera Globalización en términos de deterioro en la distribución del ingreso debieron haberse constado en el Cono Sur. La discrepancia entre la tasa de renta y la tasa de salario habría tenido mayor espacio para expresarse y ello se habría reforzado con una incorporación sostenida de tierra a la producción (en Argentina y Uruguay). Para testear la presunción derivada del marco teórico, es necesario contar con estimaciones de la evolución de la distribución del ingreso, lo que es materia del próximo capítulo.

En el Capítulo 4, se trabaja sobre dos dimensiones de la desigualdad en el sector agropecuario. Por un lado, se calculan indicadores de desigualdad en la tenencia del principal activo de la actividad, la tierra, en vísperas de la PGM y se encuentra un panorama complejo, donde la identificación de patrones no es inmediata y toma relevancia considerar diferenciales regionales. Uruguay y la zona pampeana argentina parecen presentar un patrón similar, de alta desigualdad, aunque menor a la del norte argentino, la zona de Cuyo y Chile donde, probablemente, la larga herencia colonial impuso una estructura de la propiedad altamente concentrada. En forma consistente con este último punto, se presentan discrepancias entre las zonas inicialmente colonizadas de Australasia (Victoria, New South Wales, Queesland y Nueva Zelanda) con las de asentamiento más reciente (South Australia y Western Australia) y políticas explícitas de intensificación y desconcentración de la propiedad. Este último patrón es el seguido por Canadá en su expansión de la frontera hacia el oeste, donde las provincias de Manitoba, Saskatchewan y Alberta presentan los menores indicadores de desigualdad del club. Por otro lado, se estima la distribución funcional del ingreso (rentas, salarios y beneficios) en el sector agropecuario de cada uno de los *settlers* y su evolución decadarial entre 1870 y la PGM. Dentro de un patrón general de deterioro de la distribución que se hizo notorio desde la Primera Globalización –bajo el entendido de que los asalariados constituían la mayor parte de la población–, se observa un incremento relativo de las rentas de la tierra en la estructura distributiva (*"rental drifts"*) que fue significativamente más notorio en el Cono Sur Sudamericano y donde, además, se consolidó un patrón "rentista" de la producción. En contraste, en los otros miembros del *club* se evidenció una participación mucho mayor de los beneficios en Canadá y de los salarios en Australasia, lo que

señala un funcionamiento mucho más fluido de los mercados de factores, la posibilidad de crear mercados de bienes más amplios y reducir los efectos tipo *crowding-out* que suelen "maldecir" a las economías ricas en recursos naturales.

Finalmente, considerando el marco teórico y el modelo de análisis presentados en el Capítulo 2 y la operacionalización de variables claves propuesta en los Capítulos 3 y 4, el Capítulo 5 está dedicado al testeo de algunas de las principales hipótesis. Se discute el efecto de la abundancia de recursos naturales sobre el desarrollo económico a través de la interacción entre el tipo de tierra y la calidad de sus instituciones. Como *proxy* del primer punto, se utiliza la contribución de la tierra de alta, media y baja calidad a la expansión de la frontera concepto de riqueza potencial). En el segundo caso, se utilizan dos aproximaciones. Una de ellas es básicamente cuantitativa, donde se utilizan indicadores estándar en la literatura sobre calidad institucional ("*constraints on the executive"* del programa *Polity IV* y *contract-intensive money* como *proxy* al *enforcement* de los contratos y el cumplimiento de los derechos de propiedad). La otra es de corte más cualitativo y refiere a la descripción histórica de la conformación y distribución de los derechos de propiedad sobre la tierra, desde comienzos del siglo XIX hasta la PGM, en cuatro miembros del *club*: Argentina y Uruguay (representantes de la tradición española) y Australia y Nueva Zelanda (asociados al patrón anglosajón). Estas dos aproximaciones determinan, a su vez, dos enfoques metodológicos. Por un lado, en lo que se denomina enfoque macro, se proponen ejercicios econométricos con datos de panel para contrastar las hipótesis de la maldición y de la apropiabilidad en la actividad agropecuaria y, por otro, bajo un enfoque más próximo a la conducta de los agentes, se propone un relato histórico guiado por la *appropriability hypothesis* para identificar diferentes patrones de asentamiento en ambas regiones (Río de la Plata y Australasia).

El primer ejercicio permite no rechazar la hipótesis de la maldición de los recursos naturales en cuanto a la producción agrícola, aunque sí se refuta cuando se la evalúa en términos de la distribución del ingreso. En otras palabras, fronteras abiertas –grandes riqueza de tierra sin explotar– estarían asociadas con reducidas capacidades de producción, pero con sociedades de menor desigualdad. La calidad institucional, interactuando con los recursos naturales o sin hacerlo, contribuirían positivamente, moderando la maldición o potenciando la bendición. Asimismo, se encuentra evidencia a favor de la *appropriability hypothesis* en su dimensión técnica cuando se considera como variable dependiente la inequidad, pero se la rechaza en el caso de explicar la producción. Esto es, expandir la frontera más intensivamente por las mejores tierras (las que ofrecen las posibilidades de apropiar mayores rentas) contribuye con la producción agropecuaria, pero deteriora más significativamente la distribución. ¿Cuáles son las consecuencias en el largo plazo de estos hallazgos? En la medida que la riqueza natural tiende a agotarse –en forma irregular y a

diferente ritmo aunque, evidentemente, es un recurso finito–, de algún modo, nuestras economías "escaparían de la maldición" de la baja producción en el agro pero, simultáneamente, dejarían atrás la bendición de la frontera abierta para evolucionar por una trayectoria de persistente inequidad. Cuanto más intensivo fue el avance de la frontera por las mejores tierras –como el caso del Río de la Plata y el Chile– más agudo resultó el deterioro en la distribución del ingreso agropecuario.

De acuerdo al segundo enfoque, se confirma que la cuestión de la tenencia de la tierra fue extremadamente importante en la economía política de los *settlers*, y nuestro énfasis es puesto en identificar la propiedad de la tierra como una función, antes que como un derecho. Las instituciones formales que gobernaron la distribución de la propiedad y la conducta de los agentes involucrados (efectiva o potencialmente) no fueron extremadamente diferentes entre el Río de la Plata y Australasia. Las regulaciones fueron escritas con el mismo tipo de preocupaciones, siguiendo el modelo norteamericano, y los agentes se comportaron de acuerdo a sus propios intereses, creando mecanismos para obtener la mayor cantidad posible de tierra al menor coste y tomar ventaja frente a otros cuando las circunstancias así lo permitían. Las mayores diferencias entre ambos sistemas derivaron de la debilidad de los gobiernos del Río de Plata para lograr el cumplimiento de las regulaciones en un contexto en el cual las elites sustentaban su poder en la propiedad de la tierra. En cambio, los gobiernos en Australasia crearon contextos de colonización más favorables y dispusieron acciones más próximas a una noción de desarrollo. Éstas fueron empapando la conciencia colectiva dentro de un ambiente política y financieramente más estable y una homogeneidad social bien sustentada en los valores de una idiosincrasia común. Las diferencias entre ambas regiones no se situaron tan claramente en la propiedad de activos como en la distribución del ingreso, lo que señala el predominio de mercados de factores mejor integrados y donde salarios y beneficios contribuyeron con la creación de una clase media más amplia y temprana. Las condiciones negativas de la apropiabilidad presentaron su carácter más adverso en el Río de la Plata, aunque ellas no impidieron la expansión productiva, sino que determinaron una concentración más aguda del ingreso y con un claro perfil rentista. Las consecuencias adversas sobre la producción llegarán en las décadas venideras, cuando estas economías afronten el cambio estructural sobre estructuras distributivas dispares y donde la amplitud de los mercados internos dirá mucho de la performance en los procesos de industrialización.

En definitiva, nuestras contribuciones se resumen en seis puntos: (i) Se plantea la extensión de un modelo analítico en la tradición de la *staple thesis* para incorporar, conceptualmente, la influencia de las distintas calidades de tierra en el desempeño económico. Asumiendo formas funcionales específicas, se propone un análisis numérico del modelo y se realizan ejercicios de calibración y simulación para interpretar la incidencia de los movimientos de distintas variables del sistema; (ii)

Se realiza una aplicación de la *curse hypothesis* en perspectiva histórica y, de acuerdo a la *appropriability hypothesis,* se relaciona la expansión de la frontera con la formación de arreglos institucionales en términos de un gradiente de apropiabilidad de rentas asociadas con diferente calidad de las tierras; (iii) Se discute y mide el concepto de *land frontier expansion* mediante el uso de herramientas relativamente novedosas en la disciplina (*GIS*); (iv) Se realizan estimaciones originales de la distribución funcional del ingreso en la actividad agropecuaria, por décadas, desde 1870 hasta la PGM. (v) Se proponen ejercicios econométricos de carácter indicativo para testear las hipótesis que, sin llegar a ser concluyentes, arrojan evidencia que permite avanzar en la interpretación; (vi) Se ofrece una panorámica histórica del desarrollo de los derechos de la propiedad de la tierra en el Río de la Plata y en Australasia desde comienzos del siglo XIX hasta la PGM. Se presta especial atención a la formación de los sistemas de propiedad y a la conducta de los agentes, con especial énfasis en el rol del estado y de los grupos sociales involucrados.

Como disciplina, la Historia Económica tiene una virtud incuestionable, que es la de permitir colocar al análisis económico en perspectiva histórica para comprender las especificidades de los sucesos y captar aquellos fenómenos que forman parte de expresiones más profundas e insertas en la estructura socio-económica. En este sentido, esta Tesis se presenta en un momento que resulta conveniente por sus puntos de contacto con ciertos procesos que experimenta la economía internacional. En los últimos seis años, ésta ha mostrado una fortaleza de los precios de los *commodities* que no se evidenciaba desde, al menos, mediados del siglo XX. Ello ha significado mejoras muy importantes en los términos de intercambio de un grupo amplio de economías en desarrollo, algunas de las cuales son, precisamente, las mismas que protagonizaron la edad de oro de la Primera Globalización. En particular, las economías del Cono Sur han sostenido procesos de expansión muy significativos, basados en exportaciones de productos de base primaria que mucho recuerda a procesos que sucedieron hace más de un siglo atrás. Como entonces, se trata de economías cuyas instituciones contribuyen con la expansión productiva –pues la definición de los derechos de propiedad y su *enforcement* podían considerarse casi tan aceptables para ese propósito hacia finales del siglo XIX como hoy día–, pero cuya calidad institucional poco logra incidir en el patrón distributivo. El perfil rentista de sus sociedades, modalidades de crecimiento aún concentradoras y la desatención a un manejo prudente de las rentas de los recursos naturales –que evite efectos *crowding out* como los discutidos en este trabajo– son preocupaciones que hoy parecen tan vigentes como antes. Obviamente que la expansión de la frontera ha perdido su carácter extensivo y el desafío está cifrado en avanzar en la intensificación de su uso –algunos autores hablan de la expansión "vertical" de la frontera– sin comprometer, en ese proceso, la sostenibilidad medioambiental del desarrollo. En definitiva, se trata de una articulación entre calidad institucional y progreso tecnológico que permita endogenizar la propia abundancia de recursos naturales.

Chapter 1
Presentation and introduction

1. Motivation and initial questions

1.1 Motivation: the unequal evolution between "equals"

We can identify three main features of the First Globalization: the expansion of the Atlantic economy from the mid-19th century onwards, the incorporation of new regions into the global economy and the formation of markets for goods and productive factors in a world scale. We focus our analysis on regions of recent European settlement (as the League of Nations would call them, or briefly "settler economies") in that period. The so-called "settler economies" of the 19th and 20th century seem to have some common characteristics that make comparisons between them possible. Their economic and social development followed parallel paths because they had similar dynamic relations between waves of immigration, the marginalization of native people, European capital inflows, land abundance, free labour (at least after the mid-19th century), socially-useful political institutions and neo-European cultures (Lloyd & Metzer, 2006). By the late 19th century they were well integrated into the global economy and, in fact, the main settler areas in North America, southern South America, Australasia and the southern and northern regions of Africa became essential to the development of the global economy associated with the Second Industrial Revolution.

The settler economies that we consider in this research coincide with the group of countries that Lewis (1983:209) identifies as *"template economies"* that includes Argentina, Australia, Canada, Chile, New Zealand, South Africa, the US and Uruguay. According to Foreman-Peck (1995:105), these economies are "the group of non-European countries which at the [beginning of the] twentieth century can be classified as developed". However, for the main part of this study we exclude two of these countries because they present some distinct characteristics that can make the comparison difficult. US can be considered the leader of the group as it is sometimes studied as a settler economy but had an earlier industrial trajectory that marks it off from the others. South Africa was different from the group as regards levels of activity and economic growth and showed important lags with regard the other economies. For these reasons these two economies fall outside our sample, and we will consider the other six countries as the "club" of settler economies.[1]

The "golden age" of the settler societies was the First Globalization era (1870-1913), a process characterized by the integration of the world markets for goods and productive factors,

[1] Willebald (2006) presents an analysis of the evolution of settler economies in the long run (1870-2000) that includes both economies.

convergence, free trade and peace. At the beginning of the 20th century these societies seemed to have a promising future, but as became evident after World War II (WWII), the results fell short of the first expectations in several cases (Willebald, 2007, and Willebald & Bértola, 2011).

In the 20th century the main problem for these economies was how to deal with the transition from a settler society to some form of post-settler configuration and they took different paths and adapted to the new context with different degrees of success. They began to adapt after World War I (WWI), which was a catastrophic shock to the world economic system and disrupted trade, capital and labour flows. Efforts after the war to re-establish financial stability coincided with a boom in commodity prices and the recovery in capital flows, so those profound changes were hidden for a few years. However, world trade collapsed again in the 1930s, even higher trade barriers were established and preferential blocs came into being, and this pushed the settler economies into the Great Depression. And then, before international trade had recovered the dynamism it lost in the crisis, WWII broke out, and this was another heavy blow to the settler societies. Later, the Bretton Woods arrangements favoured areas that could industrialize enough to escape to some extent the settler trap of commodity-dependence. Outcomes varied; Canada did this successfully, Australia was relatively successful and in New Zealand, with its very small internal market and greater reliance on agricultural exports, success was more limited. However, the Southern South American area was less fortunate and struggled to make the transition (Lloyd & Metzer, 2006). Therefore, "in this characterization, the South American Southern Cone countries were the 'failure' in the settler club, with slower development paths and lower living standards" (Willebald, 2007:295; our translation).

In recent literature, the discrepancies in terms of development within the club have been explained by the institutional matrix that produces a set of organizations, rights and privileges; the stability of the structure of exchange relationships in political and economic markets; and a state that provides (or not) a set of political rules and promote the enforcement of rights. In general, studies contrast the experience of Latin America vs. North America and they propose concepts as disorder vs. order in the economic change (North et al., 2000), the *"South American way"* (Landes, 1998:Ch. 20), cultural heritage (North, 2003) and different ways of organizing a society (a social order) identified with a *"limited access order"* (North et al., 2010). The application of these concepts to contrast the South American Southern Cone countries with the ex-English colonies is straightforward. However, this comparison is not new and many contemporary people were aware of important differences between these regions.

In 1831, the British Secretary of State wrote to the Governor of New South Wales that,

> "[n]othing could be more unfortunate than the formation of a race of men, wandering with their cattle over an extensive region of the interior, and losing like the descendants of the Spaniards in the Pampas of South America, almost all traces of their original civilization" (quoted in Williams, 1975:67).

In 1852, Juan María Alberdi ask for himself,

> "Do we want to implant and acclimatize in America the English liberty, the French culture, and the diligence of people from Europe and United States? Bring alive pieces of them in the customary of the inhabitants and settle here. Do we want that habits of order, discipline and industry prevail in our America? Fill up with people in possession of these habits. They are communicative ones; beside the European manufacturer the American industrial soon is formed" (Alberdi, 1852:90; own translation).

The main motivation of our research is to gain an insight into these differences within this group of countries that seem quite similar as regards their histories and productive profiles, but present so different long-run developments. Based on these discrepancies of their long-run trajectories we contrast two models of development that, although we identify with the colonial origin, we go further and propose an analytical framework where the quality of natural endowments and institutional arrangements interact. How did this resemblance operate historically? Many parts of South America, Oceania and Africa benefited from the consequences of the Second Industrial Revolution (the spread of railways, the introduction of refrigeration, a big fall in inter-ocean transport costs) as their temperate climate and fertile soils were especially suitable for the production of meat, wheat, wool and various other commodities. Their natural resource endowments enabled them to take a fast track to expansion and, in the eve of WWI, they reached levels of income per capita on a par with the richest economies in the world. Their abundance of natural resources was understood as a "*blessing*" –in the sense of the "staples thesis" or the "vent for surplus theory"– as these countries were able to participate in external trade with resources that were hitherto almost unexploited and for which international demand, mainly from European countries, was dynamic and strong. Positive relationship between natural capital and economic performance was clear and this idea formed an extended consensus among scholars. However, in recent years, and particularly since the 1990s, perceptions of the connection between abundant natural resources and economic development have changed.

A new literature has developed, inspired by the work of Sachs & Warner (1995, 1999a, b), which focuses on the so-called *"resource curse hypothesis"*, a puzzling paradox whereby resource-rich countries tend to grow more slowly than resource-poor ones. Why is an abundance of natural resources so often related to deficient economic performance in the last decades? Is an abundance

of natural resources a *curse* on economic development? Is this negative association a general pattern or does it depend on the technological and institutional structure of the economies? Is it a general pattern or does it depend on the conditions of supply and demand in a given historical situation?

Evidently, in the context of the settler economies in the First Globalization, it is difficult to think about the topic in terms of one-way relationships. The First Globalization was a period in which the settler economies developed primary productive specialization and this fostered not only growth but also increasing inequality. Therefore we cannot label an abundance of natural capital as a complete blessing or a complete curse. When the settler economies were exposed to the effects of the First Globalization they took advantage of their abundant natural resources and received the blessing of their natural capital. These economies grew quickly in the closing decades of the 19th century up to WWI thanks to favourable international conditions, represented by a dynamic external demand and plentiful productive factors flows (labour and capital). However, and taking an old expression of Barran & Nahum (1978):189 (own translation*), "the blessing was diabolical"* because these countries underwent a persistent process of worsening income distribution. In the current theoretical and empirical literature about the "curse hypothesis" the possibility of mixed influences is discussed and there are wider perspectives that introduce considerations other than economic growth, such as poverty, education and inequality. These new issues –where institutional arrangements play a central role– constitute a useful framework to understand settler development.

The recent literature on the evolution of the Atlantic economy during the First Globalization uses the Stolper-Samuelson theorem from the Heckscher-Ohlin trade theory (H-O-S) to explain the performance of the New World economies (Lindert & Williamson, 2001; O'Rourke, Taylor & Williamson, 1996; O'Rourke & Williamson, 1994, 1999; Taylor & Williamson, 1997; Williamson, 1995, 1996, 1999, 2000, 2002). This framework can be used to explain the three stylized facts of the period –economic growth, primary specialization, worsening income distribution– and it emphasizes international economic relationships and the formation of prices, but it does not pay enough attention to domestic conditions. For this reason we are interested in an alternative analytical approach based on the so-called "staple thesis" and the "vent for surplus theory" supplemented with topics derived from the appropriability hypothesis as a way to gain new insights into the phenomenon.

Our approach has a different focus of recent standard analyses that enables us to discuss key aspects of the First Globalization in terms of the endogenous expansion of the land frontier, differentials in sector productivities and different evolutions in functional income distribution. The "domestic contribution" to economic growth was the incorporation of "new" land (of variable quality) into production, and this had consequences for structural change, the evolution of income

rates and the quantity and intensity of the use of productive factors. However, natural endowments are not the whole story. The expansion of the land frontier was related to the constitution of land ownership rights and, consequently, to the establishment of different land ownership systems and different incentive mechanisms associated with them.[2] These differences in land frontier expansion and the corresponding formation of the institutional arrangements governing it are one of the main factors that in explaining why the income and distributive pattern in the different settler economies evolved in different ways. Land quality and institutional quality are central elements in our analytical and empirical approach. Our guiding concept in this Thesis is that the mere existence of abundant natural resources can not explain the success or prosperity of the settler economies. Indeed, it was not only the discovery of natural resources or of commercial opportunities to utilize them but also the rate of exploitation and the distribution of rents that acted together to create the conditions for economic development (McLean, 2004). Therefore we will focus on the transformation of natural resources as an endogenous process (David and Wright, 1997) that explains the evolution of these economies and their structures in productive and distributive terms.

1.2 Initial questions and hypotheses

The settler economies based their production on primary activities but in spite of this, around the time of WWI, they achieved levels of development close to the (industrialized) "core" of the world economy, and thus their abundance of natural resources could represent a blessing. But this blessing was accompanied by a persistent worsening in income distribution and the persistence of the primary specialization. Moreover, evolution in the countries of the "club" was heterogeneous and results differed. Income per capita was higher (they were "richer" economies) and inequality worsened less in the ex-British colonies (Australia, New Zealand and Canada) than in the ex-Spanish colonies (Argentina, Chile and Uruguay), and manufactures developed more in the former than in the latter. In some sense, the blessing was greater and the curse less damning in the British colonies than in the Spanish ones. Therefore our initial question is as follows: Is an abundance of natural resources a curse or a blessing for economic performance? The general strategy in our research is to apply this question to the settler economies during the First Globalization (and note that we understand "economic performance" in terms of economic growth, specialization, and income distribution) and to pay special attention to differences within the "club". More specifically, our main question is: Why did product, the productive structure and income distribution evolve

[2] An understanding of the dynamic of frontiers would have to include considerations of frontier peoples and institutions at specific times and places. Our study of Latin American countries in the colonial era would have to consider institutions introduced by the Spanish and Portuguese to extend their empires in the New World, such as the religious mission, the *encomienda*, the military, the town and the family (Weber & Rausch, 1994). However, these institutions are characteristic of the 16th, 17th and 18th centuries and have less effect after the independence period, so we concentrate our analysis on tenure mechanisms that are more like capitalist institutions.

differently in countries endowed with similar natural capital and exposed to the same international conditions?

Our hypothesis is that the process of land frontier expansion created different opportunities, depending on the quality of the natural resources (land aptitude for allocating grassland and distance to the markets) for members of the club and this determined how productive and distributive patterns were established. That economy that moves its frontier by the best lands experienced the blessing of the abundance of natural resources in terms of economic growth, but faces the curse of a more intense worsening in the income distribution. The appropriability conditions of the natural resources (depending on their quality) and the quality of the institutions (in terms of their capacity to reduce crowding-out effects in the resource allocation) conditioned the economic performance of the period. Availability of land resources was the main comparative advantage of these economies to participate in the international markets of food and raw materials, and it was the basis for their export-led growth strategy. But, simultaneously, the First Globalization created pressure to increase inequality. One of the main expressions of this evolution was a wider gap between land rentals and other income modalities (especially wages, but profits as well) in a process that combined rising rental rates and the expansion of the productive factor more intensively used to produce commodities, i.e. an abundant land endowment. However, the natural endowments of the settler economies in the "club" were not homogenous, and they led to different results. In our theoretical framework, moving the land frontier by better land would encourage the adverse effects on inequality because it would enable a small segment of the population (the owners of the land) to capture increasing rents. A deeper worsening in the income distribution in the agriculture in the River Plate would be associated with the different timing of land frontier expansion into land that was better as regards agricultural aptitude and distance. The prevailing conditions contributed to the creation of a "rentist" pattern in Spanish ex-colonies because land ownership ensured the elite received incomes without having to make large investments, and because land concentration was high due to the colonial heritage and the scarce effectiveness of the redistributive land policies. Land frontier expansion occurred at the same time that the institutional arrangements that created a new land ownership rights system were set up. In the ex-British colonies, the distribution of land ownership rights created a land ownership system that fostered economic growth and a more income egalitarian pattern than in South American Southern Cone. In the British territories, in relative terms, the conditions stimulated capital accumulation (physical and human) and moderated the crowding-out effects of natural resources, and therefore paved the way for better economic performance than that of the Spain's ex-colonies.

After this introduction there are three sections in this chapter in which we outline the debate that guides our research and explain the structure of this Thesis. In Section 2 we present the three main "stylized facts" of the settler economies during the First Globalization (primary export-led growth and worsening income distribution) and we focus our analysis on the differences between the countries in the "club". In Section 3 we review the "curse" and the "blessing" in the literature on natural resources to find suitable lines of argument to support our hypotheses. These are presented in Section 4, together with an outline of this Thesis that explains the main thread of our argument and the connections among the four main Chapters.

2. Some "stylized facts" of the settler economies during the First Globalization

The period 1870-1913 was a real golden age for the settler economies. Their expansion can be traced ultimately to the Industrial Revolution, a profound process of technological progress that changed social and economic relationships on a world scale. Industrial Revolution started in the second half of the 18th century in Great Britain and spread slowly to the continent over the next hundred years, in a process that meant technological growth impulses from the core to peripheral areas.[3] The result was the formation of world commodity and factor markets during the first globalization boom, which was one of the most important processes in the world economy in the last two centuries. Trade liberalism was paramount, mercantilist barriers were dismantled and there was a transport revolution, all of which helped to generate global markets during the 19th century. Transport costs fell thanks to the railways and improved shipping, and this was a permanent change, and although anti-globalization policies started to emerge after the 1870s they were not powerful enough to bring about a return to the 1820s levels of economic isolation. There was unrestricted mass migration until the end of the century (although subsidies for immigrants progressively disappeared) and global capital markets became steadily more integrated as European investors pursued good prospects for growth overseas. Recent studies on globalization, growth and inequality by Lindert, O'Rourke, Taylor and Williamson have opened up a prolific line of research and have generated a debate that has been determinant to better understand the expansion of the Atlantic economy during the period. Template regions with scant populations that were exposed to the effects of the First Globalization took advantage of their abundance of natural resources and their economies grew quickly from the closing decades of the 19th century to WWI, encouraged by dynamic demand for raw materials and by factors of production (labour and capital) flows. However, this blessing was associated with persistently worsening income distribution. A process with economic growth and increasing inequality has points in common with a "Kuznetsian view" of

[3] The process was persistent and new regions were progressively incorporated into the "revolution", but the pace was slow and the influences were not lineal or continual. By the middle of the 19th century only France and Belgium had adopted some of the main features of modern manufacturing.

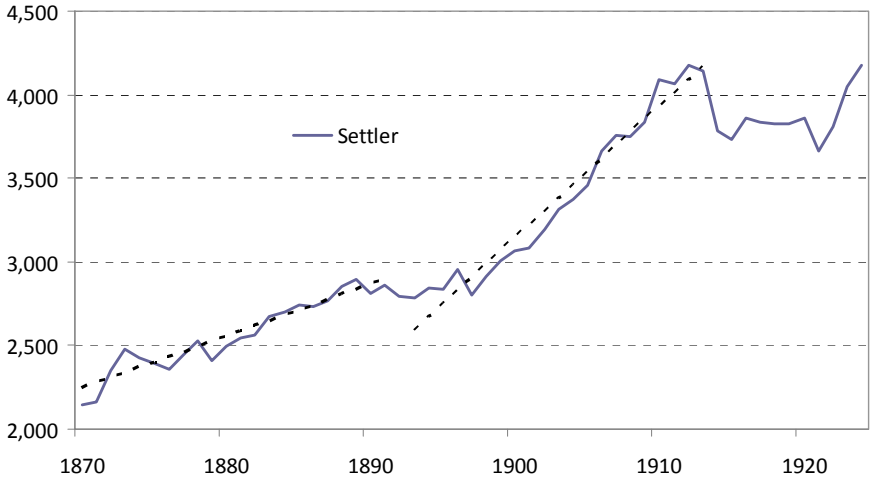
economic development (Kuznets, 1955), although the dynamic in the long-run was different. According to Bértola (2005),

> "It seems that in Australasia and the River Plate countries the underlying dynamic in the phase of increasing inequality was different to that described in Kuznets' view for the northern economies. In particular, manufacturing did not have higher productivity levels than agriculture, and it is debatable, especially in the River Plate, whether inequality in the agriculture sector was less than in manufacturing. To sum up, it can be argued that the phase of increasing inequality in the South was not related to industrialization but preceded it." (Our translation).

2.1 Economic growth

As a group, the "club" of settler economies had two phases of economic growth that showed different rates of expansion or movement through the cycle (Figure 1.1). From 1870 to the crisis of 1890 these economies grew (1.5% per annum in 1870-1891) and the rate of growth accelerated from the mid-1890s to WWI (2.2% in 1893-1912), when they suffered a sudden drop.[4]

Figure 1.1
GDP PER CAPITA: SETTLER ECONOMIES
1990 International Geary-Khamis dollars (1870-1924) 1/



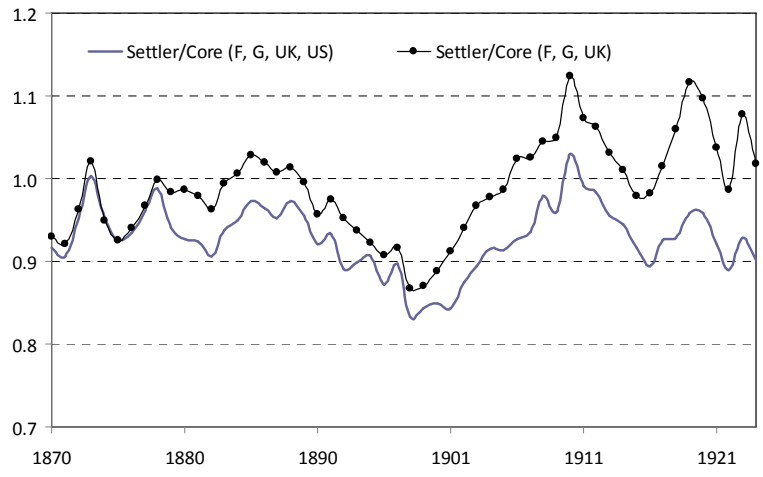
1/ Simple average of Argentina, Australia, Canada, Chile, New Zealand and Uruguay.
Source: Maddison (2001).

The economic evolution of the settler economies meant there were different periods of catching-up with the "core" of the world economy. Settler economies started the period with high levels of income per capita (between 90 and 100 per cent of the "core") but in the crisis of the 1890s they fell behind for the first time (Figure 1.2).[5] After that they grew strongly and moved closer to the core but this process came to an end in 1910, before WWI. During the war their evolution consisted of a first period in which the gap widened and then a brief

[4] Growth rates calculated between the bottom and the top of each cycle. Argentina (1875-1939), Australia (1870-1939), Canada (1900-1939), New Zealand (1875-1939) and Uruguay (1870-1939). 5-year average, Index 1911=100.
[5] We consider two indicators for the "core" of the world economy: one is the simple (unweighted) average of GDP per capita in the three main industrialized European countries –France, Germany and the United Kingdom– and the other incorporates the US into the calculations. In this chapter, the "core" economies referred to are the former group.

recovery that lasted until 1919. However, and independently on this post-war instability, our club still had income levels on a par with the richest countries in the world.

Figure 1.2
CATCHING-UP PROCESS: SETTLER ECONOMIES
Settler GDP pc/Core GDP pc (1870-1924) 1/

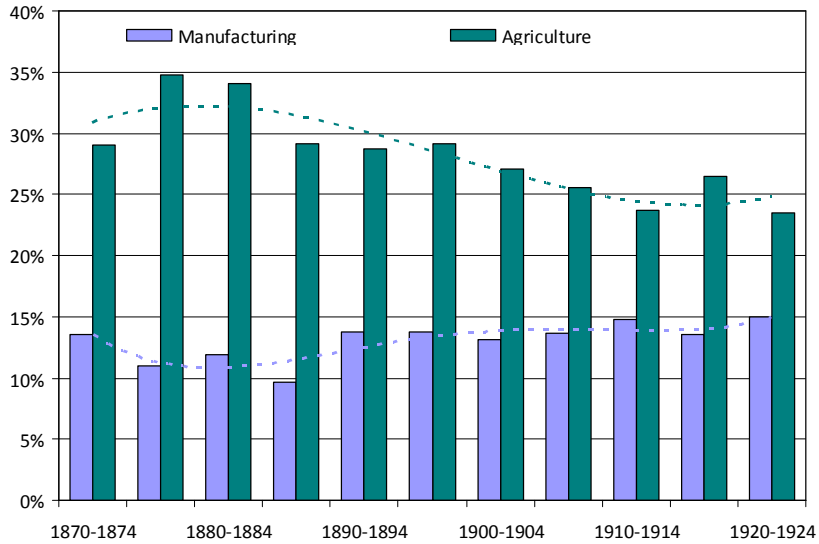


1/ Settler: see Figure 1.1. Core: France (F), Germany (G), United Kingdom (UK)), United States (US).
Source: Maddison (2001).

2.2 Primary productive specialization

The Industrial Revolution in the "core" economies brought about a profound change in their productive structure, which was that manufacturing accounted for an increasing share in the internal generation of value while the contribution of agricultural activities to total GDP shrank. This process was evident in the United Kingdom from the beginning of the 19th century, and it became apparent in France and Germany in the second half of the century as industry became the biggest sector of their economies since the 1880s. In the years prior to WWI, industry accounted for nearly 40 percent of their GDP.[6]

Figure 1.3
MANUFACTURING AND AGRICULTURE: SETTLER ECONOMIES
GDP shares in percentage (constant prices)/5-year period (1870-1924)



Source: Altman (1992); Bertino & Tajam (1999); Bértola (1998); Braun, Braun, Briones & Díaz (2000); Cortes Conde (1994); Haig(2001); Instituto de Economía (1969).

In the settler economies primary production was clearly predominant during the period, and on the eve of WWI agriculture accounted for almost 25 per cent of GDP as against only 15 per cent for manufacturing (Figure 1.3).[7] The permanent pattern was for agriculture's share to decrease and for manufacturing's share to increase, but the gap was huge and it persisted. In this

[6] UK 36.4% (1907) (Feinstein, 1972); France 35.3% (1913) (Lévy-Leboyer & Bourguignon, 1985); Germany 41.9% (1905) (quoted in Wolf, 2010:7, Table 3.a, from Hoffman *et al.*, 1965).
[7] New Zealand is excluded because manufacturing value-added is not available.

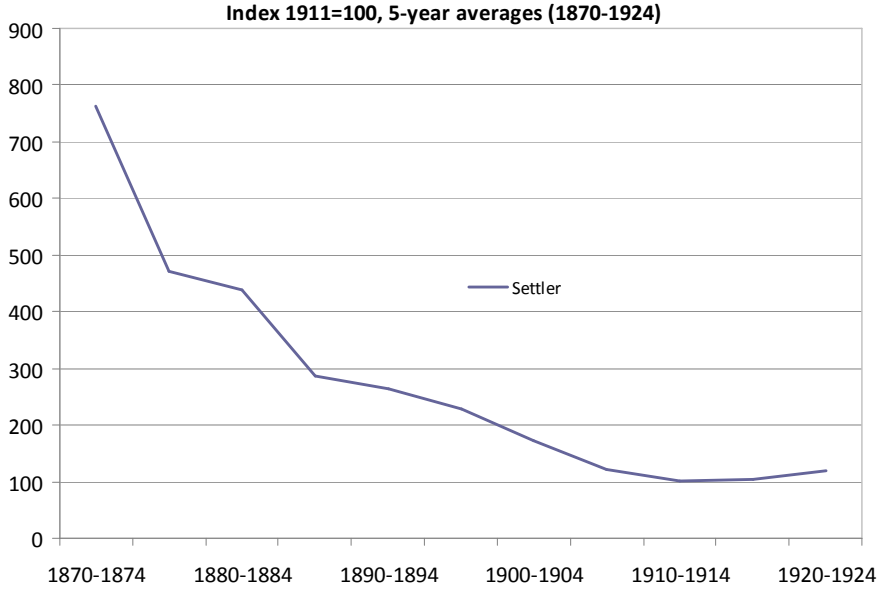
sense, the main difference between the "core" and the "settlers" was not in the importance of the agriculture but in the scarce participation of manufacturing. Settler economies were capable to achieve high per capita income levels with a productive structure based on primary activities.

2.3 Evolution of income distribution

Initially we use the wage/rental ratio as a proxy for income distribution evolution, which is how this is handled in the literature on inequality during the First Globalization.[8] Figure 1.4 shows the evolution of the wage/rental ratio for five settler economies from 1870 to the 1920s.[9]

The fact that the ratio is falling indicates worsening income distribution in the settler economies. However, we can identify two periods. According to Williamson (2002), there was one regime prior to WWI when the wage/rental ratio seriously declined, and then a second regime in the interwar years when this trend slowed down considerably or even reversed. The two regimes would reflect different policy attitudes towards globalization. Before WWI, trade was relatively free, capital flowed in abundance and mass migration was encouraged or tolerated. But these conditions changed after the war; trade policy became autarkic, mass migration was restricted and world capital markets disintegrated due to government intervention and the Great Depression. In places where "land was held by the favoured few and where industrialization had not yet taken hold, the pre-World War I commodity price convergence meant greater inequality in resource-abundant economies like those in Southeast Asia, the Southern Cone of South America, Egypt and the Punjab" (Williamson, 2000:14). On the other hand, it meant less inequality in resource-scarce economies like those of Western Europe and East Asia. Places where the family farm predominated and where land distribution was more equal, a decrease in the

Figure 1.4
WAGE/RENTAL RATIO: SETTLER ECONOMIES
Index 1911=100, 5-year averages (1870-1924)



Source: Bértola & Porcile (2002), Briggs (2003), Greasley & Oxley (2001a,b, 2004), Williamson (2000, 2002)

[8] Arroyo Abad, 2008; Bértola & Porcile, 2002; Bértola & Williamson, 2003; Greasley & Oxley, 2001a,b, 2004, 2005; O'Rourke, Taylor & Williamson, 1996; O'Rourke & Williamson, 1994, 1999; Williamson, 1996, 2002.

[9] Argentina (1875-1939), Australia (1870-1939), Canada (1900-1939), New Zealand (1875-1939) and Uruguay (1870-1939). 5-year simple average, Index 1911=100.

wage/rental ratio did not make for a similarly sharp rise in inequality. Unlike in the Kuznetsian view, worsening income distribution was not associated with structural change (the transformation from an agrarian to a manufacturing economy) but with an intensification of primary activities.

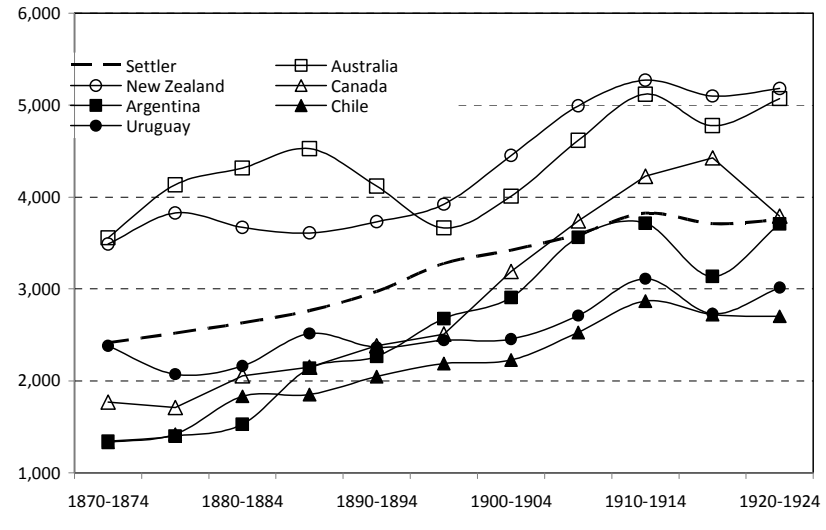
2.4 What happened within the "club"?

As we state in Section 1, our motivation is to understand how economies that are so similar can have such different economic performance in the long run. In fact, considering a common pattern, the intensity and the consequences of the First Globalization were different within the "club". Levels of product per capita were higher and the deterioration of income distribution less intense in the ex-British colonies (Australia, New Zealand and Canada) than in ex-Spanish ones (Argentina, Chile and Uruguay), and manufacturing came to the fore much more in the English-speaking countries. In the main body of this Thesis we will describe and explain these differences and highlight some general trends that explain why some economic development paths were successful and others not. Settler economies were members of the "club" of rich countries around the time of WWI (or they were very close to the "core"), and in this sense an abundance of natural resources was a blessing for these recently-settled regions. However, this blessing was accompanied by primary activities becoming predominant and income distribution persistently worsening. Did the settler economies differ from each other as regards economic growth, specialization (productive structure) and the evolution of inequality?

2.4.1 Economic growth and convergence

The common pattern was that the position of all the settler economies improved in the period before WWI, but their evolution was different (according to levels and paces). Initially, we can identify "rich" and "poor" countries in the club (see Figure 1.5[10]). On the one hand, from the mid-19th century Australia and New Zealand had higher levels of income per capita than the other settler countries (these two economies head the

Figure 1.5
GDP PER CAPITA COMPARISON: SETTLER ECONOMIES
1990 International Geary-Khamis dollars / 5-year period (1870-1924)



Source: Maddison (2001).

[10] "Settler" series is the simple average of members of the "club" and with the same information of Figure 1.1. We prefer original values instead of values expressed in logarithms because they show more clearly the differences.

GDP per capita world ranking during the period). At the turn of the century, Canada joined the group of rich economies after a long period of sustained growth. On the other hand, the countries of the South America Southern Cone were the "poor" economies of the group, only Argentina managed to rise into the top category but it did not consolidate this progress. After the 1890s, the economies of the River Plate accelerated their economic growth and progressed in a way similar to Canada, but Chile was unable to repeat its previous performance (see Table 1.1; simple average for Settler). In a similar way, New Zealand expanded again after the 1890s but it did not exceed the rate of Australia's growth.

Table 1.1
ECONOMIC GROWTH IN SETTLER ECONOMIES
GDP per capita (1990 international Geary-Khamis dollars)
and growth rates during expansion phases

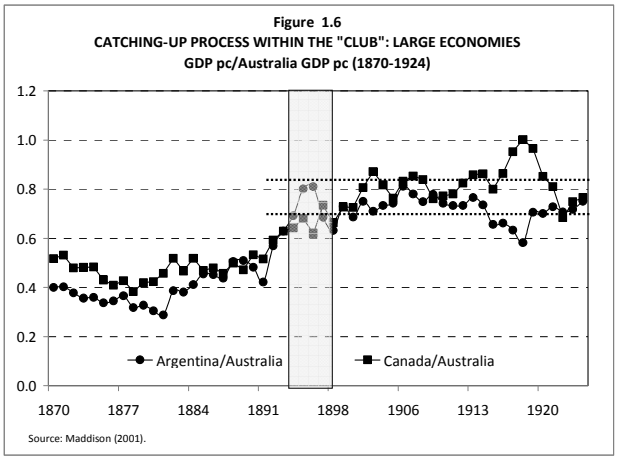
	Argentina	Australia	Canada	Chile	New Zealand	Uruguay	Settler
1870	1,311	3,273	1,695	1,290	3,100	2,181	2,142
1891	1,970	4,666	2,409	2,099	3,731	2,290	2,861
Growth	2.0%	1.7%	1.7%	2.3%	0.9%	0.2%	1.4%
1893	2,335	3,708	2,334	2,103	3,788	2,437	2,784
1912	3,904	5,098	4,377	2,968	5,209	3,508	4,177
Growth	2.7%	1.7%	3.4%	1.8%	1.7%	1.9%	2.2%

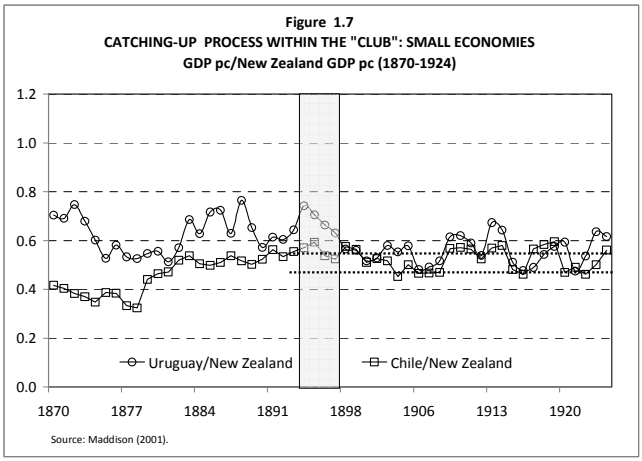
Expansion phases of settler "club". Rates of growth between the minimum and maximum figure of simple average.
Source:Maddison (2001).

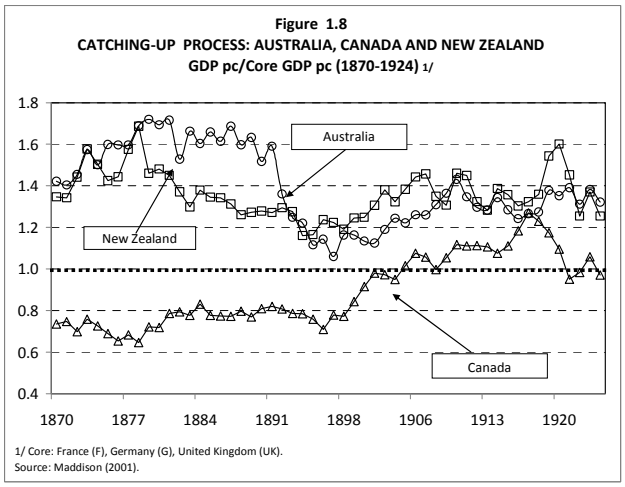
This examination by periods enhances our understanding of the short-run dynamics involved, but an analysis of the whole period as an analytical unity confirms the impression of classical authors in the comparative approach that "rich countries and their impoverished cousins" (Bértola & Porcile, 2002) took "parallel paths" (Duncan & Fogarty, 1984). This would mean that initial differences between these economies did not lessen after expansion, and that there was no catching up process in the club although these economies were similar in terms of natural endowments and international competitiveness. When we compare GDP per capita in each settler economy with the leaders of the large economies (Figure 1.6, considering Australia as the reference) and the small economies (Figure 1.7, considering New Zealand as the leader) we find this non-convergent evolution. It is clear that the 1890s was a period of crucial changes: a group of countries with similar rate of expansion and subject to comparable external influences became consolidated but there were no clear signs of convergence within the "club".[11] When we compare the GDP per capita of each settler economy with the "core" of the world economy (France, Germany and the United Kingdom) we can appreciate the extent of these changes. The indicators for the "rich" economies in the club are shown in Figure 1.8 and the "poor" ones in Figure 1.9. Argentina and Canada converged in the

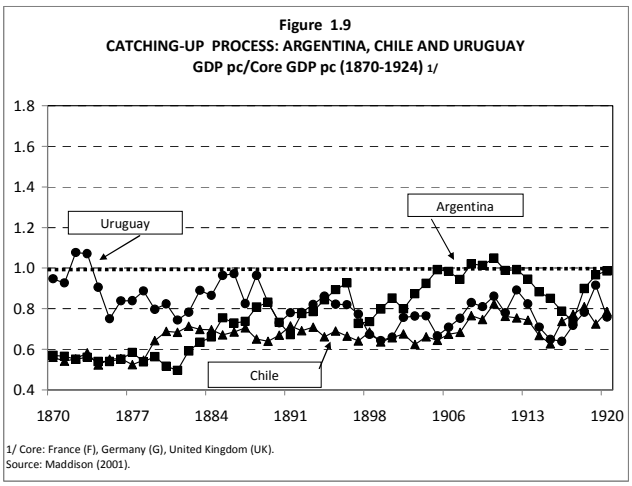
[11] Sanz-Villaroya (2005) presents evidence for this for the large economies. Argentina started to fall behind Australia in 1899 and behind Canada in 1896. The behaviour of different countries was heterogeneous and the growth of some economies is compensated for by the decline of others.

"traditional" version of the concept; they both started a catching-up process from the 1870s-1880s onwards (with some backward movements) and overtook the level of the "core" before WWI. Canada was relatively richer than Argentina and the impact of the war was less severe. In the 1920s, Canada's average GDP per capita overtook the "core" level but this was something Argentina did not achieve.









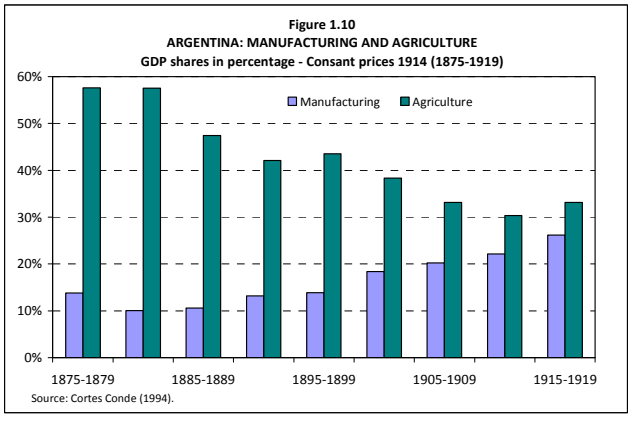
Australia and New Zealand converged from higher levels of income per capita than the "core" and maintained their indicators over the unity throughout the period (convergence as a "come down process"). Nevertheless, from the first half of the 1890s to the eve of WWI these two economies improved in a way similar to the other settler economies. Uruguay developed in an irregular and divergent way: it had high levels of income towards the end of the 19th century, it started to improve relatively fast up to WWI, it suffered adverse effects from the war but its economy then recovered dynamism and maintained levels of GDP per capita at around 80 per cent of the "core" economies. Chile began the period with low income per capita and at the end of the 19th century its levels were less than 70 percent of the "core" economies, but like in the other countries considered the years before WWI were a time of catching-up, and after the war the economy attained income per capita levels of around 70 percent of the leading world economies.

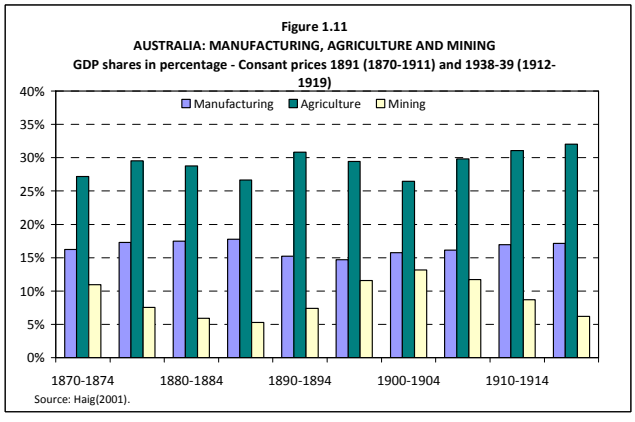
As the more extended literature on international comparison of income levels, we have concentrated on quantity effects by utilizing a fixed PPP-converted benchmark for GDP levels projected backwards with national indices of real product (in the line of Bairoch, 1976; Maddison, 1995). However, the relative positions depend upon both prices and quantities and the comparisons can change when we incorporate these considerations (see Prados de la Escosura, 2000, for a discussion). This may be especially important for the settler economies, as open economies, at the heyday of the gold standard. It is possible that other convertors –as the exchange rates– would provide better comparisons in terms of income and welfare. In current research, we follow the more extended literature on international comparison of real product and we will deal with these considerations in next steps in the research.

2.4.2 Productive structure

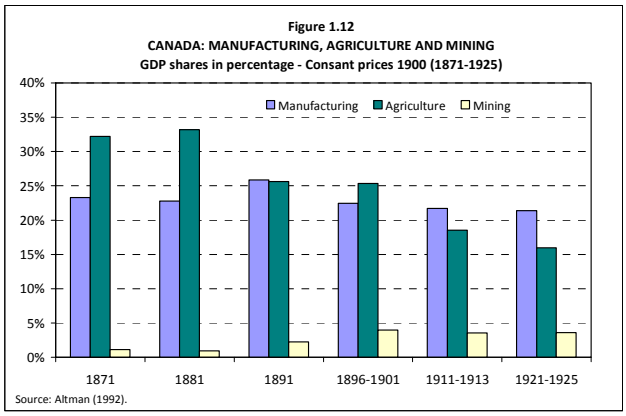
The settler economies all shared the same productive pattern with primary production predominant and a manufacturing having a small share, and although this differed from the productive structure in the "core" countries it yielded comparable levels on income per capita.

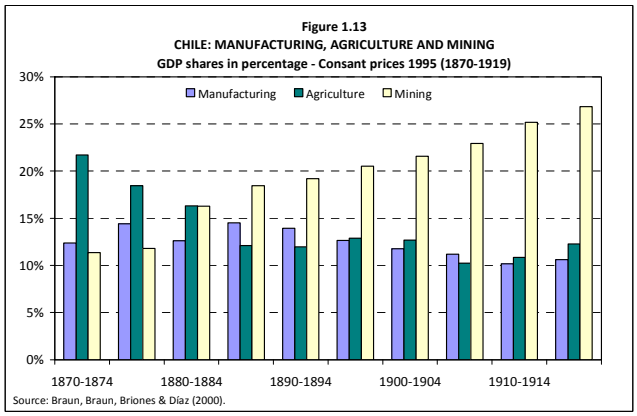
In Argentina, Australia, New Zealand and Uruguay agriculture still predominated even after WWI (Figures 1.10, 1.11, 1.14 and 1.15). However, Australia was different because in the 19th century manufacturing had a greater and stable share than in the other three countries of the group. In Canada, manufactures were more dynamic too but even so they did not account for 25 percent of the GDP in the 20th century (Figure 1.12). In Chile, the focus of primary production was mining activities, and industry and agricultural production sank to a secondary role after the start of the 20th century (Figure 1.13).

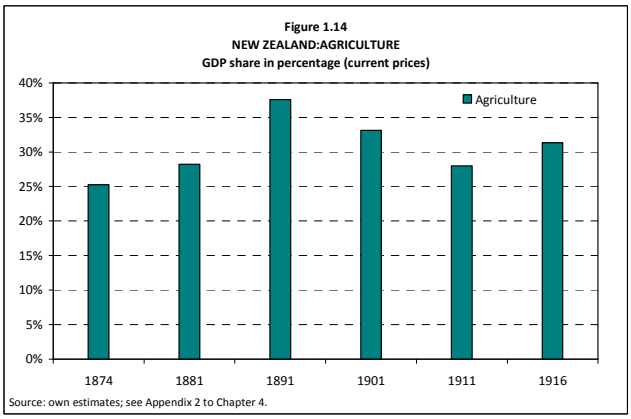


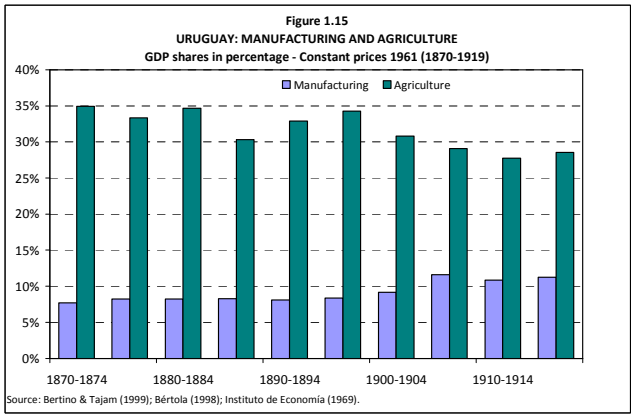


Another important aspect is that in Australia, Canada and Chile the share of manufactures decreased during the period that prices for primary products boomed (from 1890 to WWI), which suggests that these countries showed signs of reacting to the changes in relative prices. However, this did not happen in Argentina or Uruguay, where early industrialization retained certain dynamism even though it started from very low levels.









Persistent predominance of agriculture in the River Plate (Argentina and Uruguay) and Australasia (Australia and New Zealand) is clear when we compare growth rates (Table 1.2). In the 19th century, they showed paces of expansion over the settler average and slowed down during the first two decades of the 20th century. On the contrary, Canada accelerated the rise of agriculture in the 1900s and 1910s, and Chile experienced, in spite of constituting the weakest of the "club", important improvements.

Table 1.2
AGRICULTURE IN SETTLER ECONOMIES
Annual economic growth rates by decade in percentage

	Argentina	Australia	Canada	Chile	New Zealand	Uruguay	Settler 1/
1870s	0.95	0.63	0.29	0.25	1.78	0.56	0.49
1880s	2.66	0.48	0.29	0.10	0.84	0.41	0.39
1890s	3.01	0.42	0.17	0.16	0.51	0.50	0.44
1900s	1.05	0.26	0.41	0.15	0.23	0.08	0.28
1910s	0.35	0.35	0.48	0.34	0.37	0.10	0.32

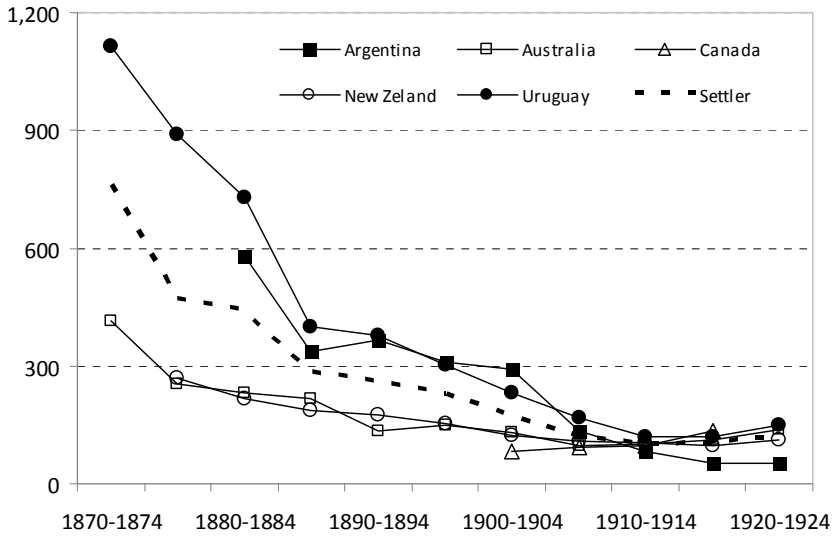
1/ Simple average.
Source: Altman (1992); Bertino & Tajam (1999); Bértola (1998); Braun, Braun, Briones & Díaz (2000); Cortes Conde (1994); Haig(2001); Instituto de Economía (1969).

2.4.3 Worsening income distribution

There is evidence that confirms that "within labour-scarce countries, opening up to international trade and to international factor movements raised inequality, a powerful effect before 1914 where immigration was massive." (Lindert & Williamson, 2001:1-2). However, different countries in the

settler "club" behaved differently. Figure 1.16 shows the evolution of wage-rental ratios in each settler economy compared with the average for the group. It is motivating to note that the economies whose ratios decreased more up to the 1920s (i.e. where income distribution worsened sharply) were precisely those whose relative performance in the long run was worse (the "poor" countries of the club). At the start of the period the ratio in Argentina was around 600 and at the end its values were around 50. The pattern in Uruguay was similar; the country started with a ratio of 1,100 and finished the period at around 150. On the other hand, in the same period the changes in Australia and New Zealand were, respectively, from 400 to 120 and from 270 to 130. Canada was different again; the trend was an increasing wage-rental ratio (the data begins in 1900).

Figure 1.16
WAGE/RENTAL RATIO: SETTLER ECONOMIES
Index 1911=100, 5-year averages (1870-1924)



Source: Williamson (2000, 2002)

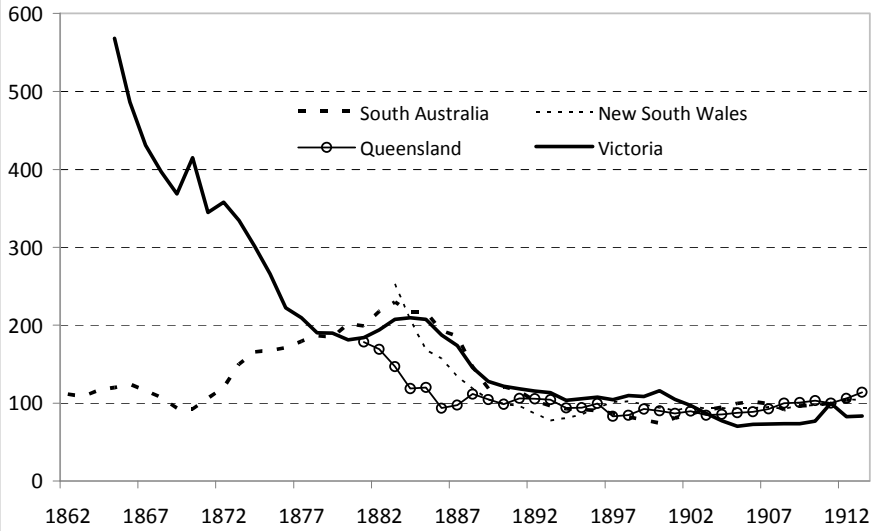
Recent studies have considered the evidence in a manner that is sensitive to regional diversity. The First Globalization was a period in which new land was constantly being put into production; this was a process of frontier expansion and it included specific geographic movements of population. Therefore the consideration of regional evolutions within large economies is a very interesting aspect of the economic performance of the settler countries.

Shanahan & Wilson (2007) disaggregate the Australian findings and present separate land and wage data (Figure 1.17) for four colonies (New South Wales, South Australia, Queensland, and Victoria) in the second half of the 19th century and up to WWI.

> "In broad terms, our results also show that the more general global pressures that impacted on Australia in aggregate were felt in each colony (and later State) to varying degrees; but the effect was in the same general direction. From the 1860s to the years just prior to World War I the wage-rental ratio in each individual colony appears to have ultimately trended down, although the paths of this convergence did differ." (Shanahan & Wilson, 2007:18).

The authors seem committed to finding the H-O-S results instead of the meaning of different regional evolutions. One of the arguments that guides our research is the incorporation of "new" land into the production and the different trajectory of the income distribution may be understood in terms of the land frontier expansion. Notions as open frontier –as it was the case of South Australia during decades– where the price of the land is practically null, and the possible existence of wage-premium in the frontier are simple concepts, absent in the standard framework, that can explain dissimilar evolutions.

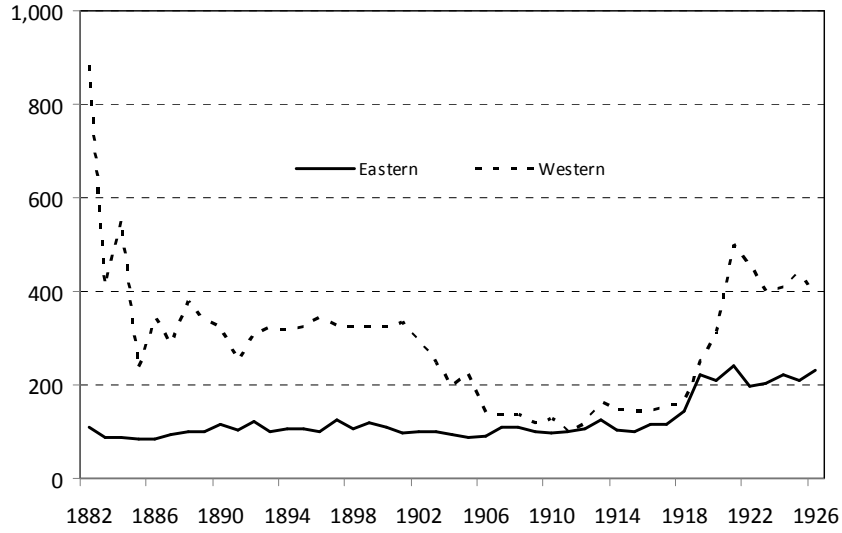
Figure 1.17
WAGE/RENTAL RATIOS: COLONIES OF AUSTRALIA
Index 1911=100 / 1862-1913



Source: Shanahan&Wilson(2007).

Emery, Inwood & Thille (2007) present the first Canadian estimates of region-specific wages and land prices. "Our evidence indicates that while Canada as a nation looks like an anomaly in the era of convergence, this is largely an artefact of aggregating the experience of the labour-abundant eastern provinces with the late-settling and land-abundant western provinces." (Emery, Inwood & Thille, 2007: 22). Figure 1.18 shows the evolution of the wage-rental ratio for Eastern regions (Augusta–Elizabethtown, Medonte and Wellington) and Western regions (Manitoba, Saskatchewan and Alberta), and the differences are very clear. In the west of the country we find the "typical" settler pattern of worsening income distribution up to WWI, while in the east there was a "European process" like in a labour-abundant

Figure 1.18
WAGE/RENTAL RATIOS: LARGE REGIONS OF CANADA
Index 1911=100 / 1882-1926



Source: Emery, Inwood & Thille (2007)

country. Huge differences in levels in the beginning of the period are not surprising when we think about the process in terms of land frontier expansion. Large extensions of "empty" lands in the West opened the gap between wages and land rents and only when the frontier closed –and ownership rights were set up– both indicators showed the same trend.

For Chile, regional estimates of the wage-rental ratio are not available. However, the evidence shows that inequality was high and the trend during the First Globalization was for it to worsen (Prados de la Escosura, 2005, 2007; Bértola & Rodríguez, 2009; Bértola, et al., 2010). Prados de la Escosura (2005: 39) reports a Gini Index of 0.41 for 1870 and 0.65 for 1913,[12] and Bértola & Rodriguez (2009:16) report a Gini Coefficient of 0.52 for 1875 and 0.66 for 1930. However, this evolution was not homogenous because the rate at which inequality increased slowed down from the beginning of the 1890s to the first five years of the 20th century (Rodriguez Weber, 2009:66), which was a period of land frontier expansion and different evolutions of the relative rewards (several indicators would show an increase of the relative wage as consequence of the expansion to the north).

2.4.4 Synthesis and new questions

While the intensity of the First Globalization and its consequences for the settler economies followed a broad common pattern, the countries reacted in different ways, and this probably determined their economic performance in the subsequent decades. These economies based their production on primary activities but in spite of this, at around the time of WWI, they achieved levels of development close to the "core". However, income per capita was higher and inequality was worsening less in ex-British possessions (Australia, New Zealand, Canada) than in the South American Southern Cone (Argentina, Chile and Uruguay), and in the former group economic specialization was relatively less concentrated on primary activities.[13] In terms of the curse/blessing of natural resources, the ex-British colonies were more blessed and less damned by their abundance of resources than the other ex-colonies.

Why were the results so different in the two groups of countries? From an analytical and empirical perspective, a possible strategy to answer this question would be to evaluate the different conditions these economies faced when they integrated to the world economy. In the literature, and especially in the framework of the H-O-S trade theory, there has been an emphasis on the role of relative prices and the movement of productive factors. In particular, the mainstream in recent literature about the expansion of the Atlantic economy has focused on analyzing the evolution of the terms of trade, relative earners (rental and wage incomes), and immigration and capital inflows.

[12] The author proposes "pseudo-Gini" indices because they are backwards projections of Gini with Inequality Indices.
[13] This statement is confirmed by data in Australia and Canada and is deduced from indirect indicators in the case of New Zealand.

However, endogenous land frontier expansion (or the moving frontier) has not been convincingly argued in this analysis, the empirical approach has been too simplistic, and except from the model we revisited in this Thesis,[14] the theoretical framework lacks formality.[15] The incorporation of abundant natural resources into production and the impact of this on a country's economic performance is a line of research that has received little attention in the recent literature on Economic History. However, the relationship between an abundance of natural resources and economic growth is an area of Development Theory that has been analyzed and researched empirically very much in recent years. Our aim is to apply these recent contributions to the settler economies during the First Globalization from an historical and comparative perspective. In the next section we review the literature to find arguments that are useful for our objective (we propose a classification of literature according to topic and analytical methodology), and in Section 4 we set out the hypotheses that guide our research.

3. Abundance of natural resources and economic development

3.1 The notion of natural capital

Since the end of the 20th century economic development is no longer considered to be dependent only on the accumulation of physical and human capital. Academics now point that there is a third form of "capital" or "economic asset" that is important to the performance of the economic system of production, consumption, investment, saving and welfare. This distinct type of capital is the natural and environmental resource endowment available to an economy, and it is commonly referred to as "natural capital". The production of goods and services in an economy is achieved by a combination of produced and natural capital. Capital refers to any stock that yields a flow of valuable goods or services now and in the future. Standard growth models emphasize the role of capital produced by humans and three types can be identified: manufactured capital (factories, buildings, tools and other physical objects identified with means of production), human capital (the stock of education, skills, culture and knowledge stored in human beings themselves) and social capital (connections within and between social networks). However, there is an increasing consensus that natural capital is important for economic growth. Natural capital consists of the various ways that the environment encourages production and supports most aspects of human existence. From a conceptual and practical point of view two kinds of natural capital may be differentiated. First, there is non-renewable natural capital like fossil fuels and mineral deposits that do not recover on a time scale close to the rate at which people use them. For all practical purposes, fossil fuels are literally consumed by use. This type of natural capital generally yields no services

[14] Findlay & Lundahl (1995).
[15] Di Tella (1982) is, probably, one of the most important exceptions.

until it is extracted. The second type is renewable natural capital, which is active and self-maintaining and uses energy from the sun and the Earth's core. Ecosystems are renewable natural capital. A forest or marine ecosystem provides a flow or annual yield of timber or seafood, and this flow can be sustained in the long run if the ecosystem is not deteriorating. The generation of natural resources is just one function of natural capital that yields a flow of ecosystem services when the system is left in place (Ayres et al., 1996). Since the flow of services from ecosystems requires that these systems function as a whole, the structure and diversity of the system is an important component in the constitution of natural capital (Barbier et al., 1995). Natural capital is important for sustainable economic development but increasing economic dependence on natural resource exploitation appears to be an obstacle to growth and development in most low- and middle-income economies in the world. The recent literature shows there is a negative relation between economic growth per capita and some measures of natural capital, and this is seen as the "curse" of natural resources (Auty, 2001a; Gylfason, 2006, 2007; Sachs & Warner, 1995, 2001).[16] Why should an abundance of natural resources often be connected to poorer economic performance? Is an abundance of natural resources a "curse" for economic growth? Are we faced with a general pattern or does it depend on specific conditions (as regards technology or institutions) in an economy, the characteristics of demand and supply and the effect of different historical circumstances? In this section we review the literature about the analytical and empirical relations between natural resource endowments and economic growth from a long run perspective. First, we introduce some concepts and a general overview of the debate (item 3.2). Second, we present two theses that represent the "natural resources blessing hypothesis", which was a commonly accepted idea about economic growth in the mid-20th century (item 3.3). Then our review presents three perspectives from the so-called "natural resources curse hypothesis": the "productive structure approach" (item 3.4), the "crowding out approach" (item 3.5) and the "factor endowment and institutional change hypothesis" (item 3.6), and we consider the different channels of cause and effect that may be identified.

3.2 The debate: "curse" or "blessing"?

"Natural resources" is a more restricted category of analysis than "natural capital" because they are generated by the latter and, consequently, they do not incorporate its systemic character. However, they lend precision to the historical analysis of settler economies where the constitution of markets and others institutions were historically determined at the same time that natural resources were first being exploited.

[16] In general, the studies cover the period from the 1960s to the end of the 20th century.

To discuss the impact of natural resources on economic development it is useful to distinguish among resource abundance (a stock measure of resource wealth), resource rents (the 'windfall' flow of earnings derived from natural resources at some point in time) and resource dependence (the degree to which economies have access to alternative sources of income other than resource extraction; usually related to export specialization). Obviously these concepts may be correlated because economies with abundant natural capital may get high incomes from extraction, they may specialize in primary exports and they may become dependent on resources. But some resource-rich countries are not dependent on resources and some relatively resource-poor economies are. Therefore, there is much confusion about the exact meaning of the concept "resource abundance". This term may be used differently in different sciences and even in different areas of economics. In the natural sciences or environmental economics, resource abundance usually means the amount of potentially exploitable natural resources. But in studies of the Dutch disease, resource abundance means the amount of natural resources and reserves that have already been exploited. The share of potential resources that, in the end, becomes economically exploitable depends on many factors such as economic and political conditions and technological progress and, in consequence, is endogenous to the economic system.

Initially in the literature the "curse" was regarded as an almost unquestionable empirical fact. This idea was based on an index –primary exports shares in GDP– but this is more a measure of *dependence* on natural resources than their *abundance*. In these terms, the analysis concentrated on the channels that connect the two processes –dependence of natural resources and economic growth– in accordance with the typical factors that affect economic performance as the accumulation of productive factors and technological progress. However, when we consider that (i) institutions have increasingly come into the mainstream of recent economic thought; (ii) a central aspect of the matter of natural resources is ownership –of the assets themselves and of the rents derived from their exploitation for production–; and (iii) interest groups and the state are key agents in the formation of the property system; then the literature has advanced systematically in bringing institutional arrangements into the analysis. The results have been mixed, but there is a general consensus in the literature that some kind of conditionality is involved. The idea is that the quality of institutions plays a central role in the curse or the blessing of natural resources, and even when there are abundant natural resources in an economy it can perform well if its institutions are "good" (this would involve some kind of curse-reversal). Finally, the latest contributions in the literature have reacted to this consensus. Several authors distinguish between natural resource *dependence* and natural resource endowment or *abundance*, and take into account alternative indicators such as

the stock of natural capital or total natural resource assets.[17] Empirical studies in this analytical line challenge the traditional view in that they invert the relationship –resource abundance positively affects growth and institutional quality– and identify "this apparent paradox [with] a red herring" (Brunnschweiler & Bulte, 2006). Does this assertion mean we are faced with a meaningless debate? On the contrary, the debate constitutes a real "research programme" and is especially useful to enhance our understanding of the economic performance of economies that are based on the successful exploitation of natural resources.

Our aim in this section is to review the recent literature about the relationships between abundant natural resources and economic performance so as to find hypotheses to guide our research. In recent years the debate has moved to less extreme positions; mixed results are now accepted and aspects of institutions are actively considered. The discussion has also broadened the notion of economic performance to incorporate concepts other than economic growth such as poverty, inequality and various welfare indicators. However, the debate has largely concentrated on analyses of the second half of the 20th century, and new light can be shed on the discussion by applying these concepts in the long run and with an historical perspective.

3.3 Natural resource abundance as a blessing

In the last quarter of the 19th century and up to WWI many countries grew rapidly. This economic boom was closely associated with export-led industrial expansion in Western Europe and the US, and temperate regions –North and South America, South Africa and Australasia– benefited from it. Industrializing European countries needed cheap natural resources from the "New World" and the settler countries needed to import capital and labour to expand their capacity to provide resource-based exports. A key factor in this world development was the transport revolution at the end of the 19th century (O'Rourke and Williamson, 1994; O'Rourke, Taylor and Williamson, 1996), which made it possible for the settler countries to meet these needs and thus join the world economy.

Myint (1958) argues that trade was the channel whereby idle resources –in particular natural resources– in new economies were brought into productive use and fuelled economic growth. According to the "staples thesis", development in many countries has been built around the expansion of export sectors in general and natural resource exports in particular. The "vent for surplus theory" –a Smithian concept– suggests that trade was the means by which unexploited resources started generating wealth and economic growth (Altman, 2003; Bertram, 1963; Chambers and Gordon, 1966; Innis, 1930, 1940; Smith, 1976; Southey, 1978; Watkins, 1963; Wellstead, 2007). Both frameworks consider the presence of excess resources –"land" and "natural resources"–

[17] The World Bank (2006) includes agricultural land, pasture land, forests, protected areas, metals and materials, coal, oil and natural gas as components of the natural wealth of economies.

that are not being fully exploited in a closed economy, and international trade allows these new natural resources to be exploited to increase exports and foster growth (Barbier, 2005).

In the vent-for-surplus theory, Adam Smith analyzed trade for a country which had been isolated but then entered into international trade. Trade provided new effective demand for the output of the surplus resources which would have remained unused had there been no external trade. According to this argument, exports can be increased without reducing production for the domestic market. In his arguments, Smith implied that internal demand was inelastic because there was zero growth in the demand for resources to enable society to benefit from the new market economy. Harold Innis, referring to Canada but in a way that is applicable to other settler economies, says that the economic history of countries with abundant natural resources had dominated by the discrepancy between the centre and the margin of western civilization.

> "The raw material supplied to the mother country stimulated manufacturers of the finished product and also of the product which were in demand in the colony. Large-scale production of raw materials was encouraged by improvement of technique of production, of marketing, and of transport as well as by improvement in the manufacture of the finished product (Innis, 1956: 385).

In these terms, agriculture, industry, transportation, trade, finance, and even governmental activities tended to be subordinate to the production of the staple for a highly specialized manufacturing society. Therefore, the staple theory is a subset of the export-led growth hypothesis and it is designed to explain the growth and economic development of resource-rich economies. Since the 1950s it has come in for heavy criticism (Altman, 2003) but it remains an important contemporary framework for economic analysis and it can help answer some of the questions about the curse and the blessing of an abundance of natural resources.

In other direction, there is a wide range of literature about the US that emphasizes the positive impact that resource endowments had on welfare levels in the late 19th and early 20th centuries (Czelusta & Wright, 2004, 2007; David & Wright, 1997; Mitchener & McLean, 2003; Wright, 1990). In particular, Wright (1990) connects the fact that the US has a leading role in manufacturing to technological progress and learning potential in the American mining sector. Similarly, David &Wright (1997), Wright (2001) and Czelusta & Wright (2004) claim that mining encouraged the establishment of prestigious educational institutions and diffused knowledge to other sectors.

Recently, several authors have proposed models to represent formally the way in which the opening up of a previously closed economic region to staples-led trade can lead to economic development (Lundahl, 1998). Some of them employ the concept of the "endogenous" or "moving" frontier (Di Tella, 1982; Findlay, 1995; Findlay & Lundahl, 1994; Hansen, 1979) and others extend

the framework of the staple approach to include the nature of export staples, regional characteristics and institutional structure (Schedvin, 1990). These models also offer an explanation as to why resource-based development may be initially successful but may not be sustainable in the long run. There were economies specialized in primary exports with a small manufacturing sector (an activity that does not usually expand in this type of economy), and the dynamic demand for raw materials during the golden age (1870-1913) made it possible for them to continue to grow. However, these economies remained vulnerable to falls in the international prices for primary products relative to prices for manufactures. Once a country specializes in resource-based exports it may find it difficult to move away from its main primary specialization and take the path of modern manufacturing. Frontier-based development is symptomatic of a pattern of economy-wide resource exploitation that generates little additional economic rent, and the rents that are produced are not reinvested in more productive and dynamics sectors (such as manufacturing) (Barbier, 2003, 2007). This form of economic life, which is typical of "new" countries, was able to offer high standards of living to society in exporting countries but only as long as domestic resource supplies and world demand remained dynamic. Declines in demand or increases in supply would have severe consequences for the internal political economy of a country and leave it weakly positioned to react to the challenge of finding a new basic product to produce and trade. As Watkins (1963) says, these economies face the risks of the "staple trap". In this sense, the small "domestic market, and the factor proportion –an abundance of land relative to labour and capital– create a comparative advantage in resource intensive exports (staples). "Economic development will be a process of diversification around an export base. The central concept of a staple theory, therefore, is the spread effects of the export sector, that is the impact of export activity on domestic economy and society." (Watkins, 1963: 53-54). In this situation the creation of "linkages" in the export of particular staples –backward, forward and final demand linkages– would be a key element in the success or failure of the country's long-run economic performance. To sum up, these kinds of models involve notions where the export orientation of some economies presents lock-in effects whereby the main primary specialization blocks structural change and consequently impedes economic growth.

3.4 The productive structure approach: the curse and primary specialization

One of the approaches to the "natural resource curse" that we present in this section focuses on the productive structure of the economy. First, a perspective that considers the allocation of resources among productive sectors with different spillover effects on aggregate growth emphasizes the role of specialization in economic development. Economies whose production is based on natural resource abundance and where manufacturing and services have a small share in the productive structure will grow more slowly. Manufacturing and services lead to a more complex

division of labour and have more potential to incorporate knowledge into production and thus develop a sustainable growth trajectory. Second, the so-called Dutch disease is an important concept in the literature about the natural resource curse hypothesis. Economies with abundant natural resources are subject to periodic increases and falls in their performance because commodity prices on world markets are variable and from time to time new exploitable natural resources are discovered. This process generates volatility in export earnings, a real appreciation in the value of the country's currency, and it damages other export industries. These two visions both pertain to productive structure but they emphasize different aspects when it comes to identifying the origin and the evolution of the curse. The former highlights the predominance of primary activities as a long run process with cumulative changes, while the latter offers an explanation of a sudden change in which the movement of relative prices is a key issue.

3.4.1 Natural resources, structural change and economic development

In the contributions to Development Theory during the 1950s, ideas about growth and structural change were closely related. The argument was that development involved the reallocation of productive factors from sectors with low productivity to activities with high productivity, which are characterized by increasing returns and complementarities (Hirschman, 1958; Lewis, 1954, 1955; Myrdal, 1957; Nurkse, 1953, 1962; Rosenstein-Rodan, 1961; Rostow, 1953). As the industrial sector would constitute the main activity to obtain higher levels of productivity, the process would involve changes in the economic structure of the economy, and manufacturing would have a greater share in GDP and employment. Manufacturing generates productive spillovers, forward and backward linkages and economic and technological externalities that maintain the increasing returns in the long run. When countries have an economic structure with a high share of primary activities then economic growth is hampered and the abundance of natural resources is a curse that impedes economic development.

In the 1960s the theoretical and empirical centre of attention changed and the focus shifted to modeling economic growth in accordance with an aggregated production function (Solow, 1956; Swan, 1956). With this new approach productive activities and structural change, by definition, played a secondary role, and with the assumption of exogenous technical progress less attention was paid matters of sector performance. However, the subject became important again in the mainstream of economic development in the 1980s with the New Theory of Economic Growth (NTEG) and the endogeneity of technical progress. The models have two or three sectors, there are increasing returns to intensive research and development (R+D) and there is greater productive diversification to obtain positive rates of growth in the long run. Clear examples of recent theoretical and empirical contributions to the subject (Cimoli et al, 2005) are new theories in the fields of international trade and the geographic location of productive activities (Grossman &

Helpman, 1994; Krugman, 1991), the new theory of economic growth (Aghion & Howitt, 1992) and the new theory of development (Ray, 2000; Ros, 2000). In view of the fact that primary activities by their very nature do not form endogenous cores of innovation and technical progress, economic dependence on natural resources has led to low productive dynamism.

There are two alternative visions to the mainstream literature that identify primary specialization with low economic dynamism. One of them is related with the Marxist and structuralist tradition and, the other, proposes a framework derived from the Schumpeterian analysis of the economic growth and innovation.

First, we consider the unequal development view, whose proponents include the Marxist and *Dependencia* authors (Amin, 1974; Baran, 1957; Emmanuel, 1972; Frank, 1967, 1978; Furtado, 1966, 1969; Wallerstein, 1974) as well as scholars identified with the Latin American Structuralism (Dixon & Thirwall, 1975; Myrdal, 1957; Prebisch, 1950, 1959; Seers, 1962; Singer, 1950). This literature includes various models and theories and many of the key elements feature in the North-South trade model (Krugman, 1981). The idea is that if trade reinforces the economic supremacy of the leading region this is because "a small 'head start' for one region will cumulate over time, with exports of manufactures from the leading region crowding out the industrial sector of the lagging region" (Krugman, 1981: 149). One of the main theories about the unequal development of the centre –the industrial core– and the periphery –with its specialization in primary production– is the Prebisch-Singer Hypothesis (Prebisch, 1950, 1959; Singer, 1950). According to this idea, there is an inherent long-run trend for (non-oil) primary product prices to fall relative to manufacturing prices. This may not be a problem if it is the result of increased technical progress and the country is able to export more and improve its position in world markets. However, the worsening terms of trade will affect the economic growth of a developing country because the income elasticity of demand for manufactured goods is much greater than the income elasticity for primary commodities. As the result of this combination of relatively low income elasticity and worsening terms of trade, countries that rely on the primary goods sector will grow more slowly than economies that rely on manufacturing industries. Recent post-Keynesian and post-Kaldorian theories have dealt with this subject and present formalizations about these limitations on the balance of payments and on economic growth (McCombie & Roberts, 2002; McCombie & Thirlwall, 1994) in terms of different income elasticities of demand for exports and imports and the dynamics of the current account.

Second, in the 1960s, the concept of a gap and technological capacity emerged from the contributions of authors concerned with technological dynamics and its influence on international trade and economic growth (Freeman, 1963; Hirsch, 1965; Posner, 1961; Vernon, 1966). In this view, technological asymmetries are the key to explaining international movements of goods and

services among countries and national patterns of specialization. Innovation is not diffused immediately and technologically advanced countries enjoy an initial advantage and can expand their share in the world market. Economic growth in the long run depends on a country's capacity of narrow the technological gap. Modern models have improved the formalization of technological dynamics in the Neo-Schumpeterian tradition and have included the notion of heterogeneity among agents (Dosi, 1988) and the analysis of aggregated economy (Dosi et al. 1990; Fagerberg, 1994). Industrialization is a process of "accumulation of capabilities" that led from traditional, especially rural, economies to others driven by industrial activities (nowadays also advanced services), "able to systematically learn how to implement and eventually how to generate new ways of producing and new products under conditions of dynamic increasing returns" (Cimoli, et al, 2008:2). In the same way, the Evolutionary School takes the "industrialist" ideas and emphasizes that technological change is the motor of structural change and the source of international specialization (Dosi et al., 1990). In economies that can internalize the new paradigms and technological trajectories there are changes in sector composition and technical progress diffuses to the whole economy. This process needs the existence of connections among codified knowledge, tacit knowledge and various capacities to transform information into innovation and development (Nelson & Winter, 1982). The notion of technical change and industrial dynamics as evolutionary processes (Dosi & Nelson, 2009) has led authors to consider the systemic relations among enterprises, organizations and the institutional structure. "National Systems of Innovation" have become a central concept in the models (Cimoli & Dosi, 1995; Freeman, 1987; Nelson, 1994) and there is a privileged level of analysis of the interactions and co-evolutionary dynamics among five sub-domains (and their related institutions) that govern (i) the generation of scientific knowledge, (ii) the development, improvement, and adoption of new techniques, (iii) the "economic machine" which organizes the production and distribution of products and incomes, (iv) the political and legal structure, and lastly (v) cultural domain-shaping values, norms and customs (Dosi, 2007:2).

Therefore, like in the mainstream, heterodox views focus on why economies that base their productive expansion on the exploitation of natural resources find it difficulty to obtain high rates of growth. The "curse" is expressed as a permanent process of economic divergence.

3.4.2 The Dutch disease

Countries with abundant natural resources undergo booms and busts at irregular intervals because of commodity price volatility and the discovery of new resources. This evolution makes for intermittent changes in export earnings and periodic real appreciation of the national currency, and it works to the detriment of other export industries and foreign capital inflows in a process that has

come to be called the Dutch disease (Corden, 1984; Drelichman, 2005; Krugman, 1987; Neary & van Wijnbergen, 1986; Torvick, 2001; van Wijnbergen, 1984; Wahba, 1998).

A resource price boom or windfall may lead initially to higher rates of growth, but this will only be a transitory gain. As a consequence of the boom, the natural resource sector will expand and attract economic resources away from more dynamic sectors such as manufacturing. As a result, in the long run the economy will become specialized in production and exports based on natural resources, and consequently economic growth will be slow and intermittent. Thus the Dutch disease tends to decrease the level of total exports or bias their composition away from high-tech or high-value-added manufacturing and service sectors that may be particularly beneficial for economic growth. The fact that exchange rates are unstable causes uncertainty, and this may damage exports, investment (Sachs & Warner, 1999a; Herbertsson et al., 1999) and other trade activities including foreign investment. Foreign direct investment may suffer because, apart from natural resource exploitation activities, the possibilities for investment are scarce. That is to say, natural capital tends to crowd out foreign capital (Auty, 1997, 2001b; Gylfason, 2006, 2007). Besides this, industries based on natural resources can pay higher wages (Sachs & Warner, 2001) and also higher interest rates than other export and import activities, and this makes it difficult for the latter to remain competitive in the world market.

Matsuyama (1992) provides a formal model that captures the "natural resource curse" effect and suggests that resource-abundant economies will specialize in the production and export of primary goods. Even if relative world prices do not change, rising productivity in the agricultural sector will attract labour away from manufacturing and thus impede industrialization and economic growth in the long run. If local agents invest their resource revenues in the economy –and not in international capital markets– this will generate a temporary consumption and production boom. Thus, a resource-rich economy will adjust to its steady state in the long term "from above" not "from below", and during the transition its average growth rates will be negative (Rodriguez & Sachs, 1999). The dynamic of the adjustment provides interesting arguments about growth and GDP levels even without considering effects in the Dutch Disease framework.

Boyce & Emery (2006) show that the basic model of a competitive well-functioning exhaustible resource industry can explain not only the negative correlation between resource abundance and growth but also the positive correlation between resource abundance and income levels. The economic rents earned in the exhaustible resource sector can explain the differences in levels, while the intertemporal tradeoffs dynamic faced by exhaustible resource owners explains the growth effects. This is a very interesting argument for settler economies, which were at the top of the GDP per capita world ranking at the end of the 19th century and gradually lost ground after WWI. The

decline in resource rents occurs endogenously, and the rate of decline is affected by the rate of change in technology and by resource prices. Interestingly, as the model assumes that natural resource markets function well, market and institutional failures are not needed to explain the resource curse. Bravo-Ortega & De Gregorio (2005) advance similar ideas about differences in terms of the curse. Natural resources have a positive effect on levels of income and a negative effect on growth rate. But the curse does not inevitably occur. If we accept the interaction term between human capital and natural resources, we can show that high levels of human capital may outweigh the negative effects that natural resource abundance has on growth. In other words, the adverse effects of the Dutch disease can be offset by specific measures (Frenkel, 2010) and even managed in such a way as to be part of an optimal growth path (Matsen & Torvik, 2005).

3.5 The crowding out approach: natural capital displaces other capital modalities

In the structure of recent models an abundance of natural resources or heavy dependence on them influences some variable *"x"* which hampers economic growth (Sachs & Warner, 2001). So the task of theorists and empirical researchers has been to identify the mechanisms that connect these two processes. These channels can be seen in terms of crowding out: an abundance of natural capital tends to displace other modalities of capital and hinder the expansion of production (Gylfason, 2004, 2007). In our presentation we focus on rent-seeking activities, the influence of "bad" institutions, the effects on the generation of human capital, and the expenditure and saving patterns associated with natural resources abundance.

3.5.1 Rent seeking, weak institutions and appropriability

In many developing countries, large natural resource rents, especially in combination with badly-defined property rights, imperfect markets (or the absence of markets) and permissive legal structures, may lead producers to engage in uncontrolled rent-seeking. This diverts resources away from economic activities that are more fruitful in social terms, and it may hamper economic growth (Ascher, 1999; Auty, 2001b; Baland & Francois, 2000; Gelb, 1988; Gylfason, 2001; Tornell & Lane, 1998, 1999; Torvik, 2002).

Huge resource rents may lead to economic and political power being concentrated in the hands of elites that, once in control, use their rents to tilt income and wealth distribution in their favour and thus secure their hold on power. The consequences of this are persistent high inequality, weakened democracy and political instability that slow growth (Acemoglu et al., 2001, 2005; Collier & Hoeffler, 1998, 2002, 2005; Dalgaard & Olsson, 2008; Karl, 1997). Governments may be tempted to spoil markets by granting enterprises or individuals privileged access to common-property natural resources, or they may offer producers tariff protection or other favours at the public expense, and this creates competition among the rent seekers to obtain such favours. Extensive rent

seeking may generate corruption in business and government (Baland & Francois, 2000; Gray & Kaufmann, 1998; Krueger, 1974; Leite & Weidmann, 1999; Torvick, 2002), distort the allocation of resources, weaken fixed investment (by crowding out physical capital), lead to increased public spending (Atkinson & Hamilton, 2003; Ross, 1999), reduce economic efficiency and work against social equity. Moreover, abundant natural resources may induce a false sense of security among the people and governments and cause the State to miss opportunities to impose good economic management (including free trade and an efficient bureaucracy) and establish good quality institutions (Auty, 2001a,b; Bulte et al, 2005; Sachs & Warner, 1999b; Sala-i-Martin & Subramanian, 2003). In other words, abundant natural capital may crowd out social capital –the infrastructure and institutions of a society in a broad sense: culture, cohesion, law, the legal system, rules and customs and so on– and affect economic growth (Auty, 2006; Gylfason, 2004). Therefore we can identify three main channels: rent seeking may corrode social capital through corruption (Auty, 2001b; Karl, 1997; Leite & Weidmann, 1999; Ross, 1999; Sala-i-Martin & Subramanian, 2003), through inequality (Gylfason & Zoega, 2003) and through the absence of political liberties, which are all factors that hinder economic growth and perpetuate poverty. However, this effect is not independent of the political regime, and the evidence indicates that the curse is more likely to occur in presidential regimes (and other non-democracies) than in parliamentary systems (Andersen & Aslaksen, 2006).

Auty (2001b) says that different kinds of natural resource endowments may have different effects on economic performance. It is especially interesting to distinguish between "point resources" (e.g. mineral and energy resources, activities where the use of capital is intensive) and "diffuse resources" (e.g. cropland and livestock). The former generate greater opportunities for rent-seeking and corruption than the latter, and the negative consequences for economic growth are more serious. Isham et al. (2005) say that export concentration in point resources is strongly associated with weak public institutions, and these in turn are strongly linked to slower economic growth. Woolcock et al. (2001) show that natural resources-rich economies in general, and different types of resources in particular, put different types of pressure on community structures, institutional capacity and state-society relations. Economic growth is more likely to be undermined when natural resources are more easily captured and controlled by a narrow elite. Bulte et al. (2005) propose similar exercises but evaluate the curse in terms of several indicators of human welfare. They show that resource-intensive countries tend to have lower levels of human development. This implies that the resource curse is a phenomenon that does not just affect economic growth but has wider impacts, and countries that rely on point resources tend to perform worse.

Boschini et al. (2005) show that the effect of natural resources on economic development is not determined by resource endowments alone but by the interaction between a country's type of resources and its quality of institutions. This combination of factors represents the so-called "appropriability" of a resource. This concept captures the probability that an abundance of natural resources leads to rent-seeking, corruption or conflicts, and these in turn damage economic development. In economies where resources are highly appropriable, the abundance of resources may hamper economic growth, while in countries where resources are less appropriable their abundance may contribute to economic expansion in the long run. Moreover, in these analytical lines the curse is seen as a process conditioned by the impact of other factors, and in this scenario institutional arrangements play a central role. However, recently other academics have questioned this view and cast doubt on the intensity of the effect and the causality of the relationship.

Stijns (2001) suggests that natural resources may affect economic growth either favourably or negatively and Domenech (2008) proves that, in the case of Spain (1860-2000), mineral resources had a positive effect on industrialization by 1920. Ding & Field (2004) use more suitable indicators of natural resource abundance –natural capital (according to the World Bank, 2006, instead of the GDP shares of primary exports) – and demonstrate that the impacts of natural resources on growth disappear. Finally, Brunnschweiler & Bulte (2006) and Brunnschweiler (2008) present evidence that overturns the causality hypothesis and propose that resource abundance has positive effects on growth and institutional quality.

3.5.2 Human capital and skill intensity

Natural resource abundance may reduce private and public incentives to accumulate human capital because there is a high level of non-wage income –e.g., dividends, social spending, low taxes– and because the predominant tendency in resource-rich economies is to underestimate the long-run value of education (Birdsall et al., 2000; Bravo-Ortega & De Gregorio, 2005; Gylfason, 2001; Wood & Mayer, 2001). In others words, abundant natural capital may crowd out human capital. In terms of the productive structure approach, activities based on natural resources –e.g agriculture, fishing, forestry or mining– are less high-skill labour-intensive and probably also less high-quality capital-intensive than other industries. Thus they confer relatively few external benefits on other industries (Wood & Berge, 1997) and tend to impede learning by doing, innovation (Papyrakis & Gerlagh, 2004; Sachs & Warner, 2001, Stijns, 2001), technological progress and consequently economic growth.

3.5.3 Expenditure patterns: incentives to saving and investment

Natural resource abundance may prevent private and public incentives from promoting saving and investing (Papyrakisa & Gerlagh, 2006). As the owners of the natural resources accumulate

more we expect that the demand for capital falls, and this leads to lower real interest rates and slower growth (Gylfason & Zoega, 2001).

Manufacturing often enjoys increasing returns to scale and creates positive externalities. A decrease in scale in manufacturing further decreases the productivity and profitability of physical capital and accelerates the decrease in investment (Sachs & Warner, 1995, 1999a; Gillis et al., 1996). In others words, abundant natural capital may crowd out physical capital. Natural resource wealth decreases the need for savings and investment as the abundance of natural resources provides a continuous stream of future windfalls, and welfare seems less dependent on the transfer of man-made capital to future periods (Corden, 1984; Gylfason & Zoega, 2001, 2006). This process may be related to the retarded development of financial institutions, a state of affairs that discourages saving, investment and economic growth. Besides this, not only is the volume of investment important but also the quality of the expenditure, and individuals or governments frequently invest windfall rents in unproductive projects.

In economies in which a large proportion of the total wealth is in the form of land, total savings can be used either to accumulate capital and attend to market demand or to invest in land (Kurz & Salvadori, 1995; Foley & Michl, 1999). When land is still relatively abundant, the aim of investing in land is to reap the benefits that will come from future price rises. As land prices increase, capitalists invest a larger part of their wealth in it and this slows down capital accumulation. On the other hand, when land is not abundant and the frontier has already been occupied, increases in land rents depress profits and boost capitalist expenditure up to a point at which capital accumulation virtually stops. In both cases resources are diverted from an alternative destination –capital accumulation– in a sense very close to the idea of crowding out, as described above. To the extent that capital accumulation is the main source of growth and technical change, economies in which land rents and/or opportunities for land speculation are higher will grow less.

3.6 Factor endowment and the institutional change hypothesis: natural resources, path dependence and institutional legacy

A last and very influential approach in recent economic history analysis about why some resource-dependent economies have developed more successfully than others, is the assertion that the basic explanation of economic development is to be found in the interaction of critical exogenous factors such as geography, climate and institutional legacy. These factors may explain why certain recently-settled regions in temperate areas, such as Australia, Canada, New Zealand and the US, entered the 20th century as “more developed” countries than the resource-dependent tropical plantation and peasant-based economies of Africa, Asia and Latin America.

Acemoglu et al. (2001, 2002) suggest that different European colonization strategies created different sets of institutions. "Neo-European" states were set up where colonial settlers tried to replicate European institutions, and the emphasis was on private property and controls against government power. But, at the other extreme, there were also "extractive" states in which these two aspects were not considered. Colonization strategy and settlement by Europeans was influenced by geography, climate, disease and environmental factors. In places less suitable for settlement and with high mortality among settlers (malaria, yellow fever) it was more likely that extractive States would be formed. But on the other hand if European colonists could safely settle in an area they created better institutions. Long after European colonies became independent the colonial legacy of the institutional matrix persisted and it has been a key factor in determining whether economic performance would be good or bad (the notion of path-dependence).

Engerman & Sokolof (1997, 2002) consider that the relevant factor endowment was not just relative abundance of land and natural resources to labour in the New World but also the soil, the climate and the size and density of native populations. Their view highlight the fundamental importance of the extreme differences across the New World societies in the extent of inequality in the distributions of wealth, human capital, and political influence that were present from the early histories of the colonies and due primarily to their respective factor endowments (or initial conditions more generally) The causal relationship is between factor endowments, social and economic inequality and the generation of institutional arrangements that create the conditions for economic development. They emphasize the role of factor endowments, arguing that the colonies that came to make up the US and Canada were quite unusual in the New World, because their factor endowments predisposed them toward paths of development with relatively equal distributions of wealth, human capital and greater population homogeneity as compared with the great majority of other regions of Latin America.

Other authors have studied the connection between specific environmental conditions –climate and tropical locations– and economic performance, and present evidence that the former directly influenced the latter (Bloom & Sachs, 1998; Kamarck, 1976). However the predominant current view is that factor endowment explains economic growth but only through the indirect impact of institutional factors (Easterly & Levine, 2003; Hall & Jones, 1999), and does not put forward arguments for direct causality.

3.7 Remarks and summary

We have identified four analytical approaches to understanding the relationship between natural resource endowment and economic development. Three of them are associated with the "resource curse hypothesis", a dominant concept in the literature since the publication of Sachs and Warner's

paper in 1995. The fourth approach is related to the "blessing" that natural resources confer on economic growth, a notion that held sway in the mainstream until the middle of the 20th century.

One approach focuses on the productive structure and considers the allocation of resources among activities with different spillovers and scale economies, and the influence these have on economic growth. Some activities would provide better opportunities for expansion than others, and therefore economic specialization becomes a key issue. Economies based on primary activities (natural resources-intensive economies) and where manufacturing and services have a small share in the internal generation of value would grow more slowly than other economies where labour division is more complex and innovative capacity is strengthened by systemic relationships. This approach includes the contributions of the Latin American Structuralism and the Developmentalist Theories of the 1950s-1960s and also of the recent analyses from the Neo-Schumpeterian and Evolutionist Schools. "Dutch disease hypothesis" occupies a key position in the approach that emphasizes changes in productive structure. Countries with abundant natural resources undergo booms and busts at irregular intervals because of price variations and because new resources are discovered. This evolution would create sudden changes in export earnings and in real currency exchange rates, and would affect the performance of foreign direct investment and productive activities, especially in tradable industries. The framework of the Dutch Disease hypothesis is useful to discuss the dynamic of the adjustment even though it is not essential to understand it. In other models it is possible, as well, to find different effects of the abundance of natural resources on income growth and income level. Economies with huge natural resources can achieve high incomes per capita although the transition into a new equilibrium may imply negative growth rates.

A second approach is based on the recent literature about the "resource curse hypothesis". In this model the idea is that an abundance of, or heavy dependence on, natural resources influences some variable *"x"* which affects economic growth. The channels of transmission of this effect can be understood in terms of crowding out: an abundance of natural capital tends to displace other modalities of capital such as social, human, physical and financial assets, and tends to damage foreign direct investment. In general, failures in economic policy and weaknesses in institutions generate conditions adverse to economic growth, and resources are allocated to activities with low contributions to social welfare. This analysis is usually based on rent-seeking behaviour, which includes the government granting privileges to private agents, corruption, inequality and restrictions on political freedom. An abundance of natural resources may reduce incentives to accumulate human capital and depress public and private expenditure on high quality education. It may also be accompanied by low incentives to save and invest in a context of weak demand for machinery and equipment and low real interest rates. When capital accumulation is the main source of resources

for growth and technical change, economies in which land rents and/or opportunities for land speculation are higher will grow less. In this context, the possibilities to connect financial capital with production are reduced and credit markets are imperfect and segmented. These considerations may be extended to foreign direct investment, which will find few attractive alternatives apart from the main natural resource exploitation activities.

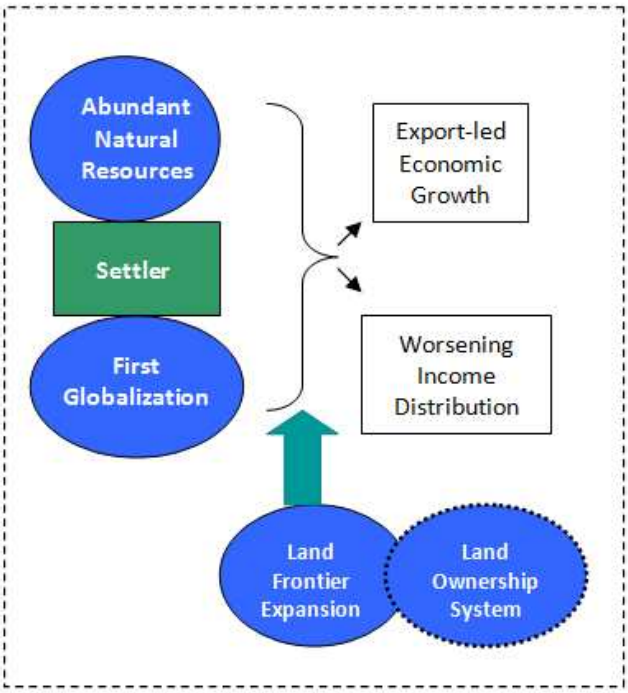
The third approach is the so-called "factor endowment and institutional change hypothesis". In accordance with this view, the core of economic development is the interaction of critical exogenous factors such as geography, climate and institutional legacy. We can identify two perspectives here. First, the endowment of natural resources may directly affect economic development because geographic and environmental factors would determine land quality, potential production and the available technology. Second, the environment, geography and natural endowments may have indirect effects on economic development through the institutional structure and changes in institutional arrangements.

Finally, a fourth approach considers that natural resources are a blessing for growth. According to the "staple theory", several countries have developed integrated economies by exporting primary products (typically some settler economies). The existence of backward and forward linkages supports this view because some activities have more potential than others to induce dynamism in the economy. The "vent for surplus theory" suggests that external trade was the way in which idle natural resources started to generate value, and this opened the way for quick expansion.

4. Hypotheses and structure of the Thesis

The starting point of our argument (see Figure 1.19) is that when the settler economies, with their abundance of natural resources, were exposed to the effects of the First Globalization they reacted differently in terms of economic performance. There was a common pattern of primary export-led economic growth and worsening inequality, and in different places the incorporation of "new" land into production would have different consequences in terms of income – levels per capita and distribution– with differing intensity in long-run performance.

Figure 1.19
OUR LINE OF ARGUMENT



4.1 Line of argument and hypotheses

Massive migrations and inflows of capital were accompanied by the expansion of the frontier, the settlement of "new" regions and movements into inhabited areas. The concept of frontier expansion has two dimensions. On the one hand there is the traditional idea of the exploitation of "new resources" that led to increasing economic growth, and on the other hand the idea of "land conversion" whereby new and relatively large scale productive activities were introduced into regions where there already was economic activity (Barbier, 2003:16). In our Thesis we concentrate on the former notion because it is more appropriate to refer to the "frontiers of settlement".[18]

The most famous study of the importance of frontier expansion for economic development was that of Frederick Jackson Turner in 1893. Turner (1920) advanced what is known as the "Turner thesis". His argument is that the frontier attracted a particular type of person, and this was crucial for determining the path of US society. This study was the first in a fruitful field of research that applied these notions to North America, Latin America, and Australasia.

The "domestic contribution" to economic growth in settler economies was precisely the incorporation of "new" land into production. The literature about the economic development of settler economies has traditionally discussed the timing of frontier expansion. "In the Argentine pampas, and in the south-eastern and south-western regions of Australia, the fertility of the soil and mean rainfall declined as the farming frontier moved inland from the coasts –though more rapidly in the case of Australia" (McLean, 2005: 20).[19] "If the 1890s saw beginning of large-scale settlement on the prairies [Canada] and the pampas [Argentina], the era of the open frontier of settlement was over by 1914" (Adelman, 1994:5). In Argentina, and in contrast to other settler economies like Australia and Canada, "[t]he economic problem was how to pass from horizontal expansion –onto new land– to expansion that we may call vertical expansion, which would include intensive agriculture and industrial development" (Di Tella & Zymelman, 1967: 141-142; our translation).[20] Another aspect of land frontier expansion is the types of natural resources involved. "Australia, and to a lesser degree New Zealand, had a significant mining sector, and this meant more diversified exports and also a supply of raw materials and energy for the country's own industry. Mining explains why GDP per capita in Australia was initially so much higher than in Argentina (around 1880)." (own translation) (Álvarez, Bértola & Porcile, 2007: 12). Denoon (1983), Dieguez (1969), Duncan & Fogarty (1984) and Platt & Di Tella (1985) all consider different land frontier expansion patterns in their analyses of comparative development. The

[18] "Frontiers of settlement" is a concept corresponding to the North American notion of land frontier expansion, and this contrasts to the European notion whereby the "political frontier" is the central idea (Power, 1999).
[19] Similar concepts are proposed in Rock (1986) and Díaz Alejandro (1975) (Argentina and the US).
[20] In other words, the problem of Argentina –as other settler economies– was how to deal with the structural change.

expansion of the land frontier was clearly related to the way in which land property rights were set up and consequently to the establishment of different land ownership systems. One of the main factors behind differences in economic performance may be differences in land frontier expansion and in the creation of the institutional arrangements related to it. The incentive mechanisms and the capacity that institutions had to appropriate rents and channel them into productive activities are determinant in explaining differences within the "club".

We focus our analysis on the settler economies during the First Globalization (from the mid-19th century to WWI) and we consider that an abundance of natural resources was one of the main factors behind economic performance in the period. In the recent literature, the stylized facts associated with the First Globalization –economic growth, primary specialization and increasing inequality– have been analyzed in terms of changes in relative prices and factor endowments –in the H-O-S tradition– although little attention has been paid to the incorporation of new land. Our approach is to emphasize this process and to consider endogenous land frontier expansion as the main expression of the abundance of natural resources in settler economies. The incorporation of "new" land was a process that went on at the same time that specific institutions dealing with land ownership were being set up. Therefore a second central aspect is to examine the connection between the dynamics of land incorporation and the quality of the institutions involved. Because worsening income distribution is a key subject, we employ a theoretical framework in which the different rental appropriability capacities of the natural resources is a key factor, and we evaluate the formation of the land ownership system in accordance with it. In line with our objectives, we put special emphasis on the agriculture performance because of two reasons. First, this sector was a central protagonist in the land frontier expansion and, in consequence, it was the activity that received more directly the effects of the First Globalization. Second, a sector approach allows us a more detailed analysis of the evolution of income and inequality in settler economies.

Our hypothesis is that the land frontier expansion shaped different opportunities, depending on the land aptitude, for members of the settler club and this determined how productive and distributive patterns were established. That economy that expands its frontier by the best lands "received" the blessing of the abundance of natural resources in terms of growth, but faced the curse of a deeper worsening in the income distribution in the agriculture. Land quality determines, technically, the appropriability conditions of the natural resources, and the quality of the institutions (in terms of their capacity to moderate concentrated rent appropriation) conditioned the long-run performance of the period. In this sense, our view has points of contact with the "factor endowment and the institutional change hypothesis" because endowments play a central role and interact with institutions to determine the economic performance in a logic of path dependence.

Availability of natural resources (especially land) was the main comparative advantage of settler economies to participate in the international commodity markets, and it determined their export-led growth strategy in a way according to the hypothesis of the blessing of the natural resources (in the tradition of the Staple Theory). But, at the same time, the First Globalization created pressures to increase income inequality. These pressures were expressed in a broader gap between rents and other income modalities (wages and profits) in a process that combined higher rental rates with the expansion of the productive factor more intensively used to produce food and raw materials (land as the abundant factor). Nevertheless, the natural endowments within the "club" were not homogenous along the territory, and the consequences rendered different results. In accordance with our theoretical framework, moving the land frontier by better lands would foster the negative effects on income distribution because it would enable a reduced segment of the population (landowners) to capture increasing rents. A more intense worsening in the inequality of the River Plate would be associated with the different timing of land frontier expansion into lands that were better as regards agricultural aptitude (in terms of the suitability to allocate grassland) and distance (to strategic territorial points that we call "centres of gravity"). Considering different land quality as diverse types of natural resources that imply different conditions to capture the rents generated by the incorporation of "new" land is represented by the "appropriability hypothesis" and its two components, i.e. the technical and the institutional dimensions.

The historical conditions in Spanish ex-colonies contributed to the creation of a "*rentist*" pattern in which land ownership made possible the elite appropriate incomes without having to make substantial investments, in a social environment where the land concentration was the norm in a society with deep roots in the colonial era. Simultaneously with the land frontier expansion, it was occurred the configuration of a system of institutional arrangements that created a new land ownership structure. In the ex-British colonies, the distribution of land ownership rights configured a land ownership system that encouraged economic growth and an income pattern more egalitarian than in South American Southern Cone. In the British territories, and in comparative terms, the conditions fostered investment (in physical and human capital) and moderated the crowding-out effects of natural resources.

4.2 Structure of the Thesis

In accordance with our hypotheses, the discussion of the literature about the curse and the blessing of the natural resources, and paying attention to the foremost stylized facts of our "club" of economies, we focus on three main questions: (i) endogenous land frontier expansion; (ii) the influence of land quality in the economic performance; (iii) the interaction between the abundance

of natural resources and institutional quality. To deal with these questions we work in four supplementary directions.

4.2.1 Theoretical framework: land frontier expansion, land quality and institutional quality

We present an analytical model that describes the three stylized facts mentioned in Section 2 to represent some aspects of the blessing and the curse of the natural resources and that supplements the view derived from the H-O-S theory. In the tradition of "specific factor" models, we study two aspects of domestic conditions: endogenous land frontier expansion and the use of a decision rule to understand this movement in terms of incomes and costs related to this expansion. We propose modifications to the theoretical formulation derived from Findaly & Lundahl (1994) and Findlay (1995) to introduce the effect of different land qualities in the results of the model. Our objective is to emphasize the role of endogenous advance on the land during the First Globalization and how it reacted to movements in the relative prices of the commodities, the changes in the relative endowments of productive factors and modifications in parameters. Our contribution is to extend the model to make it more flexible and adapt it to the different results within the settler "club". Our discussion focuses on particular on the influence of different patterns of land frontier expansion (or settlement) –which depends on land quality– on the constitution of particular distribution structures.

Land frontier expansion occurred simultaneously with the creation of specific institutional arrangements and, therefore, the institutional explanation of the natural resource curse (and blessing) constitutes a useful tool to guide our analysis. The effect of natural resources on economic development is not determined by resource endowments alone, but rather by the interaction between the type of resources and the quality of institutions. This combination represents the so-called "appropriability" of a resource. In general, this concept alludes to the environmental factors that control the innovator's ability to get returns generated by an innovation. In the case of natural resources, the concept captures the probability that they may lead to rent-seeking, anti-competitive actions and corruption or conflicts which, in turn, damage economic development. In economies where resources are highly appropriable, the abundance of resources may hamper economic development, while in countries where resources are less appropriable their abundance may contribute to it. These aspects are dealt with in Chapter 2. From this discussion, two questions are central for our analysis of the economic performance of settler countries: land frontier expansion and income distribution, and in the next two chapters we made these concepts operational.

4.2.2 Land frontier expansion: concept, measures and evidence

From the discussion in Chapter 2 we present different notions and measures of land frontier expansion. In order to identify the "settlement patterns", we present the concept of land frontier expansion and review its recent theoretical and empirical development so as to discuss ways to

measure the process. We base our quantification proposal on the use of geo-referenced information systems (GIS) and the elaboration of land frontier indexes ("extensive", "intensive", and "contribution"). With this strategy we can circumvent the limitations of previous approaches in the matter because we consider different land aptitudes (in agricultural terms) and distances (from "centres of gravity) considering potential vegetation. We dealt with these aspects in Chapter 3.

4.2.3 Inequality patterns: concept, measures and evidence

In accordance with the discussion in Chapter 2, we present different notions and measures of two dimensions of inequality in settler economies. We consider assets and incomes distribution, in order to identify different "distributive patterns". Agricultural production was the most important productive activity in the settler economies and one of the main factors in land frontier expansion, so a study of the inequality in the sector can yield interesting insights.

We review the distribution of the land ownership in the eve of the WWI. We present percentile indicators, Gini coefficients and sizes of the establishments by country in the "club" and by regions (the latter for large economies, Argentina, Australia and Canada). Inequality indexes hide certain "shapes" in land distribution that make some comparisons relative and drive us to put the emphasis on different regional realities that improve our approach to the question. We also estimate functional income distribution in the agrarian sector. We present the concept and discuss the existence of two distributive patterns. In one of them capitalist relations predominated, and this was typical of the British ex-colonies, and in the other economic relations were based on agrarian rental incomes, and this was the pattern in the economies of the South America Southern Cone. In the Australasian economies and Canada income distribution worsened less severely than in the Spanish ex-colonies in the "club", and this coincided with different dynamics of advancing into the territory. In accordance with our measure of land frontier expansion in agrarian aptitude terms, and supported by our theoretical framework, we argue that the different exploitation of natural resources explain, at least partially, these differences. These aspects are discussed in Chapter 4.

4.2.4 The role of institutional arrangements: appropriability and land ownership systems

Specific institutional arrangements –especially property rights– came into being at the same time that the land frontier was expanding (although in some periods one process preceded the other), so the influence of these two factors on economic performance should not be studied separately, and we pay attention on the simultaneous effects.

We discuss the effect of natural resources on economic development through the interaction between the type of natural resources that a country possesses and the quality of its institutions. We consider types of natural resources in terms of land aptitude. We approach institutional quality by considering governance, contract enforcement and property rights (at the macro level), and in terms

of the evolution of the configuration of the land ownership system (at the level of the agents' behaviour). Our argument is guided by the appropriability hypothesis and we propose two approaches. One is based estimating the statistical relation between economic development (growth and income distribution in the agrarian activity), natural resources and institutions, and involves the concepts of constraints on the executive and contract-intensive money. The other is a historical description of the distribution of land rights and the institutional arrangements related to the land property in four countries: Argentina and Uruguay (that represent the Spanish ex-colonies) and Australia and New Zealand (the English ex-colonies). Our main findings are that, in the long run, the curse of natural resources on development in terms of inequality arises when the new land that is brought into use is more suitable for agrarian activity (high aptitude). However, at the same time the abundance of land bestows the blessing of significant economic growth in the agriculture when economies "escape from the (initial) curse" of natural resources.

4.2.5 Other contributions

In Chapter 6 we present our main conclusions, final remarks and contributions. In addition, several chapters have a very detailed appendix. Chapter 2 has an appendix with the formal representation of the analytical model, which is commented on and illustrated in the core of the chapter, and the results of the corresponding calibration and numerical analysis. It constitutes an interesting improvement on the original model and a conceptual contribution to the analysis of the period. Chapter 3 has a description of the application of GIS tools in historical perspective and examines some methodological questions. Chapter 4 includes an appendix about the methodological construction of the functional income distribution series for the agrarian sector. This appendix provides new statistical series and describes the methodological decisions that, besides making our results plausible, may be useful for subsequent working research. Finally, in the appendix to Chapter 5 there is a description of the institutional quality indicators used in our econometric exercises.

Appendix to Chapter 1

Statistical sources

1. GDP per capita

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2. Productive structure

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Chapter 2
Land abundance, frontier expansion and income distribution in settler economies during the First Globalization (1870-1913): analytical framework

The effects of the First Globalization on economic growth and income distribution in the New World figure prominently in the recent literature about the economic history of the late 19th and early 20th centuries. Initially in this chapter we discuss an analytical model –in the "specific factors" model tradition– to improve our understanding of the evolution of economic performance in natural resource-abundant regions. This approach supplements the H-O-S approach and has endogenous land frontier expansion as a main concept. In this framework it is possible to introduce different qualities of land in order to represent the historical process of the settler economies.

First, we consider economic growth and the evolution of inequality in the settler economies as a "club" and present the well-known H-O-S framework as the "mainstream" view that explains the effects of the First Globalization (Section 1). We discuss some of the main limitations of this framework (theoretical and empirical questions) and outline recent efforts to overcome them. Then we introduce an analytical approach that changes the emphasis of the analysis. In the tradition of "specific factor" models, we work with two aspects of domestic conditions: endogenous land frontier expansion and the use of a decision rule to understand this movement in terms of marginal incomes and costs of the expansion. We propose static comparative exercises to review some of the main processes associated with the First Globalization (improving terms of trade, immigration, capital inflows, the reduction in the cost of clearing land, technical progress) and to understand how the model works (Section 2). In this framework we propose a numerical analysis with specific functional expressions to illustrate this subject and discuss our results. As this framework cannot explain differences within the "club" (studied in Chapter 1), we discuss some analytical extensions to capture different land qualities in terms of agricultural aptitude and distance from markets (Section 3) and advance suggestions and hypotheses that will be tackled in subsequent steps of this research (Section 4).

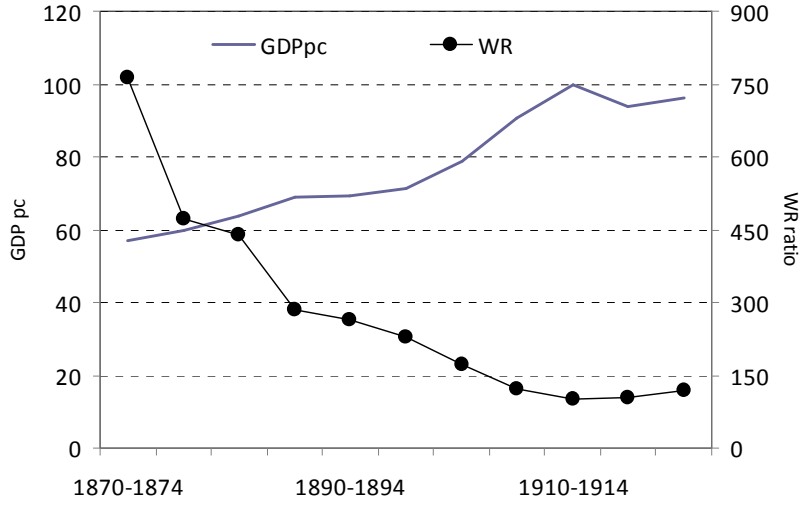
Natural endowments (land) are not the whole story and their incorporation into production is mediated by institutional arrangements, so we extend our analytical framework to consider recent contributions about economic development and an abundance of natural resources. One of the main branches of the curse of natural resources approach is the analysis of the role institutions play in economic relationships. We use the appropriability hypothesis to consider the idea that different types of natural resources interact with institutional quality and yield differing economic results. According to the more extended literature our settler economies would have similar natural capital,

but it is important to introduce the idea of "quality" to identify different "types" of natural resources. We consider different kinds of land –depending on its natural aptitude to be used for grazing– to incorporate a scale of appropriability possibilities that ranges from high quality land (with a greater probability of yielding differential rents) to low quality. First, we review the concept of the curse of natural resources and present the appropriability hypothesis (Section 5). This concept enables us to identify two models of distribution (in the agrarian sector) and the creation of institutional arrangements for land ownership. Finally, in Section 6 we draw our conclusions and make some final remarks about the two conceptual approaches, their role in this Thesis and the subsequent chapters.

1. Stylized facts and the "canonical" model: comments and limitations

During the First Globalization (from the mid-19th century to the 1910s), the settler economy development pattern was characterized by a strong primary export-led economic growth and increasing income inequality. In the closing decades of the 19th century economic growth was encouraged by the export of primary products (leather, wool, meat, wheat and, in some cases, mineral products),[21] and the abundance of natural resources was a blessing for the productive expansion of the settler economies (see Figure 2.1). But this blessing also contained a curse in that income distribution worsened and specialization in primary production adversely affected the expansion of incipient artisan and basic manufacturing activities (de-industrialization, according to Williamson, 2004).

Figure 2.1
GDP PER CAPITA AND WAGE/RETAL RATIO IN SETTLER ECONOMIES
Index 1911=100, 5-year averages (1870-1924)



Source: Maddison (2001); Williamson (2000, 2002).

The H-O-S trade theory predicts that free trade will raise the incomes of agents that own the abundant-factor and will reduce incomes of agents that posses the scarce-factor. Given a situation where labour works the land and each economy takes commodity prices as given by world markets, movements towards globalization –through trade and commodity price convergence– favour workers' incomes (as opposed to those of landowners) in places where labour is abundant and land is scarce, whereas in places where labour

[21] Willebald (2006, 2007) presents the external specialization of the settler economies during the period.

is scarce and land is abundant the relative incomes of landowners are favoured. Considering that labour remuneration in labour-abundant and land-scarce economies was initially lower than labour remuneration in labour-scarce and land-abundant ones, and that the opposite happens in landowner incomes, globalization in a pre-industrial environment leads to a levelling of world income (O'Rourke & Williamson, 1999). Therefore, the inequality-globalization connection in the nineteenth century can be summarized as follows: globalization seems to have had an anti-egalitarian effect in (initially) land-abundant regions; it was a force that increased inequality by rewarding landowners more than wage-earners. Globalization seems to have had an egalitarian effect in (initially) land-scarce countries, especially in those that adhered to free trade and resisted pressure for more protection. These two effects might appear at first glance to cancel each other out when we aggregate the Atlantic economy as a whole. However, when we note that European landlords at the top of the Atlantic income distribution scale lost the most while European unskilled workers at the bottom gained the most, we see that changes favoured an evolution of net egalitarian effects (Lindert & Williamson, 2001). The impact of mass migration reinforced this trend.

In the Atlantic economy real wages and living standards converged from the mid-19th century until WWI. This process was driven by the narrowing of the wage gap between the New and the Old World. In addition, many European countries, particularly the poorer ones, were catching up with the economic leaders in Europe (the industrial countries). Migration affected long-run equilibrium output and wages through changes in aggregate labour supply; it raised wages in countries with high emigration rates and reduced them in countries that received migrations. Capital flows acted as an anti-convergence force (in the sense of the Lucas Paradox) because they moved towards rich countries, rather than poor ones, in pursuit of abundant natural resources, young populations, and the (potential) abundance of human capital (Clemens & Williamson, 2004).

Recent studies, with very few exceptions, [22] have not applied Rybcszynski's theorem from the Heckscher-Ohlin trade theory to explain the performance of the Atlantic economy during the period. This point is important because this theorem states that the maintenance of the substitution rates of production after an increase in one factor must lead to an absolute expansion in the commodity production that uses relatively more of that factor, and to an absolute reduction in the production of goods using relatively less of the same factor. Therefore, in the settler economies, land frontier expansion would increase agrarian production and at the same time reduce manufacturing output. This stylized fact, despite some differences, is a good representation of the evolution of the club (see Chapter 1, sub-section 2). In addition, the theorem proves that "the terms

[22] Rodriguez Weber (2011) explicitly applies the Rybcszynski effect to a mining economy (Chile) in the period 1880-1905. Williamson (2004) discusses a similar question in the context of the de-industrialization of India during the First Globalization.

of trade of the commodity using relatively much of the factor whose quantity has increased must deteriorate" (Rybcszynski, 1955: 339). In our context, land frontier expansion would have been associated with a decrease in the ratio between the price of the agrarian commodity and the price of the manufactured good (P_A/P_M). This result scarcely occurs in settler economies during the period, which is probably why the literature pays scant attention to Rybcszynski's effect. In a previous paper we review the stylized facts of settler economies during the First Globalization and evaluate the evolution of two relative price ratios (Willebald, 2009:27, 29). First we present that ratio because it is, conceptually, the more suitable relationship. Second, we work with international terms of trade (*TOT*) as a proxy because, in the case of settler economies, export prices (P_X) would represent agrarian prices, and import prices (P_{IM}) the prices of industrial products. For the club, P_A/P_M tended to decrease slightly in the 1870s and 1880s, but starting in the 1890s the evolution changed direction and the ratio increased significantly until it reached a peak after WWI. The evolution of P_X/P_{IM} was similar but did not have the initial decreasing trend. In addition, if we consider the small country assumption the internal changes in factor endowments should not affect international prices. In other words, it is reasonable to think that the predominant effect of the evolution of commodity prices meant for an improved P_A/P_M ratio and therefore regressive effects on income distribution. Bearing this in mind it is no surprise that the land frontier occupied a secondary place in the recent literature and it has been practically ignored in empirical studies.

Research into inequality trends in countries that participated in the global economy looks at two kinds of empirical evidence. First, it considers trends in the ratio between farm rents per unit of acre and the unskilled wage rate (r/w), which can be understood as a measure of how many days an employee has to work to pay the rent for one unit of land. This is an adequate index of inequality in a world with a big agricultural sector where land is a critical component of total wealth and a decisive factor in income generation, and where the landowning class is a minority. Second, the other inequality evidence from factor prices uses trends in the ratio between GDP per worker and the unskilled wage rate (y/w) and yields an index of how far the recipient of an average income is from the typical unskilled worker near the bottom of the income distribution scale. In order to make historical and long run comparisons of globalization and inequality, it is important to take into account two shortcomings of this approach.

First, there is a serious empirical obstacle to obtaining satisfactory results, which is that consistent data, even for a single country, are scarce and fragile. Data have often been compiled from a variety of sources –which involves us in all the difficulties of working with different methodologies– and they have been used to create different types of series for real wage rates (for unskilled urban workers, usually taken from the construction sector), land prices (rural areas), trade

(the exchange of goods and international commodity prices), migration (distinguishing regions of origin and destination), and capital movements (financial and foreign direct investment). In particular, when we work with rental-wage ratios (or income-wage ratios) changes in the structure of the active population are not considered, so the ratios can be interpreted as indicators of income polarization rather than overall inequality. Second, from a conceptual point of view the framework to understand this question is based on the neoclassical approach to the theory of international trade and specialization. The H-O-S approach is a useful framework to help us think about and interpret several features of the process, but other aspects seem to be hidden behind prices and their comparative evolutions. In particular, productivity gains, the possibility to advance into unoccupied regions, the possibility to change the specialization of inhabited areas, and changes in the economic structure have consequences that are hard to incorporate into the neoclassical approach.

Recent studies have addressed the first point in two ways. First, they try to improve the quality and quantity of the data by elaborating new series (Arroyo Abad, 2008, for Argentina, Mexico, Venezuela and Uruguay in the 19th century; Bértola and Colab, 2000; Bértola, et al., 1999, for Argentina, Brazil, and Uruguay; Bohlin & Larsson, 2007, for Sweden; Greasley & Oxley, 2005, for New Zealand) or by considering evidence so as to allow for regional diversity (Emery, et al., 2007, for Canada; Shanahan & Wilson, 2007, for Australia). Second, these new studies estimate inequality and poverty in the long run using various indices (Prados de la Escosura, 2005, 2007, for Latin America) or in a direct way using population and economic census data and assigning income to active individuals depending on their economic activity, profession, gender, and region (Álvarez & Nicoloni, 2010, for one region in Argentina; Bértola, et al., 2007, and Bértola, et al., 2009c, for Brazil; Bértola and Rodríguez Weber, 2009, and Rodríguez Weber, 2009, for Chile; Bértola, et al., 2009a,b, and 2010, for the South American Southern Cone).

Other authors have addressed the second shortcoming by emphasizing the relationship between growth and inequality in pre-industrial economies. The basic idea is that the level of possible inequality depends on the level of per capita income, the subsistence level of the majority of the population and the size of the elite that may appropriate the eventual surplus (Milanovic, et al., 2007). Other authors take the evolution of productivity as a central concept and treat it as a process that depends on the interaction between technical progress, changes in the productive structure and changes in the demand pattern, which have consequences for the development of international trade (Bértola, 2000; Porcile and Bértola, 2007; Willebald, 2006, 2007). Finally, in a 2007 article, Knick Harley argues the following.

> "Applying the Stopler-Samuelson paradigm from the Heckscher-Ohlin trade theory, the result is an approach that sees price convergence as pivotal in defining, identifying,

and measuring globalization. This focus, however, obscures the implications of frontier incorporation and other insights achieved by viewing nineteenth-century globalization as a mechanism whereby peripheral economies were incorporated into the core of organized economic activity. A frontier-centred perspective also reintroduces the role of economic institutions as a crucial element of economic growth and development." (Harley, 2007:238).

Bringing the frontier into the analysis involves the discovery of export staples, a process of learning how best to exploit them, and the mobilization of capital and labour for production, use and distribution. In a recent working paper, Camilo García-Jimeno and James Robinson show similar interest in the frontier. They analyze the classical F.J. Turner (1920) view, the "Frontier (or Turner) Thesis", for North, Central and South America from the middle of the 19th century to 2007. They suggest that institutional quality, taken together with the open frontier, explain the success or failure of these economies in the long-run.

"The consequences of the existence of a frontier for different countries in the Americas depended a lot on the nature of political institutions which formed in the early independence period. If these institutions featured few constraints on the executive, having a frontier was actually bad for economic development". (García-Jimeno & Robinson, 2009: 18).

From this viewpoint, the focus centred on frontiers –the incorporation of regions that were originally almost unoccupied and outside European economic influence– supplements the mainstream approach and helps to explain new questions. In particular, land frontier expansion may be a pivotal concept insofar as it enables us to connect considerations about technological progress and institutional formation in a different way, as based on the combination of endogenous growth in the use of the productive factor and regional and local perspectives. These considerations are particularly useful in our line of research.

Our thesis is part of the literature that seeks to understand the effects of the First Globalization on economic growth and income distribution in the closing decades of the 19th century and the first decades of the 20th century. Initially, we present a model that incorporates the concept of endogenous land frontier expansion to complement the view derived from H-O-S framework, and includes a focus on different land quality in interaction with institutional quality. We attempt to incorporate some of the proposals presented in Harley (2007) related to land frontier expansion, and in García-Jimeno & Robinson (2009) related to institutional approach. Afterwards, we will discuss the land frontier expansion approach of García-Jimeno & Robinson (2009) (Chapter 3) and we will contribute with new evidence about income distribution from a sector perspective (Chapter 4).

2. A complementary view to H-O-S approach: the importance of endogenous land frontier expansion

Changes in levels of economic activity, income distribution and the productive structure may be represented by a simple model that incorporates changes in relative prices, inter-sector differences in productivity, and the accumulation of productive factors. This model is based on the so-called Ricardo-Viner "specific factors" model, which was itself influenced by Jones [1979, (1971)] in the "staple theory" tradition. We initially follow Findlay & Lundahl (1994) and Findlay (1995) and present comparative static exercises to represent the main stylized facts of the First Globalization. As in Di Tella (1982) and Harley (1978), this model considers the concept of an endogenous or moving frontier, and permits us to introduce a perspective that supplements the insights usually studied in the recent literature.

The basic idea is that the supply of land "physically" given, as in Ricardo's notion of "the original and indestructible powers of the soil", is not necessarily perfectly inelastic. Incorporating land into production requires an investment to clear waste land, improve transportation and create the conditions for people to live in distant territories. Therefore the acquisition of "new" land could be thought of as an investment that yields returns equal to its rents, but that also requires some initial expenditure which has to be recovered at a rate of return that is competitive with other alternatives (the typical notion of opportunity cost). In this sense, the supply of land become "endogenous" and its quantity and price have to be determined along with the supply and cost of all the other commodities and factors. As in the H-O-S theory, the way to understand the economic process is to solve the model for changes in factor prices and commodity outputs when commodity prices or factor endowments are altered. However, the interesting point is that those changes in relative commodity and factor prices cause changes in the supply of specific factors (capital and land). In sub-sections 2.1 and 2.2 we concisely present the model –with some of the main functions–and the static comparative exercises include a numerical resolution –by adopting specific functional relations– to give dimension to and illustrate more clearly some of the relationships. The complete formal presentation is given in the Appendix to Chapter 2.

2.1 Main characteristics of the initial model

Technology is represented by a constant returns to scale production function for Primary Products (A) and Manufactures (M):

$$A=A(N, L_A) \qquad (1)$$

$$M=min[F(K_M, L_M),A_R/\alpha_M] \qquad (2)$$

Where:

N: input of natural resources specific to sector A ("land").

K_M: input of capital to sector M.

F: the familiar neoclassical constant returns to scale production function.

A_R: raw material input; it is connected to gross output M by the fixed coefficient α_M.

L_i: input of labour in sector i, with $i=A, M$.

$L = L_A + L_M$ *(3)*

K_M is assumed as a perfectly elastic supply in the long run at interest rate ρ, which is determined by domestic time preferences. K_M consists of an accumulated stock of M (a good that can be either consumed or invested). N is determined by an endogenous frontier and may be increased by incurring in a rising marginal cost in terms of capital:

$K_A = \phi(N)$ *(4)*

With $\phi'(N) > 0$ and $\phi''(N) > 0$; where $\phi'(N)$ is the marginal cost of "clearing" a unit of land. $\phi(N)$ is a convex function of the amount of land cleared.

If we adopt M as the *numeraire* good we have:

$p = P_A / P_M$: the relative price of A.

$w = W / P_M$: the real wage.

We can write the production function for M in an intensive form:

$m=min[m(k),a_R/\alpha_M]$ *(2)'*

For any given value of p, first order condition imply: $(1-\alpha_M p)\, m'(k) = \rho$ *(5)*

Where k^* that satisfied *(5)* also determines the equilibrium real wage:

$w^* = (1-\alpha_M p)\,[m(k^*) - m'(k^*)\, k^*]$ *(6)*

That is, the retribution to each unit of labour in sector M is given by the difference between the product generated in the activity (equivalent to the income) and the capital cost (in intensive terms) corrected by the coefficient (adjusted) of the raw material. Capital cost given by the product of the price of the capital (its marginal productivity) and the amount of capital used in the production.

Analogously, we can write the production function for A in an intensive form:

$a=a(n)$ *(1)'*

Where:

a: output per worker in sector *A*.

n: land per worker in sector *A*.

a'(n): marginal productivity of land; with $a'(n) > 0$ and $a'' (n) < 0$.

Assuming perfect competition and free mobility of labour between sectors:

$$w^* = pa - p[a'(n) .n] = p[a-a'(n) n] \quad (7)$$

That is, the retribution to each unit of labour in sector *A* (the same that sector *M*) must be equal to the difference between the value of the product generated in the sector and the cost of land (in intensive terms). The last is given by the product of the price of land (the value of the marginal productivity) and the amount of land used in the activity. For each value of *p* there exists a unique value for *n* and therefore a unique value for the marginal productivity of land *a'(n)*.

How is the extension of the frontier (and the amount of land) determined? In the long run, the rate of return on clearing land (the relation between the marginal income and the marginal cost on clearing land, Λ) must be equal to the interest rate (that represents the opportunity cost):

$$\frac{pa'(n)}{\phi'(N)} = \Lambda = \rho \quad (8)$$

In accordance with *(7)*, a rise in *p* leads to a fall in *n* to restore the level of wage w^*. In addition, the numerator of *(8)* rises since the marginal productivity of a unit of land *a'(n)* rises in response to an increase in *p* ($a'' (n) < 0$). As $\phi''(N) > 0$, *N* must increase in order for equation (8) to hold. We have thus proven that:

$$N = N (p) \text{ and } N'(p) > 0 \quad (9)$$

The extension of the frontier is an increasing function of *p*. Since for each *p* there is a unique *n(p)* and *N(p),* it follows that there is also a unique L_A and therefore a unique *A*. Since $N'(p)>0$ and $n'(p)<0$, it follows that L_A and *N* are increasing functions of *p*:

$$A = A(p); A'(p) >0, \quad (10)$$

where *(10)* represents the supply curve of *A*.

From *(3)* we know that the value of L_A corresponds to a unique value of L_M as well.

Since k^* is determined uniquely by *(5)* we know K_M and hence *M* as well. We obtain:

$$M = M (1/p); M' (1/p)>0, \quad (11)$$

where *(11)* represents the supply curve of *M* (a positively sloped curve that depends on its own relative price; the reciprocal of *p*). Assuming that consumers have identical and homothetic

preferences we define demand functions:

$A_D = A_D\ (p,\ Y)$ *(12)*

$\delta A_D / \delta p < 0;\ \ \delta A_D / \delta Y > 0$

$M_D = M_D\ (1/p,\ Y)$ *(13)*

$\delta M_D / \delta\ (1/p) < 0;\ \ \delta M_D / \delta Y > 0,$

Where Y is the national income and may be expressed as:

$Y \equiv w\ (L_A + L_M) + \rho\ K_M + q\ N$ *(14)*

with $q \equiv p\ a'(n)$: rental rate per unit of land. *(15)*

The rental rate per unit of land (q) is equal to the value of the marginal productivity of land.

Y is a representation of the functional (or factorial) income distribution of the economy. That is, how the "cake" (total income) is distributed among the owners of labour (workers), capital (capitalists) and land (renters or landowners). From *(10)* and *(12)* we may determine the full general equilibrium of the closed economy:

$E_A\ (p) = A(p) - A_D\ (p);\ E'_A\ (p) > 0$ *(16)*

The equilibrium corresponds to the value p^* of p that satisfied: $E_A = 0$ *(17)*

Comparing with the standard Ricardo-Viner model, with given values of specific inputs N and K, it represents the short-run response to changes in prices, while Findlay-Lundahl (F-L) model stands for the long-run expansion. As Findlay (1995):131, we can drawn the short-run excess supply function through p^* in Figure 2.2 as the curve *SS'*, steeper than *LL'* because the effects are enhanced when we consider N and K endogenous. In our analysis, both provide identical equilibrium p^* when endowments are set equal to values K^* and N^* determined endogenously.

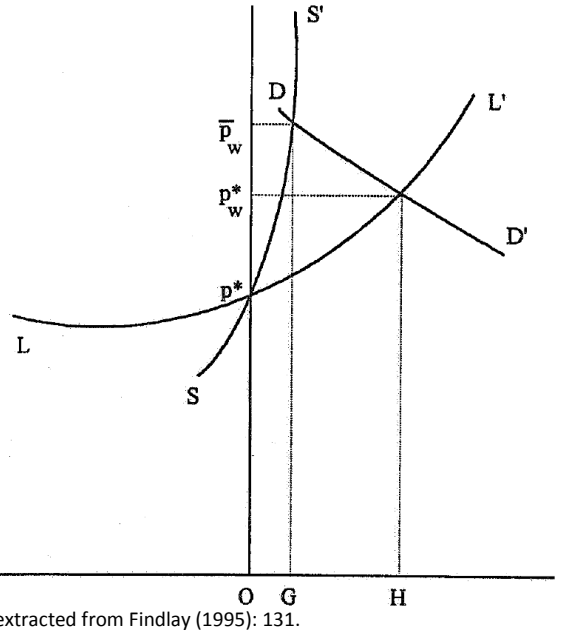
2.2 The dynamics of the First Globalization: how does the model work?

2.2.1 External demand and improving terms of trade

From the middle of the 19th century Atlantic commodity markets became closely integrated as a consequence of the transport revolution (steam replacing sails, refrigeration ships, trans-continental railroads). Economies (or colonies) ceased to be autarkic and opened up to the rest of the world. Economies that were previously self-contained faced an excess demand for primary goods (A), and the relative price (p) of these goods increased (in other words the terms of trade improved). Initially these economies were "small" and so the price was determined by the conditions of the world

market. With the opening of the economy there was an excess demand function indicated by *DD'* in Figure 2.2. What happens with the free trade equilibrium of our economy after economic opening?

Figure 2.2
GENERAL EQUILIBRIUM: AUTARKY AND OPEN ECONOMY



Source: extracted from Findlay (1995): 131.

The initial impact (while land and capital held constant) was to raise p very sharply from p^* (in autarky) to $\overline{p}_w$, where *DD'* intersects the short-run excess supply function *SS'*. A rise in p increases L_A and reduces L_M and therefore A increases and M falls, and the emerging exports of A are equivalent to the distance *OG*. According to *(15)* the increase in p and L_A raise the rental rate per unit of land (q), and this leads to an increase in the numerator of *(8)* and thus the rate of return on clearing land increases. To re-establish the equilibrium, N has to expand in order to raise the marginal cost of a unit of land [$\phi'(N)$] relative to the rental rate. Agrarian employment L_A expands even faster that N and L_M falls less sharply than K_M, since the capital-intensity k_m must decline with a rise in p. The long-run equilibrium occurs at the intersection between *DD'* and the long-run excess supply function *LL'* and a price level p^*_w after an "overshooting" of prices. The results are additional exports of *GH*. Capital has been diverted away from manufacturers into land expansion in a process that can be interpreted as a more intense primary specialization (de-industrialization, Williamson, 2004), leaving the rate of return (□) in the long-run unchanged in ρ. What happens to functional income distribution? Assuming the average productivity in agriculture is greater than in manufacturing, total income increases. Since ρ and L remain unchanged, w in both sectors stagnates or fall, K_M decreases and q and N increase, it is clear that a new distributive pattern has emerged. In this pattern landowner earnings will have a greater share of national income and earnings derived from labour and capital will have a smaller share. Since landowners are a small proportion of the population these changes in income distribution mean there is greater inequality.

The model adequately represents our three stylized facts. Settler economies increased their exports to the rest of the world (mainly to Europe) when technical progress in international transport made it economically efficient to move commodities over long distances. In this context, there was an incentive for settler economies to expand the land area devoted to agricultural production, to increase agrarian output and to reallocate their productive factors. However, we also found that worsening income distribution was an "inherent" component of the First Globalization.

We propose a numerical analysis[23] from a calibration of the model to simulate marginal changes in p,[24] and we verify changes in all the variables in accordance with the theoretical relationships and coinciding with the stylized facts of settler economies. In Table 2.1 we present the signs of the changes of the main variables when p increases and classify the variables into four areas: productive factors; growth (of the whole economy, Y, and each sector, A and M) and productive structure; income distribution (some relevant ratios as the total land rentals as proportion of total wages, R/W, and profits, R/P; and the share of each earning to productive factor in the total income, W/Y, R/Y and P/Y), and prices (in this case, only of the productive factors).[25]

Table 2.1
VARIATIONS IN VARIABLES OF THE MODEL
Increasing in p=PA/PM

PRODUCTIVE FACTORS		GROWTH AND STRUCTURE	
N	+	A	+
KM	-	M	-
LA	+	Y	+
LM	-		
		A/Y	+
n	-	M/Y	-
k	-		
INCOME DISTRIBUTION		**PRICES**	
R/W	+	q	+
R/P	+		
		w	-
W/Y	-		
R/Y	+		
P/Y	-		

Source: own estimates.

2.2.2 Immigration

Another major result of the transport revolution was a deeper integration of labour markets across the Atlantic. Declining transport costs, which made the passage more affordable, and increasing transport speed –shorter journeys– acted together to facilitate the movement of millions of people from Europe to America and Oceania. In addition, several governments in the New World stimulated immigration from Europe as part of their plan to settle the "empty land". How did this supply of new immigrants affect the long-run equilibrium presented in the previous analysis? How does the system react after the economy opens if we include movements in the labour factor?

Initially, holding P_w^* and thus all other prices constant, the greater supply of labour would have

[23] Initial parameters are: α=0.25; α_M=0.60; β=0.80; γ=10; ρ=0.05; θ=1.70; L=1.50 (details in Appendix to Chapter 2).
[24] From our calibrated model, we repeat our exercises with marginal changes in p, considering p*0.99 and p*1.01
[25] We present the results of all our simulation exercises in Appendix to Chapter 2.

all been absorbed by the manufacturing sector. This happens because the frontier is fixed by the marginal value product of land and we assume that the supply of capital in manufacturing is perfectly elastic in the long run. Therefore, manufacturing (*M*) expands, influenced by employment (L_M) and investment (K_M). As the economy expands (*Y*), the domestic demand for *A* increases as a consequence of increased final consumption and the intermediate use of additional raw materials in manufacturing. Under these conditions, the relative price of agricultural goods increases, primary exports decline below the original level *OH* (to satisfy domestic demand) and the land frontier extends, absorbing some of the increase in labour.[26] The rise in p_w^* leaves the return to capital unchanged –by *(5)*– but the fall in *k* that this requires must lower the real wage in terms of either good –by *(6)* and *(7)*. The return to land raises (*q*) making possible the investment needed to clear new land. As the raw material is more expensive (a higher relative price of the primary sector's output), manufacturing reduces capital intensity (*k*) to absorb it, and both processes cause a decline in the real wage (in a market where the labour supply increases).

The main consequences of the impact of immigration on settler economies are adequately represented in our simulation exercises by assuming marginal changes in *L* (see Table 2.2). [27] With this effect, in spite of decreases in the land-labour coefficient in agrarian activity and the capital-labour coefficient in manufacturing, the economy expands led by agriculture and improving terms of trade. The combination of land frontier expansion and increasing land returns worsens income distribution and rentists obtain an increased part of the total output.

Table 2.2
VARIATIONS IN VARIABLES OF THE MODEL
Increasing in L

PRODUCTIVE FACTORS		GROWTH AND STRUCTURE	
N	+	A	+
K_M	-	M	-
L_A	+	Y	+
L_M	-		
		A/Y	+
n	-	M/Y	-
k	-		
INCOME DISTRIBUTION		**PRICES**	
R/W	+	q	+
R/P	+		
		w	-
W/Y	-		
R/Y	+	p	+
P/Y	-		

Source: own estimates.

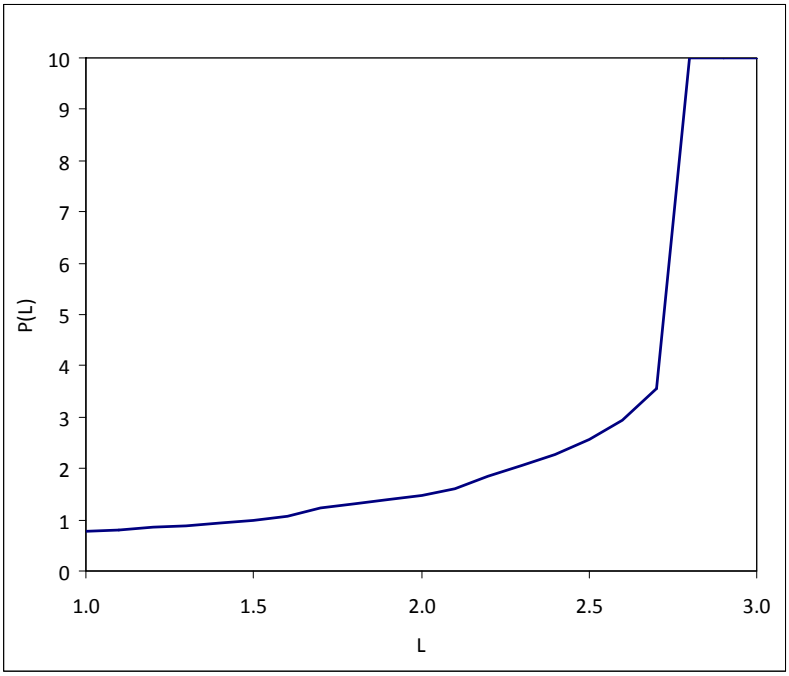
Considering the importance of the evolution of terms of trade for the settler economies, we simulate the relationship between *p* and *L* (see Figure 2.3). The positive relationship is consistent with the historical evolution. Improving terms of trade in economies where, initially, labour markets offered high wages, made these countries attractive for settlers and added to the natural growth of

[26] The subtraction of excess demand from the original excess supply shifts the long-run excess supply *LL'* to the left, thus raising the primary (relative) price and reducing exports. The demand curve *DD'* of Europe should also have shifted to the left because emigration reduces demand and this would mitigate the increase in p_w^*

[27] From our calibrated model, we repeat our exercises with marginal changes in *L*, considering *L**0.99 and *L**1.01

the population. However, *ceteris paribus*, this is a process restricted by the resources of the economy, and in the long run there is a limit.

Figure 2.3
SIMULATION EXERCISE: TERMS OF TRADE AND LABOR



2.2.3 Capital inflow

The opening up of the economies of the New World in the 19th century attracted considerable inflows of capital that would have driven down the interest rate. How can we represent this process? We first assume a fall in the interest rate from the level $\rho*$ (in the long-run equilibrium).[28] A lower interest rate corresponds to a higher capital-labour ratio in manufactures (k) and, from *(6)*, it becomes clear that this also corresponds to a higher real wage. Since, initially, p_w^* remains unchanged, equation *(7)* shows that the rise in w must increase the marginal productivity of labour in A or equivalently the land-labour ratio in sector A must rise. What happens to our "crucial" condition *(8)*?

If N remains constant, the left hand side of *(8)* will fall in proportion to $pa'(n)$, i.e., in proportion to the value of marginal productivity of land in A or in accordance with the rental per unit of land q. If q falls less than proportionally to ρ, an increase in N is needed to raise $\phi'(N)$ to restore equilibrium. That is to say, if the rental rate per unit of land falls less than proportionally to the interest rate, it will be optimal to extend the frontier until the rate of return on clearing land equals the interest rate. It is possible that the rise in the land-labour ratio (n) in sector A leads to a fall in L_A and an increase in L_M. Since K_M is higher in sector M (because k is higher too) manufacturing

[28] As Findlay & Lundahl (1994), we ignore the effects on the balance of payments on the ownership of financial assets.

production increases. What is the effect on primary production? It is ambiguous because even if N increases, L_A falls and this may result in lower output. If the increase in land can compensate for the fall in labour we may see a rise in A and consequently a general expansion of the economy. Assuming that the value of the marginal productivity of land and the interest rate fall in the same proportion, $\phi'(N)$ will remain unchanged and so will the land supply. In this case, L_A and L_M remain unchanged and the higher K_M in manufacturing will increase M. This will raise the demand for raw materials and there will be an excess demand for A that will be brought about by the fall in ρ (the higher consumption drives higher income).

Table 2.3
VARIATIONS IN VARIABLES OF THE MODEL
Decreasing in ρ

PRODUCTIVE FACTORS		GROWTH AND STRUCTURE	
N	+	A	+
K_M	+	M	+
L_A	-	Y	+
L_M	+		
		A/Y	-
n	+	M/Y	+
k	+		
INCOME DISTRIBUTION		**PRICES**	
R/W	-	q	-
R/P	-		
		w	+
W/Y	-		
R/Y	-	p	-
P/Y	+		

Source: own estimates.

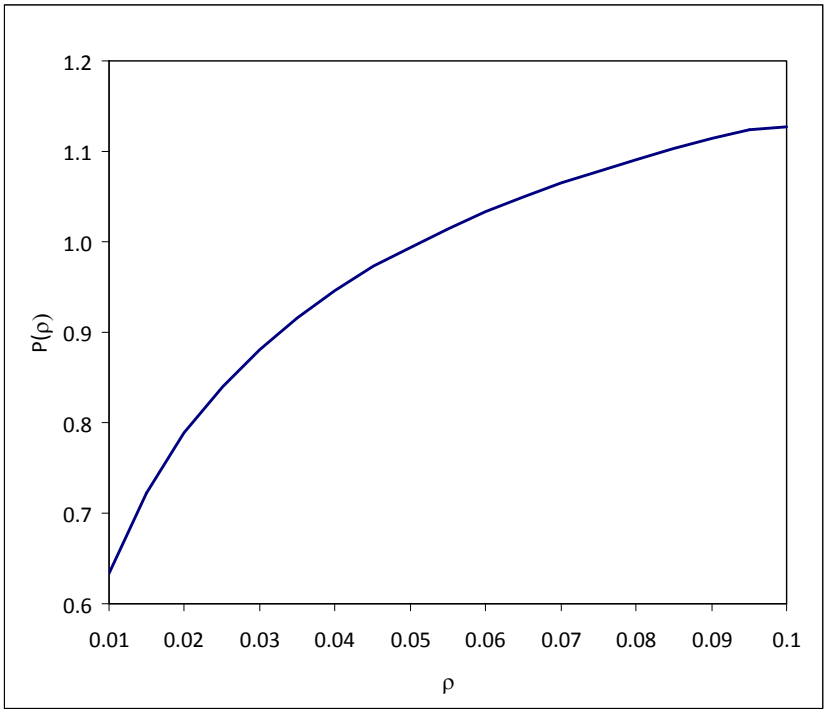
What happens to the functional income distribution if the economy undergoes a general expansion? Since w rises and L remains constant, workers initially improve their share in the national income, but changes in capital and rental components are ambiguous. In the first case, since ρ falls and K_M rises we have two opposing effects. In the second case, the change in the rental component depends on the specific characterization of the relations in the model and the relative changes. Therefore, the capital inflows can moderate the effects of the initial improvement in the agrarian relative price in terms of income distribution. It may be possible that the decline in the interest rate leads to a rise in M, associated to the deepening of capital, as well as an increase in A related to the extension of the frontier without a "necessary" worsening in income distribution.

The main consequences of the impact of capital inflows on settler economies are adequately represented in our simulation exercises assuming marginal changes in the interest rate ρ [29] (see Table 2.3, where we propose a decrease in the variable) in the case of general expansion of the economy. With this effect, both the land-labour coefficient in agriculture (n) and the capital-labour coefficient in manufacturing (k) increase, which would stimulate growth in both sectors but with a bias towards industry (the share of manufacturing in total income increases). Under these conditions, the land frontier expands but as land rental (q) decreases, rentists lose earnings while

[29] From our calibrated model, we repeat our exercises with marginal changes in ρ, considering ρ*0.99 and ρ*1.01. We present the results of the simulation in the Appendix to Chapter 2 considering an increase in the interest rate.

workers and capitalists relatively gain, and only the latter improve their share in total income. Therefore, if our conditions in the model can be applied to the club of settler economies, capital inflows would have favourable consequences on economic growth and there would be a trend towards equality.

Figure 2.4
SIMULATION EXERCISE: TERMS OF TRADE AND INTEREST RATE



As before, we simulate the trajectory of the interest rate and prices and we obtain a positive relationship (Figure 2.4). The higher cost of capital in economies specialized in primary goods makes production relatively more expensive and leads to higher agrarian prices in relation to manufacturing prices. The opportunity cost of capital increases, the chances to expand agrarian production decrease and, in relative terms, primary output becomes more expensive.

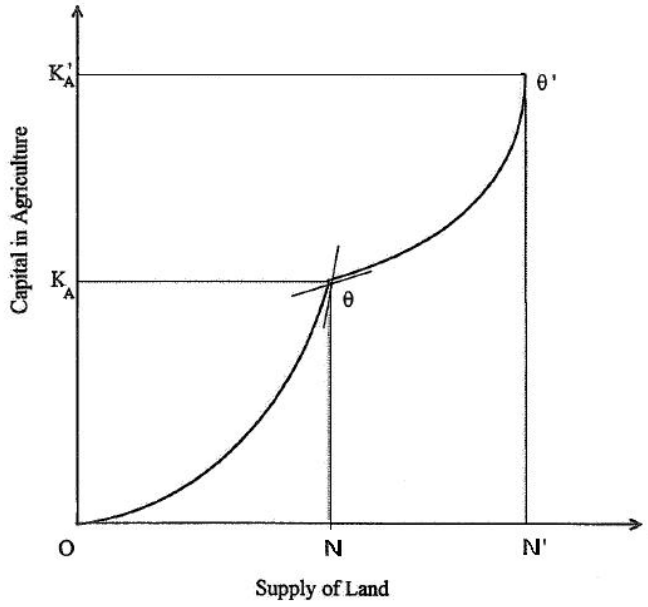
2.2.4 Innovations that lower the real cost of land frontier expansion

During the period, some innovations occurred that made for improvements in the internal conditions of the settler economies and reduced the real costs of land frontier expansion. The introduction of railway systems, the construction of canals and more extensive road networks meant real reductions in the cost of clearing land. Inventiveness is not a prerogative of frontier societies but the list of inventions stimulated by the challenge of opening the land is impressive.[30] To represent these improvements we need to assume changes in the function $\phi(N)$ that denote a cheapening of the land clearing process (see Figure 2.5). The function $\phi(N)$ become flatter from

[30] The list includes the six-shooter, portable windmills, barbed wire and an enormous variety of mechanical appliances like the improved plough and the combine harvester (Hennessy, 1978).

point θ on. If p_w^* is held constant, the new equilibrium level of land will be in *N'*, where the slope of the shifted $\phi(N)$ function at θ' is equal to the slope of the original function at θ. In consequence, greater land supply would come about without changes in the factor price, i.e. an unchanged land-labour ratio, and thus an increase in L_A would be required. In this case, labour moves from manufacturing to agriculture while capital and output decline (K_M and M). However, a rise in manufacturing productivity occurs because raw materials are cheaper. The agricultural excess supply increases shifting *LL'* to the right and inducing a fall in p (the terms of trade worsen) and an expansion in exports. In the new equilibrium, as p is lower real wages are higher, while the rental per unit of land (q) must fall because access to the "new" territories has been facilitated by technical progress. Therefore, improvements in the means of access to the land make it possible to expand exports even though the terms of trade do not improve, and to free resources from agriculture so they can go to industrial investment.

Figure 2.5
CHANGES THAT CHEAPEN THE REAL COST OF CLEARING LAND



Source: extracted from Findlay (1995): 138.

Our representation of the wave of innovations that affected internal conditions in settler economies and lowered the real cost of further extension of the frontier requires modifications to two parameters of our model. To obtain a flatter $\phi(N)$ we marginally reduce the parameter θ and to get a curve intersecting the original function in K_A, we deal with lower values of γ[31] (see Table 2.4). With these changes, we obtain results equivalent to inflows of capital. Both the land-labour coefficient in agriculture and the capital-labour coefficient in manufacturing increase and stimulate the general expansion of the economy. As it is cheaper to expand the frontier, land rental decreases

[31] In our calibrated model, we repeat our exercises with marginal changes in θ (θ*0.99 and θ*1.01) and γ (γ-1 and γ+1). We present the results of the simulation exercises and we consider increases in both variables in the Appendix to Chapter 2.

and rentists lose earnings with respect to total wages and profits, although only capitalists increase their share in the total product. If the conditions we assume are correct, the technical progress that improved access to new land would have positive consequences on economic growth and there would be a trend to moderate the worsening distribution derived from the initial increasing in *p*.

Table 2.4
VARIATIONS IN VARIABLES OF THE MODEL
Decreasing in θ and γ

PRODUCTIVE FACTORS		GROWTH AND STRUCTURE	
N	+	A	+
K_M	+	M	+
L_A	-	Y	+
L_M	+		
		A/Y	-
n	+	M/Y	+
k	+		
INCOME DISTRIBUTION		**PRICES**	
R/W	-	q	-
R/P	-		
		w	+
W/Y	-		
R/Y	-	p	-
P/Y	+		

Source: own estimates.

Our representation of the improvement in the internal conditions for clearing land requires changes in two parameters of the model. As a result it is not possible to make a visual illustration to show the relationship to prices. However, it is evident that cheaper land clearing is associated with lower land rents, and our model adequately represents the worsening terms of trade that result from cheaper access to new territories.

2.2.5 Innovations that directly affect the production sectors

There was also technological progress in production sectors. Our model may represent shifts in the production function as Hicks-neutral for both sectors.[32] An improvement in the manufacturing production function, and maintaining constant p_w^*, will raise *k* to preserve the equality of the net marginal product of capital with a fixed interest rate ρ (remember that *m''(k)* is negative). From *(6)* and *(7)*, these changes must raise the real wage and the land-labour ratio in agriculture. As land is initially maintained constant, L_A must fall, L_M must increase and consequently, *A* decreases and *M* expands. The excess demand for *A* at constant price p_w^* and the leftward shift of the excess supply function *LL'* mean an increase in the price, which reduces exports even though the extension of frontier required to recompose equilibrium in equation *(8)*. On the other hand, an improvement in agriculture would lead to a fall in the land-labour ratio if *p*, and therefore *w*, are held constant. From *(8)*, *N* rises and L_A must increase more that proportionally to reduce *n*, causing L_M, K_M and *M* all to fall. *LL'* shifts to the right, leading to a decline in p_w^* and a rise in the export volume. As p_w^* decreases real wages increase, and all the changes in Table 2.1 continue so a final equilibrium is

[32] Hicks-Neutral (or Hicksian Neutrality) technological progress refers to changes in the production function (innovation) that do not affect labour differently from the way they affect capital. The relationship between the marginal productivities of the factors holds constant for a given proportion between capital and labour (Sala-i-Martin, 1994).

established. Sector innovations are "import biased" in the first case and "export biased" in the second, and the terms of trade improve when productivity improves in manufactures and worsens when it improves in agriculture. The consequences in terms of income inequality are ambiguous.

Our representation of some innovations in agriculture that make for greater yield per hectare requires changes in the parameter β (the elasticity of the productive factor, which is used more intensively in agrarian production)[33] (see Table 2.5). With these changes, we obtain consequences in productive factors, growth and structure equivalent to inflows of capital. As before, both the land-labour coefficient in agriculture and the capital-labour coefficient in manufacturing increase, thus stimulating a general expansion of the economy. New land incorporated into production under better productive conditions frees resources (capital and labour) which can go to manufacturing and this sector expands. Land rental increases –the returns on the land is higher– and when this is taken with a greater land area we see that the income of rentists grows faster than total wages, and income distribution worsens.

Table 2.5
VARIATIONS IN VARIABLES OF THE MODEL
Increasing in β

PRODUCTIVE FACTORS		GROWTH AND STRUCTURE	
N	+	A	+
K_M	+	M	+
L_A	-	Y	+
L_M	+		
		A/Y	-
n	+	M/Y	+
k	+		
INCOME DISTRIBUTION		**PRICES**	
R/W	+	q	+
R/P	-		
		w	+
W/Y	-		
R/Y	+	p	-
P/Y	+		

Source: own estimates.

As before, we simulate the relationship between β and p (Figure 2.6). Improved yield of land per hectare should be related to lower prices, but this is true only from certain levels of β. When the yield of land is insufficient to produce high output per unit of productive factor, prices can increase with the improvement in β.

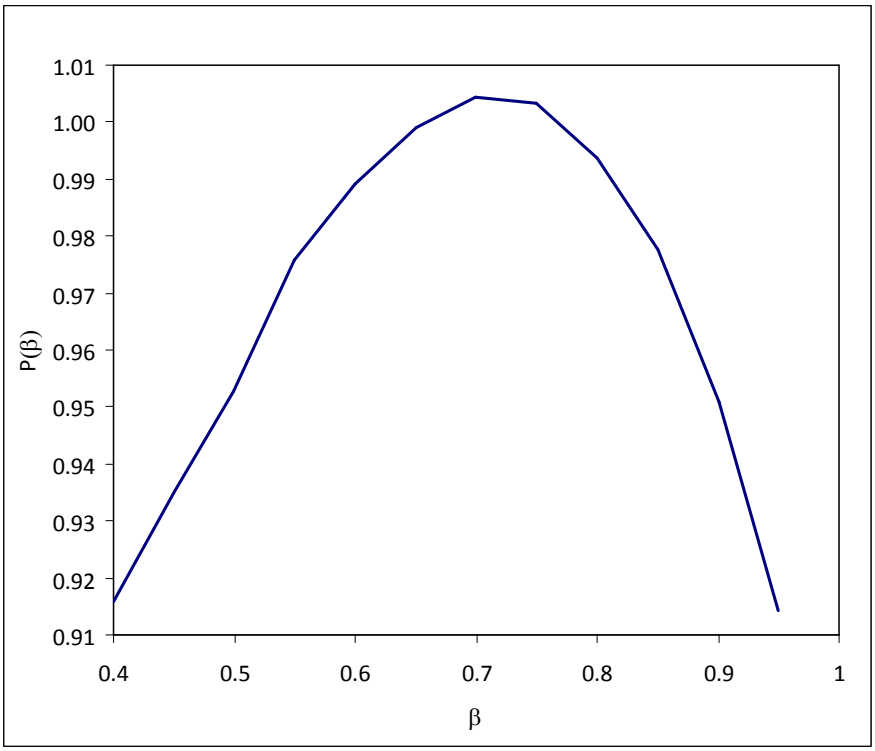
2.3 General overview

The model shows that the economies exposed to the effects of the First Globalization and subject to a process of rising relative prices for primary goods displayed three main trends that we identify with three main stylized facts. Settler economies, blessed by their abundance of natural resources, participated actively in international trade, expanded their volume of exports and had high economic growth rates. This process also included the loss of incipient manufacture activities (handicrafts) –a "curse" in the jargon of literature– and a worsening in income distribution.

[33] Using our calibrated model, we repeat our exercises with marginal changes in β (considering β*0.99 and β*1.01). We present the results of the simulation in the Appendix to Chapter 2.

The other effects of the First Globalization –analyzed as processes "added" to the improvement in the terms of trade– were processes that intensified the positive consequences for economic growth, but they had ambiguous effects on income distribution. In accordance with our simulation exercises, immigration and improvements in the productive performance of land could lead to a more acute worsening in the income distribution. On the other hand, capital inflows and cheaper cost of clearing land could make for lower inequality in the settler economies.[34]

Figure 2.6
SIMULATION EXERCISE: TERMS OF TRADE AND LAND ELASTICITY



3. Why is endogenous land frontier expansion a useful analytical concept?

Our approach is to regard 19th century globalization in terms of the expansion of the Atlantic economy from north-western Europe to the frontier periphery instead a "regimen switch to openness".[35] This means we see globalization as the incorporation of regions that were beyond the frontier of organized economic activity into capitalist relationships on a world scale.[36] In these terms, we do not have to introduce the notion of price convergence in order to understand world integration. Globalization may be "defined as a shift from an economy where local supply and

[34] Another process that can be represented by the model is the introduction of tariffs on the import of manufactures (see Findlay, 1995: 140). A tariff on imports of manufactures reduces *p* and discourages the extension of the frontier and the output of *A*. On the other hand, output *M* increases and so do real wages since the cost of the primary input is reduced.
[35] Identifying globalization with a change in the opening regimen is the predominant vision in the mainstream literature (i.e. O'Rourke & Williamson, 2005:21).
[36] This notion was familiar in the tradition of the "Great Frontier" idea, as was proposed by Walter Prescott Webb in his work of 1952. According to Weber & Rausch (1994), Webb extended the argument of Turner –who saw the North American frontier as promoting democracy– and regarded the entire Western Hemisphere (Latin America together with South Africa, Australia and New Zealand) as a "great frontier" that transformed Europe, breaking down feudal institutions, and helped in the rise the European capitalism, dynamism and democracy.

demand fluctuations dominated price fluctuations to one in which the economy became a price-taker to global forces" and if this is the case, "it need not depend on price convergence" (Harley, 2007:240-241). In the model we present in Section 2 we introduce the notion of land frontier expansion to explain processes that play only a secondary role in the H-O-S theoretical framework. Our proposal is to change the Findlay-Lundahl model to illustrate an important aspect of the historical evolution of settler economies. It is possible to introduce different land qualities as additional components in the colonizer's decisions to inhabit certain areas and not others (for a complete formal presentation of the model see the Appendix to Chapter 2).

The decision to expand the land frontier initially depends on the rate of return on clearing land, that is to say the relationship between the marginal income from the use of "new" land and the marginal cost of preparing the area for production. Is the condition of the land throughout the territory homogenous? Probably not; it is more reasonable to assume that land quality varies. Thus the expansion of the frontier will yield different incomes (depending on land fertility, for instance) and the cost of clearing land will differ depending on the characteristics of the land (climatic conditions and the ruggedness of the terrain, for instance). In others words, the returns on expanding the frontier are different when we consider the process in Argentina in the fertile regions of the Pampas on the one hand and in cold Patagonia (in the south) on the other, or in Australia the returns in the coastal savannah will differ from those in the central desert. How we can incorporate these variations in conditions of settlement?

3.1 Our contributions to the model

We modify our concept of "land" in the model (N) to introduce considerations about land quality (N_Q). Land quality depends on the agricultural aptitude of the land (N_{aa}) (its natural suitability for grazing or crops) and distance (d) from markets. In other words, our variable must consider that excellent soils located very far away are in fact bad soils in productive and economic terms. Producers are able to identify land quality[37] and they choose the "direction" of expansion in accordance with the rate of return of each type of land. How can we represent land quality and the producers' decision rule? For simplicity, we consider two types of land –high (N_H) and low quality (N_L)– and two corresponding functions that represent the access conditions to the "new" land.

$$K_{AH} = \phi_H (N_H) \qquad (18)$$

$$K_{AL} = \phi_L (N_L) \qquad (19)$$

We assume that the land rental of high quality land (q_H) is higher than that of low quality (q_L) and, formally, this means that expanding the frontier into high quality land is not cheaper than

[37] We assume that producers use all available information when they make decisions about expanding the frontier.

settling in low quality land. In other words, this difference means that the conditions to accede to the "new" land are not necessarily more favourable for high quality land than for low quality land. The point is that to start production on better land (fertile soils, with watering holes, relatively close to the markets) can require improvements (dwellings, roads, wire fences) that are not necessary (or justified in economic terms) in the case of the worse land. We demonstrate this assertion in the Appendix to Chapter 2.

In addition, we consider two production functions in agriculture:

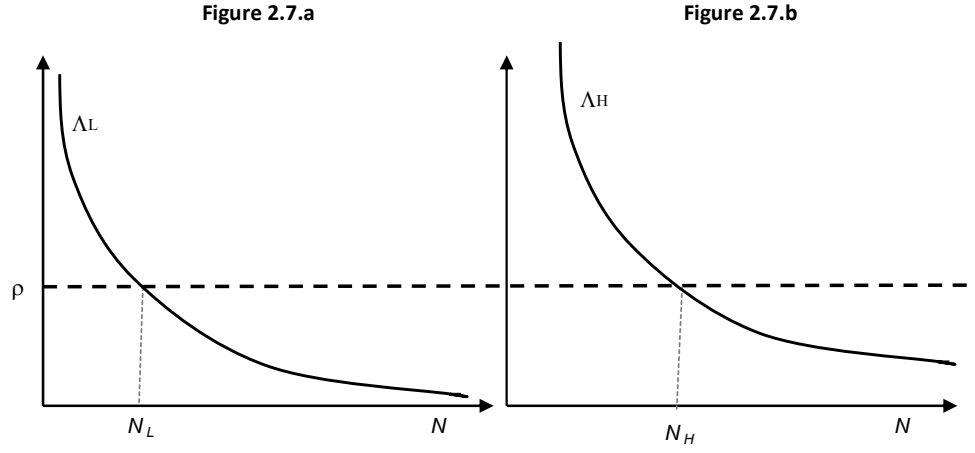
$$A_H=A(N_H, L_{AH}) \qquad (20)$$

$$A_L=A(N_L, L_{AL}) \qquad (21)$$

We assume that the marginal productivity of high quality land is greater than that of low quality land but we identify only one agriculture product with a (relative) price p. Therefore production in agriculture is: $A=A_H+A_L$

In the F-L model, the function $\phi(N)$ and $a(n)$ represent (in marginal terms) the two main components of the "crucial" relation *(8)* to obtain the rate of return on clearing land (Λ). N and Λ relate negatively[38] and the optimum occurs when Λ equalizes the rate of interest (ρ). In our analysis (in Appendix to Chapter 2 we give a complete formal presentation of the model) we propose to introduce two functions (Λ_H and Λ_L) of return. The producers will choose to expand the frontier into both types of land until the point where the two rates of return reach the level of the interest rate (see Figure 2.7).

Figure 2.7
RATE OF RETURN ON CLEARING LAND



Producers will choose the "direction" of the expansion depending on relative yields (of the two kinds of land) and theoretically this is represented by a comparison between the marginal rates of

[38] Λ is a function with negative slope and concave up. See equations *(21)*, *(31)*, and *(34)* in the Appendix to Chapter 2, Section 1.

return on clearing land. The producers' decisions depend on the technological conditions of the economy and the land endowments previously incorporated, which is represented by the possibilities to expand the frontier and the production functions.

Total income is represented in the following expression:

$$Y \equiv w\,(L_A + L_M) + \rho\, K_M + q_L\, N_L + q_H\, N_H \qquad (14)'$$

Where q_L and q_H are the rental rates for each type of land and $q_L < q_H$.

Rents from low quality land or remote land will be lower than those in areas with high agricultural aptitude or close to "centres of gravity" (usually the seaports; i.e. the "external door" of the economies). Therefore the consequences of extending the land frontier beyond the Prairies in Canada, from South Australia to the North Territory or from the Pampas to Patagonia will have different effects on income distribution than our model initially predicted. The direction of the changes of the distributive pattern will react as the initial model predicts, but the intensity of the effects will depend on land aptitude (associated with the production functions) and on how far away the natural endowments are (associated with functions $A(.)$ and $\phi(.)$).

Under these assumptions, the different intensity of the worsening of income distribution in the settler economies during the First Globalization may be explained by the fact that people occupied land of differing quality and thus received different rewards. The widening of the gap between land rentals and wages that characterized the period depended on the effective existence of returns to appropriation. The abundance of excellent land in the Pampas or Uruguay made it easier to capture rents –as against wages– than the case of Australia (where the land became more arid the farther from the coast the producer moved) or Canada (where the exceptional prairies were all of 2,000 km from the eastern coast). [39]

3.2 Numerical analysis

We apply a numerical analysis to solve the model in accordance with our proposition and to propose a contra-factual exercise to compare results. First, we suppose an economy similar to that in the previous section but with two production functions in agriculture with different land elasticities. In the case of high quality land, we propose an elasticity of 0.8 and for low quality land an elasticity of 0.4 ($\beta_H=0.8$ and $\beta_L=0.4$). In addition, we consider different cost functions of clearing land with $\theta_H=1.4$ and $\theta_L=1.2$. Second, we consider an economy with absolute land homogeneity and therefore without differences in parameters. We calibrate the model to obtain

[39] Other interesting issue is to introduce the idea of segmented labour markets. We can consider that the wage in frontier was higher (because it included a *premium*) and we may identify three types of labour retributions, one corresponding to manufacturing ($w_M.L_M$) and the other two corresponding to agrarian sector ($w_{AF}.L_{AF} + w_A.L_A$) and with $w_{AF} > w_A = w_M$.

similar results –in terms of structure[40]– as in the previous exercise and we consider $\beta=0.62$ and $\theta=1.4$. The details of both calibrations are presented in the Appendix to Chapter 2. We concentrate on the effect of changes in relative prices for two reasons: (i) the historical evidence clearly shows that improving terms of trade was one of the main processes in the First Globalization; (ii) our model adequately captures the stylized facts of settler economies in a situation of improving terms of trade. In next stages of the research other effects we will be studied. In Table 2.6 we present the main results of our numerical analysis to compare the evolution and the levels (periods 0, 1, 2) of total output and income distribution with marginal changes in p in model with different types of land (Economy 1) and with land homogeneity (Economy 2).

Table 2.6
VALUES AND VARIATIONS OF THE VARIABLES OF THE MODEL
Simulation of a marginal increasing in p=PA/PM

GROWTH AND STRUCTURE				INCOME DISTRIBUTION			
	Economy 1	Economy 2	Economy 3		Economy 1	Economy 2	Economy 3
A0	0.922	0.884	0.969	**RW0**	0.677	0.596	0.741
A1	0.998	0.944	1.050	**RW1**	0.721	0.635	0.792
A2	1.080	1.007	1.136	**RW2**	0.768	0.675	0.846
Var.				Var.			
1	8.22%	6.72%	8.30%	1	6.58%	6.41%	6.92%
2	8.18%	6.71%	8.18%	2	6.48%	6.29%	6.79%
M0	0.528	0.495	0.536	**RP0**	7.037	6.633	7.528
M1	0.459	0.441	0.467	**RP1**	8.852	8.110	9.457
M2	0.385	0.383	0.393	**RP2**	11.542	10.153	12.278
Var.				Var.			
1	-13.11%	-11.02%	-12.88%	1	25.79%	22.28%	25.63%
2	-16.15%	-13.12%	-15.73%	2	30.39%	25.18%	29.84%
Y0	1.451	1.380	1.505	**WY0**	0.564	0.593	0.544
Y1	1.457	1.385	1.516	**WY1**	0.555	0.584	0.533
Y2	1.465	1.390	1.529	**WY2**	0.545	0.574	0.522
Var.				Var.			
1	0.46%	0.35%	0.76%	1	-1.67%	-1.55%	-1.97%
2	0.51%	0.40%	0.82%	2	-1.73%	-1.61%	-2.03%
AY0	0.636	0.641	0.644	**RY0**	0.382	0.354	0.403
AY1	0.685	0.682	0.692	**RY1**	0.400	0.371	0.422
AY2	0.737	0.725	0.743	**RY2**	0.419	0.387	0.442
Var.				Var.			
1	7.73%	6.35%	7.48%	1	4.82%	4.75%	4.84%
2	7.62%	6.29%	7.30%	2	4.62%	4.56%	4.62%
MY0	0.364	0.359	0.356	**PY0**	0.054	0.053	0.054
MY1	0.315	0.318	0.308	**PY1**	0.045	0.046	0.045
MY2	0.263	0.275	0.257	**PY2**	0.036	0.038	0.036
Var.				Var.			
1	-13.50%	-11.33%	-13.54%	1	-16.61%	-14.26%	-16.45%
2	-16.58%	-13.46%	-16.42%	2	-19.69%	-16.41%	-19.46%

Economy 1: βh=0.8 βl=0.4; θh=1.4, θl=1.2.
Economy 2: βh=0.62 βl=0.62; θh=1.4, θl=1.4.
Economy 3: βh=0.8*1.01 βl=0.4*0.99; θh=1.3*0.99, θl=1.2*0.99.
Source: own estimates.

[40] We calibrate both "economies" to obtain similar results in terms of sector shares in total income and labour.

Economic growth in the economy where we identify different types of lands is quicker, the evolution occurs from higher levels and the structural change is more intensive than in the economy with identical land throughout. Analogously, in the former the differences between total land rents and total wages are huge, and the worsening in the income distribution is more severe.

Now, we can compare economies with differences in land quality to make out concepts more precise. Economy 3 represents a situation similar to Economy 1 but with marginal changes. High quality land has greater input elasticity (0.8*1.01) and low quality land has a lower β-coefficient (0.4*0.99). In addition, we adjust the coefficients of the land clearing frontier to reduce the gap between the two types of land rentals and focus basically on the productive dimension of land quality. In other words, in this exercise, we reduce the differences between the two costs of clearing land to concentrate our attention only on differences in productivities.[41]

In accordance with our expectations, the situation shows an economy that grows quicker and income distribution worsens more intensively. In Economy 3 the average growth rates of total income is 0.8 per cent and in Economy 1 it is 0.5 per cent; and the relation between total land rents and wages is systematically higher, and increases by an average of 6.9 per cent in Economy 3 and 6.5 per cent in Economy 1. In addition, the share of total wages in income deceases 2 per cent in Economy 3 but only 1.7 per cent in Economy 1. This fall in total wages is not compensated by higher land rental shares but by less of a fall in total profits. Economy 3 shows the higher agriculture specialization of our simulation exercises although the pace of the structural change is slower than in Economy 1. Table 2.7 gives the details about land incorporated into production, labour, and the corresponding factor prices to supplement our analysis and to gain insights into this subject.

In the version of F-L model, land is homogenous throughout the territory and so there is no question of choosing between types of land. This is why in Economy 2 the advance into the two types of land is the same and land rentals coincide. We make it possible to identify different land qualities and, considering that rents for high quality land are higher, agents decide to occupy good land more intensively. However, it is not possible to expand the frontier only to better land. In the process of settling new land, the chance to obtain better quality was often conditioned by the occupation of land of inferior quality. This process is well represented in our model. Nevertheless, land is a finite resource and it is not possible to expand the frontier at the same rate all the time. The model illustrates a convergence process where the decreasing rates of land expansion coincide with higher amount of land incorporated. Comparing Economy 1 and 3, we find that the incorporation of

[41] In Economy 1, the difference between the parameters of clearing land is 0.2 (θ_H- θ_L=1.4-1.2). In Economy 3 the difference is 0.1 (1.3*0.99-1.2*0.99).

land of high quality is more intensive when lands are relatively more productive (a wide gap between β_H and β_L) and this happens in spite of appropriating lower rent by unity of land (q).

This representation has an attractive interpretation in terms of the curse hypothesis. An economy that moves its frontier to better land enjoyed the blessing of an abundance of natural resources and this was reflected in economic growth, but it also encounters the curse of a more intense worsening in income distribution. This raise three important points: (i) different land quality can be understood as different types of natural resources; (ii) the impact of the abundance of natural resources is far from being unique and universal, it depends on historical specificities and on different dimensions of the economic development where positive effects can coexist with negative ones; (iii) strictly speaking, an abundance of natural resources is not a question of endowments but of the productive application of resources and, in this sense, the abundance is an endogenous process.

Table 2.7
VALUES AND VARIATIONS OF THE VARIABLES OF THE MODEL
Simulation of a marginal increasing in p=PA/PM

PRODUCTIVE FACTORS				PRICES			
	Economy 1	Economy 2	Economy 3		Economy 1	Economy 2	Economy 3
Nh0	0.728	0.471	0.835	**qh0**	0.617	0.518	0.611
Nh1	0.748	0.488	0.864	**qh1**	0.623	0.525	0.617
Nh2	0.769	0.505	0.893	**qh2**	0.630	0.533	0.623
Var.				Var.			
1	2.76%	3.63%	3.44%	1	1.09%	1.43%	0.98%
2	2.71%	3.54%	3.36%	2	1.07%	1.41%	0.94%
Nl0	0.233	0.471	0.215	**ql0**	0.449	0.518	0.445
Nl1	0.255	0.488	0.237	**ql1**	0.457	0.525	0.453
Nl2	0.278	0.505	0.259	**ql2**	0.464	0.533	0.461
Var.				Var.			
1	9.38%	3.63%	10.04%	1	1.81%	1.43%	1.80%
2	8.77%	3.54%	9.29%	2	1.71%	1.41%	1.70%
Km0	1.573	1.471	1.611	**w0**	0.545	0.545	0.545
Km1	1.317	1.265	1.354	**w1**	0.539	0.539	0.539
Km2	1.062	1.061	1.100	**w2**	0.532	0.532	0.532
Var.				Var.			
1	-16.29%	-14.03%	-15.92%	1	-1.19%	-1.19%	-1.19%
2	-19.34%	-16.13%	-18.76%	2	-1.22%	-1.22%	-1.22%
Lah0	0.648	0.548	0.671				
Lah1	0.669	0.574	0.692				
Lah2	0.689	0.601	0.714				
Var.							
1	3.19%	4.78%	3.24%				
2	3.08%	4.63%	3.11%				
Lal0	0.419	0.548	0.386				
Lal1	0.465	0.574	0.431				
Lal2	0.511	0.601	0.476				
Var.							
1	10.82%	4.78%	11.46%				
2	10.03%	4.63%	10.54%				

Economy 1: βh=0.8 βl=0.4; θh=1.4, θl=1.2.
Economy 2: βh=0.62 βl=0.62; θh=1.4, θl=1.4.
Economy 3: βh=0.8*1.01 βl=0.4*0.99; θh=1.3*0.99, θl=1.2*0.99.
Source: own estimates.

It is common to associate the differences in inequality within the club of settler economies especially with institutional arrangements and cultural questions). "Of course, in those places where the family farm dominated and where land was distributed more equally, a fall in w/r [Wage/Rental ratio] would not have translated into such a sharp rise in inequality" (Williamson, 2000:14). Refered to Uruguay and New Zealand, some scholars demonstrate that the divergent path "can be explained by the existence of different institutions governing the agricultural sectors of the [two] countries, which in turn generated different distributions of both land property rights and product shares in the agricultural sector (Álvarez et al., 2011:165). Other authors propose,

> "[t]he rise in the returns to land could lead to the emergence or consolidation of a wealthy land-owning elite […] while the real wages of workers in both sectors may have stagnated or fallen. In the case of more 'open' Anglo-Saxon regions, such as the United States, Canada, and Australia, the extension of the frontier largely meant an extension of the family farm, with the returns to land as well as the wage of labour accruing to the same individual, leading to a rise in general prosperity (Findlay, 1995:133).

It is beyond doubt that institutional arrangements influenced the evolution of economic growth and income distribution during the period, but theoretical and empirical research has paid little attention to the different types of natural resources. Our proposal includes an attempt to consider differing land quality. In the following section we supplement this vision based on endowments with a consideration of the effects of institutions.

4. The curse and natural resources: institutional quality and the appropriability hypothesis

Since the end of the 20th century economic development has no longer been considered to depend only on the accumulation of physical and human capital. Academics now accept that there is a third form of "capital" or "economic asset" that affects the performance of the economic system. This distinct type of capital is the natural and environmental resource endowment available to an economy, and it is commonly referred to as "natural capital". Natural capital is important for sustainable economic development, but increasing economic dependence on natural resource exploitation appears to hamper growth and development in most low- and middle-income economies in the world. It has been shown in the recent literature that there is a negative relationship between economic growth per capita and some measures of natural capital, and this is considered the "curse" of natural resources.

Why should an abundance of natural resources so often be related to deficient economic performance? Is the curse a general pattern or does it depend on other factors? Can the blessing of certain historical circumstances change into a curse? The literature about this subject is very

extensive and varied, and the results are mixed. Authors today prefer not to tackle the curse as such but to see the relationship as a conditional connection, where the curse is not considered to be an inevitable result. In Chapter 1 we propose a classification of the different analytical perspectives in this debate and we identify four interpretations: an abundance of natural resources as a blessing; an abundance of natural resources as a curse –with two approaches: the "productive structure approach" and the "crowding out approach"–; and finally the "factor endowment and institutional change hypothesis". We will now work with the third and fourth approaches and discuss the impact of weak institutions on economic development in terms of the appropriability hypothesis.

4.1 The curse of natural resource abundance: the institutional explanation

We saw in our review of the literature in Chapter 1, Section 3, that large natural resource rents, especially in combination with poorly-defined property rights, imperfect markets and permissive legal structures may lead to uncontrolled rent seeking among producers. This would divert resources away from economic activities that are more fruitful in social terms and would affect economic growth. When big rent incomes are in the hands of elites, economic and political power may be concentrated, and once these groups are in the government they may use these resources to strengthen their position and remain in power. The usual results of this are persistent high levels of inequality, weak democracy and political instability. Moreover, abundant natural resources may induce a false sense of security in people and in governments and cause them to miss opportunities to develop good economic management and good quality institutions. Governments are tempted to spoil markets by granting some enterprises privileged access to common-property natural resources or by offering producers tariff protection or other favours, and this creates competition among the rent seekers to obtain these favours. Extensive rent seeking may generate corruption in private and public sectors, distort resource allocation, weaken investment, increase public spending and harm economic efficiency and social equity. Abundant natural capital may crowd out social capital through corruption, inequality and the absence of political freedoms, which are all factors that hinder economic growth and cause poverty to persist.

Auty (2001b) says that different kinds of natural resource endowments may have different effects on economic performance. It is interesting to distinguish between "point resources" (that require the intensive use of capital, such as minerals and energy resources) and "diffuse resources" (that require less concentrated development, such as cropland and livestock). "Point resources" generate greater opportunities for rent-seeking and corruption and the negative effects on economic growth are more severe. In a similar vein, Isham et al. (2005) say that export concentration in point resources is strongly associated with weak public institutions, which are in turn strongly related to slower economic growth. Woolcock et al. (2001) show that natural resource-rich economies and different

types of resources put different kinds of pressure on community structures, institutional capacity and state-society relations. The situation most likely to undermine economic growth is when natural resources are easily captured and controlled by a narrow elite and, in these terms, some scholars are interested in the conditions of appropriability of natural resources and its rents. Recently the institutional explanation of the curse has focused on two related issues, (i) the intrinsic characteristics of the natural resources in question (the effect of abundance differs depending on the type of natural resource), and (ii) the quality of institutions in terms of their capacity to open appropriability possibilities for incomes based on the natural capital.

4.2 The appropriability hypothesis

Institutional explanations offer interesting predictions about why different resource-rich economies may be affected differently by their natural wealth. In general, countries with extensive plantation crops (sugar, bananas) or very valuable minerals (oil, diamonds) are more likely to have unfavourable results than countries with wheat, rice or livestock. But when we contrast countries with comparable natural resources, why do some seem to gain relatively more from their endowments while others have bad outcomes?

Boschini, et al. (2005) propose a framework that provides arguments to answer this question. They show that the effect of natural resources on economic development is not determined by resource endowments alone, but rather by the interaction between the type of resource and the quality of institutions. This combination of factors represents the so-called "appropriability" of a resource. In general, this concept alludes to the environmental factors that control the innovator's ability to obtain returns from an innovation. In the case of natural resources, the concept captures the probability that abundance may lead to rent-seeking, corruption, anti-competitive strategies or conflicts, and these in turn damage economic development. In economies where resources are highly appropriable, abundance may hinder economic performance, whereas in countries where resources are less appropriable, abundance may contribute to long term economic development.

The appropriability hypothesis may be seen in terms of the institutional and the technical dimensions. An abundance of natural resources negatively affects economic development where institutions are weak, and the impact of institutional quality and abundant natural resources is more pronounced when the natural resources are technically –in the sense of intrinsic characteristics of the resource– more easily captured ("appropriable"). The model that authors propose to test this hypothesis has the following specification for the country *i*:

$$g_i = X'_i\alpha_0 + \alpha_1 NR_i + \alpha_2 Inst + \alpha_3 (NR_i \, x \, Inst_i) + \varepsilon_i \qquad (22)$$

Where *g* is the average yearly growth rate of GDP (1975-1998), *X'* is a vector of control variables, *NR* is a measure of natural resource wealth, and *Inst* a measure of institutional quality. *NR x Inst* represents the interaction between natural resources and institutional quality.

Authors use four different measures of natural resources to capture a gradual increase in technical and institutional appropriability. The proposals, from the broadest to the narrowest measure, are as follows: the share of primary exports in GNP (Sachs & Warner, 1995); the share of ore and metal exports in GDP; the share of mineral production in GNP (Sachs & Warner, 1995); and the value of production of gold, silver, and diamonds as a share of GDP. To capture institutional quality, the authors employ the (unweighted) average of indexes for quality of the bureaucracy, corruption in government, rule of law, the risk of expropriation of private investment, and the repudiation of contracts (from Knack & Keefer, 1995, 2002). This article shows that whether natural resources are good or bad for a country's development depends crucially on the interaction between the prevailing institutional arrangements and the type of resources the country has. For economic and technical reasons, some natural resources are more likely than others to cause problems such as rent-seeking and conflicts. However, these potential problems can be countered by good institutional quality. In contrast to the traditional resource curse hypothesis, these authors show that the impact of natural resources on economic growth is non-monotonic with regard to institutional quality. Countries rich in minerals are cursed only if they have low quality institutions, and the curse is reversed if institutions are sufficiently good. Additionally, Mehlum et al. (2006) and Robinson et al. (2006) also present the concept that there is a non-monotonic relationship between natural resources and economic development with regard to institutional quality.

Mehlum et al. (2006) develop a model in which entrepreneurs choose between becoming "producers" or "grabbers". The relative payoff from these activities depends on how "grabber friendly" the institutions are, which also determines the effect of natural resources on the economy. More natural resources will raise national income if institutions are "production friendly" but reduce it if they are "grabber friendly". Robinson et al. (2006) develop a model with similar predictions but in which the political incentives generated by the resources are the key explicative factor. In countries with good institutions resources are positive because the effects of incentives that promote perverse political practices are mitigated, but in countries with bad institutions resources remain a curse.

There are different analytical options that enable us to reach similar and compatible conclusions through other channels. In a recent working paper, García-Jimeno & Robinson (2009) show renewed interest in land frontier expansion. This concept involves the incorporation of land (a natural resource) into production, and this process is accompanied by the setting up of a new system

of property rights (institutional arrangements), so there is an immediate connection with the field we are interested in. These authors analyze the classical F.J. Turner view, the "Frontier (or Turner) Thesis", for North, Central and South America from the middle of the 19th century to 2007. They suggest that "…if political institutions were bad at the time of frontier settlement, the existence of such frontier land might actually lead to worse development outcomes, probably because it provides a resource which non-democratic political elites can use to cement themselves in power" (García-Jimeno & Robinson, 2009:18).

These authors propose a model similar to the following:

$$g_{i,}=\beta_0+\beta_1 F_{i,t}+\beta_2 C_{i,t}+\beta_3(F_{i,t}\,x\,C_{i,t})+\varepsilon_i \qquad (23)$$

Where $g_{i,t}$ is the dependent variable of interest for country i. This is, respectively, GDP per-capita in 2007; the Polity average democracy score in the periods 1950-2007 and 1990-2007; and the average Gini coefficient for income inequality over the latter period. $F_{i,t}$ is the proportion of the country which was frontier land in period t and $C_{i,t}$ is the constraints on the executive power from *Polity IV* in period t , considering $t=1850$ (or some year around that time).

What is particularly interesting about this specification is that if we reinterpret the analytical relation and consider that the open frontier (not occupied territory) represents the natural wealth as unexploited natural resources of these economies, the model is equivalent to that used in Boschini, et al. (2005) (see equation *(22)*).

5. Highlights and final remarks

In this Chapter we propose a supplementary model to the H-O-S framework in order to explain the performance of settler economies during the First Globalization. The modeling of specific factors enables us to stress the importance of domestic conditions in countries exposed to the effects of the First Globalization up to WWI. Land frontier expansion becomes a key factor in explaining the different effects of globalization on the settler economies. The availability of land resources was the main comparative advantage that enabled them to participate in international markets. In order to better understand this process, we modify the model to incorporate differing land quality. There are three important contributions in our model.

First, it constitutes an application of recent theories in the literature about the relationship between an abundance of natural resources and the economic performance to the Atlantic economy during the First Globalization. Basing our work on this literature, we show that the curse and the blessing of natural resources do not constitute a deterministic process, and outcomes are associated with the specific historical circumstances in each case. Settler economies were blessed with an abundance of natural resources and had strong export-led growth, but the curse was present in the

form of increasing income inequality. Note too that the First Globalization did not affect all economies with the same intensity. These differences can explain the long-run divergent economic performance in some members of the "club".

Second, we emphasize the concept of a moving frontier or endogenous land frontier expansion. An abundance of natural resources is not a fixed situation but a process that reacts to changes in the structure of commodity prices and factor endowments, and to progress it requires capital, labour, technical progress and suitable institutional arrangements. Therefore this abundance is not given but is part of the evolution of the economic system, an idea that is not new because it goes back a long way. "Resources are highly dynamic concepts; they are not, they become, they evolve out of the triune interaction of nature, man, and culture…" (quoted in Ding & Field, 2004:2 from Zimmerman, 1933:4).

Lastly, we consider that differing land quality can refer to different types of natural resources. With this framework, we can conjecture that differences in evolutions within the "club" are connected to differences in endowments as regards agricultural aptitude and distance from markets. The hypothesis that our framework supports is that settler economies that first occupied the "best" land achieved higher incomes and agricultural production, but they suffered worse income distribution. This would be because landowners (the small rich elite) were able to obtain greater relative factor earnings to the detriment of workers and capitalists. Our interpretation has similar points to Milanovic et al. (2007).

When average incomes are very low or barely above the subsistence minimum, the income surplus is small.[42] Under these conditions, the members of the upper class would be few, and the level of inequality would be quite modest. However, as average incomes increase –with the incorporation of "new" land– this constraint on inequality is lifted. In a context where wages cover the subsistence conditions and emerge land rents –that results higher in better lands–the surplus increases, and the maximum possible inequality compatible with the new average income is greater. In other words, the maximum achievable inequality is an increasing function of average income and, in our model, it also reacts to the income structure of the agrarian activity. The historical association between land rents and elites, and the possibility of widening the gap between land rents and wages when land is comparatively superior, reinforces our proposition.

The timing and intensity of frontier expansion, together with institutional change, explains the dynamics of the process. Different types of land (depending on its natural aptitude) can be classified on a scale of appropriability that ranges from high quality land (with a greater likelihood to yield

[42] Authors suppose that each society has to distribute income in such a way as to guarantee a subsistence minimum for its poorer classes. The remainder of the total income is the "surplus" that is shared among the richer classes.

differential rentals) to low quality land. However, the impact of this situation on economic performance depends on the quality of the institutions. “Bad” institutions worsen the adverse effects of land frontier expansion when the movement is onto high quality land, and “good” institutions moderate that evolution.

We reinterpret an equation as *(23)* (in the tradition of Turner’s approach) in the light of appropriability hypothesis (in the tradition of the curse of the natural resources) tested in an equation as *(22)*, and we consider the appropriability gradient that offer the different land qualities to evaluate the two dimensions of this hypothesis. On the on hand, we consider the institutional dimension, which involves the quality of the institutions and, on the other hand, the technical dimension, which refers to the “intrinsic” conditions of the natural resource that encourage or moderate the capacity of the agents to capture rents. This statistical approach gives several interesting insights that guide our description of the formation of institutional arrangements specifically related to land ownership rights in settler economies.

Appendix to Chapter 2
Formal presentation of the model

1. Initial version

The model derives from Findlay & Lundahl (1994) and Findlay (1995). We include a specification of the generic functions to illustrate the problem and to find an analytical solution. With this solution, we solve the problem with a numerical analysis[43] to determine the incidence on the endogenous variables of changes in the exogenous ones.

1.1 Production and utility functions

- Primary (agriculture) sector (A):

$$A = A(N, L_A) = N^{\beta} L_A^{1-\beta} \qquad (1)$$

Where $0 < \beta < 1$

- Manufactures (M):

$$M = \min\left\{ M(K_M, L_M), \frac{A_R}{\alpha_M} \right\} \qquad (2)$$

Where

$M = M(K_M, L_M) = K_M^{\alpha} L_M^{1-\alpha}$

$0 < \alpha < 1$

$\frac{A_R}{\alpha_M}$: is an industrial input that comes from A and participates in the industrial production according to the coefficient α_M.

In equilibrium: $M(K_M, L_M) = \frac{A_R}{\alpha_M}$

Besides: $L_A + L_M = L$ *(3)*

- Utility function:

$$u = u(A_C, M_C) \qquad (4)$$

Agrarian production has two destines: input of Manufactures (A_R) and consumption (A_C).

$$A_R + A_C = A \qquad (5)$$

Manufacturing production is used to consumption (M_C) and the capital re-composition.

$$\delta K_M + M_C = M \qquad (6)$$

Where δ is the capital amortization rate.

- Normalization of production functions:

$$\frac{A}{L_A} = A(N/L_A) = a(n) = n^{\beta} \qquad (7)$$

[43] We use MatLab (Matrix Laboratory) as our numerical computing application.

$$\frac{M}{L_M} = M(K_M / L_M) = m(k) = k^{\alpha} \quad (8)$$

$$\frac{A_R}{L_M} = \alpha_M m(k) \quad (9)$$

1.2 Profit maximization and resolution of *k*

- Manufactures:

$$\Pi_m = m(k) - \rho k - p\alpha_M m(k) - w \quad (10)$$

$$\max \Pi_m \Rightarrow \frac{\partial \Pi_m}{\partial k} = 0 \Rightarrow m'(k) - \rho - \alpha_M p m'(k) = 0 \Rightarrow$$

$$\Rightarrow (1 - \alpha_M p) m'(k) = \rho \quad (11)$$

Replacing *m'(k)* in accordance to *(8)*:

$$(1 - \alpha_M p)\alpha k^{\alpha - 1} = \rho \quad (12)$$

$$k^{\alpha - 1} = \frac{\rho}{\alpha(1 - \alpha_M p)} \quad (13)$$

Applying the natural logarithm (logarithm to the base *e*):

$$\ln k^{\alpha - 1} = \ln \frac{\rho}{\alpha(1 - \alpha_M p)} \quad (14)$$

In accordance to logarithm proprieties:

$$(\alpha - 1)\ln k = \ln \rho - \ln \alpha(1 - \alpha_M p) \quad (15)$$

$$\ln k = \frac{\ln \rho - \ln \alpha(1 - \alpha_M p)}{(\alpha - 1)} \quad (16)$$

$$k = e^{\frac{\ln \rho - \ln \alpha(1 - \alpha_M p)}{(\alpha - 1)}} \quad (17)$$

- Primary (agriculture) sector (*A*):

Cost on clearing land:

$$k_A = \phi(N) \quad (18)$$

Where: $\phi(N)$ is the cost function; it is an increasing and concave up function and, then, $\phi'(N) > 0$ and $\phi''(N) > 0$. We can express it as: $k_A = \phi(N) = \gamma N^{\theta}$ (19)

With $\theta > 1$ and $\gamma > 0$.

Therefore,

$$\Pi_a = pa(n) - \phi(N)\rho - w \quad (20)$$

$$\max \Pi_A \Rightarrow \frac{\partial \Pi_a}{\partial n} = 0 \Rightarrow pa'(n) - \phi'(N)\rho = 0 \Rightarrow pa'(n) = \phi'(N)\rho \Rightarrow$$

$$\frac{pa'(n)}{\phi'(N)} = \rho \qquad (21)$$

1.3 Resolution of *w*

With constant returns to scale (and in accordance with Euler's Theorem) the sum of factor earnings exhausts the total product. Considering *(10)* and working out *w*:

$$m(k) = \rho k + p\alpha_M m(k) + w \qquad (22)$$

$$w = (1 - \alpha_M p)m(k) - \rho k \qquad (23)$$

Replacing ρ in accordance with *(11)*:

$$w = (1 - \alpha_M p)m(k) - (1 - \alpha_M p)m'(k)k \qquad (24)$$

$$w = (1 - \alpha_M p)[m(k) - m'(k)k)] \qquad (25)$$

In accordance with *(8)* and considering $m'(k) = \alpha k^{\alpha-1}$ *(26)*

$$w = (1 - \alpha_M p)[k^{\alpha} - \alpha k^{\alpha-1}k)] \qquad (27)$$

$$w = (1 - \alpha_M p)k^{\alpha}(1 - \alpha) \qquad (28)$$

Perfect competition in the labour markets makes:

$$pa(n) - \phi(N)\rho = w \qquad (29)$$

1.4 Resolution of *n*

Replacing with the value of ρ from *(21)* in *(29)*:

$$w = pa(n) - \phi(N)\frac{pa'(n)}{\phi'(N)} = p[a(n) - \phi(N)\frac{a'(n)}{\phi'(N)}] \qquad (30)$$

By differentiation and considering that $N=L_An$,

$$\phi'(N) = \gamma\theta N^{\theta-1} = \gamma\theta L_A{}^{\theta-1} n^{\theta-1} \qquad (31)$$

From *(30)* and *(31)*,

$$w = p[a(n) - \gamma(L_A n)^{\theta}\frac{a'(n)}{\gamma\theta L_A{}^{\theta-1} n^{\theta-1}}] \qquad (32)$$

$$w = p[a(n) - L_A n\frac{a'(n)}{\theta}] \qquad (33)$$

In accordance with *(7)* and considering $a'(n) = \beta n^{\beta-1}$ *(34)*

$$w = p[n^{\beta} - L_A n\frac{\beta n^{\beta-1}}{\theta}] = pn^{\beta}(1 - L_A\frac{\beta}{\theta}] \qquad (35)$$

$$n = \left[\frac{w}{p(1 - L_A\frac{\beta}{\theta}]}\right]^{1/\beta} \qquad (36)$$

From *(21)*, considering *(31)* and *(34)*,

$$\rho = \frac{p\beta n^{\beta-1}}{\gamma\theta L_A{}^{\theta-1} n^{\theta-1}} = \frac{p\beta}{\gamma\theta L_A{}^{\theta-1}}\frac{n^{\beta-1}}{n^{\theta-1}} = \frac{p\beta}{\gamma\theta L_A{}^{\theta-1}} n^{\beta-\theta} \qquad (37)$$

$$L_A = \left[\frac{p\beta}{\gamma\theta\rho} n^{\beta-\theta}\right]^{1/\theta-1} \qquad (38)$$

Replacing with *(38)* in *(36)* we obtain *n*. Our procedure is the following. We start with one of the components of the denominator of *(36)*:

$$L_A\frac{\beta}{\theta} = \left[\frac{p\beta}{\gamma\theta\rho} n^{\beta-\theta}\right]^{1/\theta-1}\frac{\beta}{\theta} = \left[\frac{p^{1/\theta-1}\beta^{1/\theta-1}}{\gamma^{1/\theta-1}\theta^{1/\theta-1}\rho^{1/\theta-1}} n^{(\beta-\theta)/(\theta-1)}\right]\frac{\beta}{\theta} = \left[\frac{p^{1/\theta-1}\beta^{\theta/\theta-1}}{\gamma^{1/\theta-1}\theta^{\theta/\theta-1}\rho^{1/\theta-1}} n^{(\beta-\theta)/(\theta-1)}\right]$$

We continue with the denominator of *(36)*,

$$p\left[L_A\frac{\beta}{\theta}\right] = \left[\frac{p^{\theta/\theta-1}\beta^{\theta/\theta-1}}{\gamma^{1/\theta-1}\theta^{\theta/\theta-1}\rho^{1/\theta-1}} n^{(\beta-\theta)/(\theta-1)}\right]$$

Therefore, the complete denominator of *(36)* is,

$$p(1 - L_A\frac{\beta}{\theta}] = p - \left[\frac{p^{\theta/\theta-1}\beta^{\theta/\theta-1}}{\gamma^{1/\theta-1}\theta^{\theta/\theta-1}\rho^{1/\theta-1}} n^{(\beta-\theta)/(\theta-1)}\right]$$

Therefore, we substitute the last relation in *(36)*:

$$n = \left[\frac{w}{p - \left[\frac{p_a{}^{\theta/\theta-1}\beta^{\theta/\theta-1}}{\gamma^{1/\theta-1}\theta^{\theta/\theta-1}\rho^{1/\theta-1}} n^{(\beta-\theta)/(\theta-1)}\right]}\right]^{1/\beta} \qquad n^{\beta} = \left[\frac{w}{p - \left[\frac{p_a{}^{\theta/\theta-1}\beta^{\theta/\theta-1}}{\gamma^{1/\theta-1}\theta^{\theta/\theta-1}\rho^{1/\theta-1}} n^{(\beta-\theta)/(\theta-1)}\right]}\right]$$

$$n^{\beta} p - n^{\beta}\left[\frac{p_a{}^{\theta/\theta-1}\beta^{\theta/\theta-1}}{\gamma^{1/\theta-1}\theta^{\theta/\theta-1}\rho^{1/\theta-1}} n^{(\beta-\theta)/(\theta-1)}\right] = w \qquad n^{\beta} p - \left[\frac{p^{\theta/\theta-1}\beta^{\theta/\theta-1}}{\gamma^{1/\theta-1}\theta^{\theta/\theta-1}\rho^{1/\theta-1}} n^{\theta(\beta-1)/\theta-1}\right] = w$$

$$n^{\beta} p - \left[\frac{p\beta}{\theta}\right]^{\theta/\theta-1}\left[\frac{1}{\gamma\rho}\right]^{1/\theta-1} n^{\theta(\beta-1)/\theta-1} = w \qquad (39)$$

Then, we calculate *n* by Newton approximation.

1.5 Rest of variables

The deduction of the rest of the variables (*N*, *A*, L_M, K_M, *M*, *q* and *Y*) is immediate and we close the system estimating *p* from the following relation:

$$A+M=Y=w(L_A+ L_B)+\rho K_M+qN \qquad (40)$$

2. Selection of parameters and discussion of the results for Findlay-Lundahl model

2.1 Parameters and discussion

Our numerical analysis takes as reference the structure and the conditions of Uruguay in the eve of the WWI (in general terms, we work with 1912 as benchmark). We choose Uruguay because we have enough information to incorporate in the model and it constitutes a small and homogenous economy where regional disparities are less relevant. In this section, we present and justify the choices of the values of the parameters (Table A2.1) and discuss, critically, our results.

Table A2.1
Calibration: parameters and values

Parameter	Value
α	0.25
α_M	0.60
β	0.80
ρ	0.05
γ	10
θ	1.70
L	1.50

α is the output elasticity of capital in manufacturing sector; it is a constant value determined by the available technology. Output elasticity measures the responsiveness of output to a change in levels of the productive factor used in production (*ceteris paribus*). In these terms, the more α is higher, the more capital- intensive the economic activity results. They are not available historical statistics of *α* in manufacturing and we only have some assumptions to the whole economy from the 1960s on. Carracelas et al. (2009) review different available studies that cover similar periods and propose different values of *α*: 0.3 in Bucacos (1999) (1960-1998); 0.28 in De Brum (2004) (1957-1999); 0.35 in Fossati et al. (2005) (1956-2003); 0.38 in Thedoluz (2005) (1978-2003); 0.35 in

Chumacero (2006) (1961-2000). For the second half of the 20th century, it is expected a higher value of α in manufacturing than for the whole economy –probably upper 0.4– and a level significantly higher than in the first decade of the century, when industry was more labour-intensive. Therefore it is reasonable to suppose an elasticity between 0.2 and 0.3 for 1912. We assume 0.25 as our value of reference.

α_M is a fixed coefficient that connects the gross output of manufacturing (M) to raw material input. It represents the share of inputs on manufacture production. Information is available for 1930 (constant prices of 1936) and, considering the characteristics of industry during the first decades of the 20th century, we only consider those branches that manufacture agrarian products (foodstuffs, drinks, tobacco, textile, clothes, forest products, paper, leather). Inputs represent 64 per cent of gross production and we assume 0.6 as our value of reference (Millot, et al., 1974).

β is the output elasticity of land in the agriculture; as in the case of α, it is a constant value determined by the available technology and represents the responsiveness of output to a change in levels of the land (*ceteris paribus*). There are studies about Argentine case and, considering historical similarities with Uruguay, we consider that they are results applied to Uruguayan agriculture.[44] Newland & Poulson (1998):341 estimate the total factor productivity in pastoral production in the Argentine Littoral for two periods, 1825-1865 and 1865-1908, and three productive factors. For the first period, they consider the following weights: land (0.35), labour (0.20) and capital (0.45). For the second period, as Diaz Alejandro (1975):142-144, they propose 0.375, 0.250 and 0.375, respectively. We present a model with two productive factors in agriculture and then we add land and capital and assume a weight of 0.8 for land (N) and 0.2 for labour (L).

ρ is the interest rate and it represents the price of the capital and acts as the opportunity cost of the investment. Data about interest rates are scarce although consistent between sources. In 1911-1913, the average of the yield government bonds was 4.3 per cent (Obstfeld & Taylor, 2003) and the active interest rate 6.5 per cent (Román, 2010). Therefore, we assume ρ=0.05 to consider a value within this range.

γ and θ are technological coefficients that were determined from the calibration of the model and the consideration of a theoretical expression of the function $K_A = \phi(N)$, where $\phi(N)$ is a convex function of the amount of land cleared with $\phi'(N) > 0$ and $\phi''(N) > 0$. We consider our results acceptable when we assume γ=10 and θ=1.7.

L represents the quantity of labour that participates in the different productive activities of the

[44] Moraes (2001): 61-64 proposes an estimation of the total factor productivity of the pastoral production of Uruguay for the period 1872-1930 (three benchmarks). However, her calculation methodology implies a share of labour that is absolutely marginal and is not adequate for our objective.

economy. We consider that our economy has only two sectors, agriculture and manufacturing, and we consider the estimates of economic active population available for around 1912. In accordance with our sources, the economy presented 48,640 agrarian (Bértola, 2005) and 22,224 manufacturing workers (Maubrigades, 2002). Information about days and hours of work in the South American Southern Cone is scarce, partial, and basically qualitative. In our estimates of functional income distribution in the agrarian sector (see Chapter 4) we review some evidence and our assumptions in this case are consistent with that estimation. We assume 230 days of work per year and 9 hours per day. Therefore, we estimate 146,688,480 worked hours in agrarian and manufacturing activities around 1912. We assume $L=1.5$.

The variable n –the land-labour coefficient– is calculated applying a Newton approximation, and we assume as extremes of p for the bisection of the function the values 0.5 and 1.5. We look for a value $p=P_A/P_M$ around 1 because we always can express the agriculture and manufacture product in such a way that the relation of prices equals the unity.

How can we consider that our calibration of the model renders "good" results? We regard as "good" results obtaining some basic relationships closer to the historical data of economic structure. Considering only two sectors, the GDP structure of the Uruguayan economy around 1912 showed an agrarian participation of 65 per cent and the remaining 35 per cent to manufacturing (Bértola, 1998). Our calibration offers a productive structure of 68 and 32 per cent, respectively. Analogously, the labour structure showed an agrarian participation of 69 per cent and the remaining 31 per cent to manufacturing (Bértola, 2005; Maubrigades, 2001). Our calibration offers a labour structure of 76 and 24 per cent, respectively.[45] Taking account the simplicity of our model and the quality of our data –in all cases historical estimates– we consider that it renders satisfactory results.

2.2 Results of the simulation exercises

We present the complete simulation results of the calibration and simulation exercises in the following Tables.

All cases consider increases in variables that cause changes in factor endowments and factor productive prices. We present movements in terms of trade, labour (associated to migration), interest rate (related to capital flows), cost of clearing land and land productivity. Variables are presented in four analytical categories: productive factors; economic growth and structural change; income distribution; and prices.

[45] Differences are not so small but they do not surprise us. Our assumption of the same labour-days and worked hours in both sectors may be inducing distortions. For instance, if we consider that worked hours in the agriculture and manufacture are, respectively, 10 and 8 instead of 9, the "real" labour structure would be 73 and 27 per cent instead of 68 and 32 per cent and, in consequence, very close to the results of our model.

Table A2.2
VALUES OF THE VARIABLES OF THE MODEL
Simulation of a marginal increasing in p=P_A/P_M

PRODUCTIVE FACTORS		GROWTH AND STRUCTURE		INCOME DISTRIBUTION		PRICES	
N_0	0.9461	A_0	0.9829	RW_0	1.3216	q_0	0.8177
N_1	0.9613	A_1	0.9997	RW_1	1.3846	q_1	0.8268
N_2	0.9764	A_2	1.0165	RW_2	1.4504	q_2	0.8359
K_{M0}	0.9235	M_0	0.4508	RP_0	16.7539	w_0	0.3902
K_{M1}	0.8429	M_1	0.4176	RP_1	18.8590	w_1	0.3827
K_{M2}	0.7653	M_2	0.3848	RP_2	21.3321	w_2	0.3752
L_{A0}	1.1450	Y_0	1.4052	WY_0	0.4098		
L_{A1}	1.1696	Y_1	1.4110	WY_1	0.4043		
L_{A2}	1.1940	Y_2	1.4173	WY_2	0.3985		
L_{M0}	0.3550	AY_0	0.6882	RY_0	0.5506		
L_{M1}	0.3304	AY_1	0.7041	RY_1	0.5633		
L_{M2}	0.3060	AY_2	0.7199	RY_2	0.5759		
n_0	0.8263	MY_0	0.3208	PY_0	0.0329		
n_1	0.8219	MY_1	0.2959	PY_1	0.0299		
n_2	0.8178	MY_2	0.2715	PY_2	0.0270		
k_0	2.6016						
k_1	2.5513						
k_2	2.5012						

Period 1: p; Period 0: p*0.99; Period 2: p*1.01
Source: own estimates.

Table A2.3
VALUES OF THE VARIABLES OF THE MODEL
Simulation of a marginal increasing in L

PRODUCTIVE FACTORS		GROWTH AND STRUCTURE		INCOME DISTRIBUTION		PRICES	
N_0	0.9479	A_0	0.9849	RW_0	1.3422	q_0	0.8187
N_1	0.9613	A_1	0.9997	RW_1	1.3846	q_1	0.8268
N_2	0.9754	A_2	1.0154	RW_2	1.4317	q_2	0.8353
K_{M0}	0.8751	M_0	0.4279	RP_0	17.7363	w_0	0.3894
K_{M1}	0.8429	M_1	0.4176	RP_1	18.8590	w_1	0.3827
K_{M2}	0.8079	M_2	0.4058	RP_2	20.1710	w_2	0.3757
L_{A0}	1.1479	Y_0	1.3980	WY_0	0.4074	p_0	0.9850
L_{A1}	1.1696	Y_1	1.4110	WY_1	0.4043	p_1	0.9938
L_{A2}	1.1924	Y_2	1.4244	WY_2	0.4008	p_2	1.0031
L_{M0}	0.3371	AY_0	0.6939	RY_0	0.5551		
L_{M1}	0.3304	AY_1	0.7041	RY_1	0.5633		
L_{M2}	0.3226	AY_2	0.7151	RY_2	0.5721		
n_0	0.8258	MY_0	0.3061	PY_0	0.0313		
n_1	0.8219	MY_1	0.2959	PY_1	0.0299		
n_2	0.8180	MY_2	0.2849	PY_2	0.0284		
k_0	2.5958						
k_1	2.5513						
k_2	2.5045						

Period 1: L; Period 0: L*0.99; Period 2: L*1.01
Source: own estimates.

Table A2.4
VALUES OF THE VARIABLES OF THE MODEL
Simulation of a marginal increasing in ρ

PRODUCTIVE FACTORS		GROWTH AND STRUCTURE		INCOME DISTRIBUTION		PRICES	
N_0	0.9694	A_0	1.0061	RW_0	1.3797	q_0	0.8234
N_1	0.9613	A_1	0.9997	RW_1	1.3846	q_1	0.8268
N_2	0.9534	A_2	0.9935	RW_2	1.3896	q_2	0.8303
K_{M0}	0.8627	M_0	0.4217	RP_0	18.6905	w_0	0.3856
K_{M1}	0.8429	M_1	0.4176	RP_1	18.8590	w_1	0.3827
K_{M2}	0.8236	M_2	0.4134	RP_2	19.0332	w_2	0.3798
L_{A0}	1.1678	Y_0	1.4193	WY_0	0.4041	p_0	0.9916
L_{A1}	1.1696	Y_1	1.4110	WY_1	0.4043	p_1	0.9938
L_{A2}	1.1715	Y_2	1.4028	WY_2	0.4044	p_2	0.9960
L_{M0}	0.3322	AY_0	0.7029	RY_0	0.5623		
L_{M1}	0.3304	AY_1	0.7041	RY_1	0.5633		
L_{M2}	0.3285	AY_2	0.7054	RY_2	0.5643		
n_0	0.8301	MY_0	0.2971	PY_0	0.0301		
n_1	0.8219	MY_1	0.2959	PY_1	0.0299		
n_2	0.8138	MY_2	0.2947	PY_2	0.0296		
k_0	2.5969						
k_1	2.5513						
k_2	2.5067						

Period 1: ρ; Period 0: ρ*0.99; Period 2: ρ*1.01
Source: own estimates.

Table A2.5
VALUES OF THE VARIABLES OF THE MODEL
Simulation of a marginal increasing in θ and γ

PRODUCTIVE FACTORS		GROWTH AND STRUCTURE		INCOME DISTRIBUTION		PRICES	
N_0	1.0495	A_0	1.0682	RW_0	1.3440	q_0	0.7828
N_1	0.9613	A_1	0.9997	RW_1	1.3846	q_1	0.8268
N_2	0.8881	A_2	0.9416	RW_2	1.4226	q_2	0.8674
K_{M0}	0.9602	M_0	0.4538	RP_0	17.1118	w_0	0.4075
K_{M1}	0.8429	M_1	0.4176	RP_1	18.8590	w_1	0.3827
K_{M2}	0.7463	M_2	0.3862	RP_2	20.6440	w_2	0.3610
L_{A0}	1.1466	Y_0	1.4808	WY_0	0.3968	p_0	0.9613
L_{A1}	1.1696	Y_1	1.4110	WY_1	0.4043	p_1	0.9938
L_{A2}	1.1899	Y_2	1.3491	WY_2	0.4104	p_2	1.0226
L_{M0}	0.3534	AY_0	0.6935	RY_0	0.5548		
L_{M1}	0.3304	AY_1	0.7041	RY_1	0.5633		
L_{M2}	0.3101	AY_2	0.7137	RY_2	0.5710		
n_0	0.9154	MY_0	0.3064	PY_0	0.0324		
n_1	0.8219	MY_1	0.2959	PY_1	0.0299		
n_2	0.7464	MY_2	0.2863	PY_2	0.0277		
k_0	2.7167						
k_1	2.5513						
k_2	2.4067						

Period 1: θ and γ; Period 0: θ*0.99 and γ-1; Period 2: θ*1.01 and γ+1
Source: own estimates.

Table A2.6
VALUES OF THE VARIABLES OF THE MODEL
Simulation of a marginal increasing in β

PRODUCTIVE FACTORS		GROWTH AND STRUCTURE		INCOME DISTRIBUTION		PRICES	
N_0	0.9558	A0	0.9983	RW_0	1.3758	q_0	0.8235
N_1	0.9613	A1	0.9997	RW_1	1.3846	q_1	0.8268
N_2	0.9666	A2	1.0012	RW_2	1.3924	q_2	0.8301
K_{M0}	0.8182	M0	0.4063	RP_0	19.2387	w_0	0.3814
K_{M1}	0.8429	M1	0.4176	RP_1	18.8590	w_1	0.3827
K_{M2}	0.8688	M2	0.4291	RP_2	18.4701	w_2	0.3842
L_{A0}	1.1782	Y0	1.4001	WY_0	0.4068	p0	0.9955
L_{A1}	1.1696	Y1	1.4110	WY_1	0.4043	p1	0.9938
L_{A2}	1.1608	Y2	1.4221	WY_2	0.4019	p2	0.9918
L_{M0}	0.3218	AY0	0.7098	RY_0	0.5622		
L_{M1}	0.3304	AY1	0.7041	RY_1	0.5633		
L_{M2}	0.3392	AY2	0.6983	RY_2	0.5642		
n_0	0.8112	MY0	0.2902	PY_0	0.0292		
n_1	0.8219	MY1	0.2959	PY_1	0.0299		
n_2	0.8328	MY2	0.3018	PY_2	0.0305		
k_0	2.5426						
k_1	2.5513						
k_2	2.5611						

Period 1: β; Period 0: β*0.99; Period 2: β*1.01
Source: own estimates.

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3. Revision of the model: our proposal

As in the previous presentation, we include specifications of the generic functions to illustrate the problem and to find an analytical solution. With this solution, we solve the problem with a numerical analysis to determine the incidence on the variables of the model of exogenous changes in variables. We concentrate in the influence of changes in the relative prices ($p=P_A/P_M$) because terms of trade were the main factor to explain the stylized facts of the period.

3.1 Production and utility functions

- Primary (agriculture) sector (A) with two sub-sectors A_H and A_L that work, respectively, in high aptitude (N_H) and low aptitude land (N_L):

$$A_H = A_H(N_H, L_{AH}) = N_H^{\beta_H} L_{AH}^{1-\beta_H} \quad (1)$$

$$A_L = A_L(N_L, L_{AL}) = N_L^{\beta_L} L_{AL}^{1-\beta_L} \quad (2)$$

Where $0 < \beta_L < \beta_H < 1$

- Manufactures (M):

$$M = \min\left\{M(K_M, L_M), \frac{A_R}{\alpha_M}\right\} \quad (3)$$

Where $M = M(K_M, L_M) = K_M^{\alpha} L_M^{1-\alpha}$ and $0 < \alpha < 1$

$\frac{A_R}{\alpha_M}$: is an industrial input that comes from A and participates in the industrial production according to the coefficient α_M.

In equilibrium: $M(K_M, L_M) = \frac{A_R}{\alpha_M}$

Besides: $L_{AH} + L_{AH} + L_M = L$ *(4)*

- Utility function:

$$u = u(A_C, M_C) \quad (5)$$

Agrarian production has two destines: input of Manufactures (A_R) and consumption (A_C).

$$A_R + A_C = A = A_H + A_L \quad (6)$$

Manufacturing production is used to consumption (M_C) and the capital re-composition.

$\delta K_M + M_C = M$, Where δ is the capital amortization rate *(7)*

- Normalization of production functions:

$$\frac{A_H}{L_{AH}} = A_H\left(N_H \middle/ L_{AH}\right) = a(n_H) = n_H^{\beta_H} \quad (8)$$

$$\frac{A_L}{L_{AL}} = A_L\left(N_L \middle/ L_{AL}\right) = a(n_L) = n_L^{\beta_L} \quad (9)$$

$$\frac{M}{L_M} = M\left(K_M \middle/ L_M\right) = m(k) = k^{\alpha} \quad (10)$$

$$\frac{A_R}{L_M} = \alpha_M m(k) \quad (11)$$

3.2 Profit maximization and resolution of *k*

- Manufactures:

$$\Pi_M = m(k) - \rho k - p\alpha_M m(k) - w \quad (12)$$

$$\max \Pi_M \Rightarrow \frac{\partial \Pi_M}{\partial k} = 0 \Rightarrow m'(k) - \rho - \alpha_M p m'(k) = 0 \Rightarrow$$

$$\Rightarrow (1 - \alpha_M p) m'(k) = \rho \quad (13)$$

Replacing *m'(k)* in accordance to *(10)*:

$$(1 - \alpha_M p)\alpha k^{\alpha - 1} = \rho \quad (14)$$

$$k^{\alpha - 1} = \frac{\rho}{\alpha(1 - \alpha_M p)} \quad (15)$$

Applying the natural logarithm (logarithm to the base *e*):

$$\ln k^{\alpha - 1} = \ln \frac{\rho}{\alpha(1 - \alpha_M p)} \quad (16)$$

In accordance to logarithm proprieties:

$$(\alpha - 1)\ln k = \ln \rho - \ln \alpha(1 - \alpha_M p) \quad (17)$$

$$\ln k = \frac{\ln \rho - \ln \alpha(1 - \alpha_M p)}{(\alpha - 1)} \quad (18)$$

$$k = e^{\frac{\ln \rho - \ln \alpha(1-\alpha_M p)}{(\alpha-1)}} \quad (19)$$

- Primary (agriculture) sector (A):

Cost on clearing land:

$$k_{AH} = \phi(N_H) = \gamma N_H^{\theta_H} \quad (20)$$

$$k_{AH} = \phi(N_H) = \gamma N_L^{\theta_L} \quad (21)$$

Where: $\phi(N_i)$ is the cost function; an increasing and concave up function; i.e. $\phi'(N_i) > 0$ and $\phi''(N_{ii}) > 0$.

The cost on clearing land is different by type of land and we assume: $\theta_H > \theta_L$ (w explain this assumption in the following section).

$$\Pi_{AH} = pa(n_H) - \phi(N_H)\rho - w \quad (22)$$

$$\max \Pi_{AL} \Rightarrow \frac{\partial \Pi_{AH}}{\partial n_H} = 0 \Rightarrow pa'(n_H) - \phi'(N_H)\rho = 0 \Rightarrow p_a a'(n_H) = \phi'(N_H)\rho \Rightarrow$$

$$\frac{pa'(n_H)}{\phi'(N_H)} = \rho \quad (23)$$

$$\Pi_{AL} = pa(n_L) - \phi(N_L)\rho - w \quad (24)$$

$$\max \Pi_{AL} \Rightarrow \frac{\partial \Pi_{AL}}{\partial n_L} = 0 \Rightarrow pa'(n_L) - \phi'(N_L)\rho = 0 \Rightarrow p_a a'(n_L) = \phi'(N_L)\rho \Rightarrow$$

$$\frac{pa'(n_L)}{\phi'(N_L)} = \rho \quad (25)$$

Therefore, the maximum profit in the Agriculture occurs when the rate of return of clearing land in both types of land coincides.

3.3 Resolution of *w*

With constant returns to scale (and in accordance with Euler's Theorem) the sum of factor earnings exhausts the total product,

$$m(k) = \rho k + p\alpha_M m(k) + w \quad (26)$$

$$w = (1 - \alpha_M p)m(k) - \rho k \quad (27)$$

Replacing ρ in accordance with *(13)*:

$$w = (1 - \alpha_M p)m(k) - (1 - \alpha_M p)m'(k)k \quad (28)$$

$$w = (1 - \alpha_M p)[m(k) - m'(k)k)] \quad (29)$$

In accordance with *(10)* and considering $m'(k) = \alpha k^{\alpha-1}$ *(30)*

$$w = (1 - \alpha_M p)[k^{\alpha} - \alpha k^{\alpha-1}k)] \quad (31)$$

$$w = (1 - \alpha_M p)k^{\alpha}(1 - \alpha) \quad (32)$$

Perfect competition in the labour markets makes:

$$pa(n_H) - \phi(N_H)\rho = w \quad (33)$$

$$pa(n_L) - \phi(N_L)\rho = w \quad (34)$$

3.4 Resolution of *n*

Replacing with the value of ρ from *(23)* in *(33)*:

$$w = pa(n_H) - \phi(N_H)\frac{pa'(n_H)}{\phi'(N_H)} = p[a(n_H) - \phi(N_H)\frac{a'(n_H)}{\phi'(N_H)}] \quad (35)$$

By differentiation *(20)* and considering $N=L_A n$,

$$\phi'(N_H) = \gamma\theta_H N_H^{\theta_H - 1} = \gamma\theta_H L_{AH}^{\theta_H - 1} n_H^{\theta_H - 1} \quad (36)$$

From *(35)* and *(36)*,

$$w = p[a(n_H) - \gamma(L_{AH}n_H)^{\theta_H}\frac{a'(n_H)}{\gamma\theta_H L_{AH}^{\theta_H - 1} n_H^{\theta_H - 1}}] \quad (37)$$

$$w = p[a(n_H) - L_{AH}n_H\frac{a'(n_H)}{\theta_H}] \quad (38)$$

In accordance with *(8)* and considering $a'(n_H) = \beta_H n_H^{\beta_H - 1}$ *(39)*

$$w = p[n_H^{\beta_H} - L_{AH}n_H\frac{\beta_H n_H^{\beta_H - 1}}{\theta_H}] = pn_H^{\beta_H}(1 - L_{AH}\frac{\beta_H}{\theta_H}] \quad (40)$$

$$n_H = \left[\frac{w}{p(1 - L_{AH}\frac{\beta_H}{\theta_H}]}\right]^{1/\beta_H} \quad (41)$$

From *(23)*, considering *(39)* and *(36)*,

$$\rho = \frac{p\beta_H n_H^{\beta_H - 1}}{\gamma\theta_H L_{AH}^{\theta_H - 1} n_H^{\theta_H - 1}} = \frac{p\ \beta_H}{\gamma\theta_H L_{AH}^{\theta_H - 1}} \frac{n_H^{\beta_H - 1}}{n_H^{\theta_H - 1}} = \frac{p\beta_H}{\gamma\theta_H L_{AH}^{\theta_H - 1}} n_H^{\beta_H - \theta} \qquad (42)$$

$$L_{AH} = \left[\frac{p\ \beta_H}{\gamma\theta_H \rho} n_H^{\beta_H - \theta_H} \right]^{1/\theta_H - 1} \qquad (43)$$

Replacing with *(43)* in *(41)* we obtain *n*. Our procedure is the following. We start by one of the components of the denominator of *(41)*,

$$L_{AH} \frac{\beta_H}{\theta_H} = \left[\frac{p\beta_H}{\gamma\theta_H \rho} n_H^{\beta_H - \theta_H} \right]^{1/\theta_H - 1} \frac{\beta_H}{\theta_H} = \left[\frac{p^{1/\theta_H - 1}\ \beta_H^{1/\theta_H - 1}}{\gamma^{1/\theta_H - 1}\theta_H^{1/\theta_H - 1}\rho^{1/\theta_H - 1}} n_H^{(\beta_H - \theta_H)/(\theta_H - 1)} \right] \frac{\beta_H}{\theta_H} =$$

$$= \left[\frac{p^{1/\theta_H - 1}\ \beta_H^{\theta_H/\theta_H - 1}}{\gamma^{1/\theta_H - 1}\theta_H^{\theta_H/\theta_H - 1}\rho^{1/\theta_H - 1}} n^{(\beta_H - \theta_H)/(\theta_H - 1)} \right]$$

We give other steps in the denominator of *(41)*,

$$p\left[L_{AH} \frac{\beta_H}{\theta_H} \right] = \left[\frac{p^{\theta_H/\theta_H - 1}\ \beta^{\theta_H/\theta_H - 1}}{\gamma^{1/\theta_H - 1}\theta_H^{\theta_H/\theta_H - 1}\rho^{1/\theta_H - 1}} n^{(\beta_H - \theta_H)/(\theta_H - 1)} \right]$$

$$p(1 - L_{AH} \frac{\beta_H}{\theta_H}] = \ p - \left[\frac{p^{\theta_H/\theta_H - 1}\ \beta^{\theta_H/\theta_H - 1}}{\gamma^{1/\theta_H - 1}\theta_H^{\theta_H/\theta_H - 1}\rho^{1/\theta_H - 1}} n_H^{(\beta_H - \theta_H)/(\theta_H - 1)} \right]$$

Therefore, relation *(41)* can be expressed as,

$$n_H = \left[\frac{w}{p - \left[\frac{p^{\theta_H/\theta_H - 1}\ \beta^{\theta_H/\theta_H - 1}}{\gamma^{1/\theta_H - 1}\theta_H^{\theta_H/\theta_H - 1}\rho^{1/\theta_H - 1}} n_H^{(\beta_H - \theta_H)/(\theta_H - 1)} \right]} \right]^{1/\beta_H}$$

$$n_H^{\beta_H} = \left[\frac{w}{p - \left[\frac{p^{\theta_H/\theta_H - 1}\ \beta_H^{\theta_H/\theta_H - 1}}{\gamma^{1/\theta_H - 1}\theta_H^{\theta_H/\theta_H - 1}\rho^{1/\theta_H - 1}} n_H^{(\beta_H - \theta_H)/(\theta_H - 1)} \right]} \right]$$

$$n_H^{\beta_H} p - n_H^{\beta_H}\left[\frac{p^{\theta_H/\theta_H-1}\,\beta^{\theta_H/\theta_H-1}}{\gamma^{1/\theta_H-1}\,\theta_H^{\theta_H/\theta_H-1}\,\rho^{1/\theta_H-1}} n_H^{(\beta_H-\theta_H)/(\theta_H-1)}\right] = w$$

$$n_H^{\beta_H} p - \left[\frac{p^{\theta_H/\theta_H-1}\,\beta_H^{\theta_H/\theta_H-1}}{\gamma^{1/\theta_H-1}\,\theta_H^{\theta_H/\theta_H-1}\,\rho^{1/\theta_H-1}} n_H^{\theta_H(\beta_H-1)/\theta_H-1}\right] = w$$

$$n_H^{\beta_H} p - \left[\frac{p\,\beta_H}{\theta_H}\right]^{\theta_H/\theta_H-1}\left[\frac{1}{\gamma\rho}\right]^{1/\theta_H-1} n_H^{\theta_H(\beta_H-1)/\theta_H-1} = w \qquad (44)$$

We work analogously with n_L to obtain the following result:

$$n_L^{\beta_L} p - \left[\frac{p\,\beta_L}{\theta_L}\right]^{\theta_L/\theta_L-1}\left[\frac{1}{\gamma\rho}\right]^{1/\theta_L-1} n_L^{\theta_L(\beta_L-1)/\theta_L-1} = w \qquad (45)$$

We calculate n_H and n_L by Newton approximation.

3.5 Rest of variables

The deduction of the rest of the variables (N, A, L_M, K_M, M, q_H and q_L and Y) is immediate and we close the system estimating p from the following relation:

$$A_H + A_L + M = Y = w(L_{AH} + L_{AH} + L_M) + \rho K_M + q_H N_H + q_L N_L \qquad (46)$$

4. Selection of parameters and discussion of the results in our model

4.1 Parameters and discussion

We apply a numerical analysis to solve the model and to propose contrafactual exercises to contrast results. On the one hand, we suppose an economy similar to the Section 3 considering two production functions in the agriculture with different land elasticities: $\beta_H=0.8$ and $\beta_L=0.4$. The first elasticity coincides with the formulation used in our F-L Model and, the second one, is assumed inferior and equivalent to a half of the former. However, the elasticity of the low quality land results higher than the elasticity of the capital in manufacturing to denote the primary specialization of the economy. In addition, we consider different cost functions of clearing land with $\theta_H=1.4$ and $\theta_L=1.2$ because they assure us that land rentals of the better lands are higher than those of the worst lands. From equations *(23)* and *(25)* of Section 3 we know:

$$\frac{pa'(n_H)}{\phi'(N_H)} = \rho \quad \text{and} \quad \frac{pa'(n_L)}{\phi'(N_L)} = \rho$$

Where $pa'(n_H) = q_H$ and $pa'(n_L) = q_L$.

In accordance with *(36)*, $\phi'(N_H) = \gamma\theta_H N_H^{\theta_H-1}$ and $\phi'(N_L) = \gamma\theta_L N_L^{\theta_L-1}$

Then: $\frac{q_H}{\gamma\theta_H N_H^{\theta_H-1}} = \rho = \frac{q_L}{\gamma\theta_L N_L^{\theta_L-1}}$

We assume $q_H>q_L$ and $N_H>N_L$ and, as $N=N_L+N_H$, we can express $N=\lambda N_H+N_H$ with $0<\lambda<1$.

Therefore, $\gamma\theta_H N_H^{\theta_H-1} > \gamma\theta_L N_L^{\theta_L-1}$

$$\frac{\theta_H}{\theta_L} > \frac{N_L^{\theta_L-1}}{N_H^{\theta_H-1}}$$

Applying logarithms, $ln\ \theta_H - ln\ \theta_L > (\theta_L-1)\ ln(\lambda N_H) - (\theta_H-1)\ ln(N_H)$

As we consider $\theta_H > \theta_L > 1$ then,

$ln\ \theta_H - ln\ \theta_L > 0$ and $(\theta_L-1)\ ln(\lambda N_H) - (\theta_H-1)\ ln(N_H) < 0$

Therefore, we are sure that we obtain $q_H>q_L$.

On the other hand, we consider an economy with land homogeneity (types of land are identical) and we calibrate the model to obtain similar results –in terms of productive and labour structure– that our framework. For this, we consider $\beta_H=\beta_L=0.62$ and $\theta_H=\theta_L=1.4$.

Finally, we propose a third exercise to represents an economy with different types of lands, similar to former but with marginal changes. High quality land presents a higher input elasticity (0.808=0.8*1.01) and low quality land a lower β-coefficient (0.396=0.4*0.99). In addition, we adjust the coefficients of the clearing land frontier to reduce the gap between both types of land rentals and to put higher requirements to differences in land quality issue. We assume $\theta_H=1.287=1.3*0.99$ and $\theta_L=1.188=1.2*0.99$. [46]

As in Section 2, we compare the economic structures we calibrated with the historical estimates of GDP by sector (Bértola, 1998) and labour by activity (Bértola, 2005, and Maubrigades, 2001) (see Table A2.7). Our

Table A2.7
SOME ECONOMIC STRUCTURAL RELATIONSHIPS
Percentage in the total

	Observation (a)	Observation (b)	Economy 1	Economy 2	Economy 3
GDP					
Agriculture	65%		63%	63%	64%
Manufacturing	35%		37%	37%	36%
Labour					
Agriculture	69%	73%	76%	77%	75%
Manufacturing	31%	27%	24%	23%	25%

(a) Worked hours per day: 9 in both sectors.
(b) Worked hours per day: 10 in agriculture; 8 in manufacturing.
Economy 1: βh=0.8 βl=0.4; θh=1.4, θl=1.2.
Economy 2: βh=0.62 βl=0.62; θh=1.4, θl=1.4.
Economy 3: βh=0.8*1.01 βl=0.4*0.99; θh=1.3*0.99, θl=1.2*0.99.
Source: Bértola (1998, 2005); Maubrigades(2001); own estimates.

[46] The gap between θ-parameters is 0.2 for Economy 1 and 0.1 for Economy 3.

calibrations show a participation of 63-64 per cent and 36-37 per cent for Agriculture and Manufacturing, respectively. In all cases, the approximation to the observed values is even better than the F-L Model. Analogously, in the labour structures that was obtained the participations of the agrarian and manufacturing are around 76 and 24 per cent, respectively (values close to those obtained for F-L Model). As in that case, considering the simplicity of our model and the type of the data, we believe that the results are satisfactory.

4.2 Results of the simulation exercises

Table A2.8
VALUES OF THE VARIABLES OF THE MODEL
Simulation of a marginal increasing in $p=P_A/P_M$

PRODUCTIVE FACTORS				GROWTH AND STRUCTURE				INCOME DISTRIBUTION				PRICES			
Economies	(1)	(2)	(3)		(1)	(2)	(3)		(1)	(2)	(3)		(1)	(2)	(3)
Nh0 =	0.728	0.471	0.835	Ah0=	0.629	0.442	0.701	RW0 =	0.677	0.596	0.741	qh0 =	0.617	0.518	0.611
Nh1 =	0.748	0.488	0.864	Ah1=	0.665	0.472	0.744	RW1 =	0.721	0.635	0.792	qh1 =	0.623	0.525	0.617
Nh2 =	0.769	0.505	0.893	Ah2=	0.704	0.504	0.790	RW2 =	0.768	0.675	0.846	qh2 =	0.630	0.533	0.623
Nl0 =	0.233	0.471	0.215	Al0=	0.293	0.442	0.268	RP0 =	7.037	6.633	7.528	ql0 =	0.449	0.518	0.445
Nl1 =	0.255	0.488	0.237	Al1=	0.333	0.472	0.305	RP1 =	8.852	8.110	9.457	ql1 =	0.457	0.525	0.453
Nl2 =	0.278	0.505	0.259	Al2=	0.375	0.504	0.346	RP2 =	11.542	10.153	12.278	ql2 =	0.464	0.533	0.461
Km0 =	1.573	1.471	1.611	M0 =	0.528	0.495	0.536	WY0 =	0.564	0.593	0.544	w0 =	0.545	0.545	0.545
Km1 =	1.317	1.265	1.354	M1 =	0.459	0.441	0.467	WY1 =	0.555	0.584	0.533	w1 =	0.539	0.539	0.539
Km2 =	1.062	1.061	1.100	M2 =	0.385	0.383	0.393	WY2 =	0.545	0.574	0.522	w2 =	0.532	0.532	0.532
Lah0 =	0.648	0.548	0.671	Y0 =	1.451	1.380	1.505	RY0 =	0.382	0.354	0.403				
Lah1 =	0.669	0.574	0.692	Y1 =	1.457	1.385	1.516	RY1 =	0.400	0.371	0.422				
Lah2 =	0.689	0.601	0.714	Y2 =	1.465	1.390	1.529	RY2 =	0.419	0.387	0.442				
Lal0 =	0.419	0.548	0.386	AhY0	0.434	0.321	0.466	PY0 =	0.054	0.053	0.054				
Lal1 =	0.465	0.574	0.431	AhY1	0.457	0.341	0.491	PY1 =	0.045	0.046	0.045				
Lal2 =	0.511	0.601	0.476	AhY2	0.481	0.362	0.517	PY2 =	0.036	0.038	0.036				
Lm0 =	0.433	0.405	0.443	AlY0	0.202	0.321	0.178								
Lm1 =	0.367	0.352	0.377	AlY1	0.228	0.341	0.201								
Lm2 =	0.299	0.299	0.310	AlY2	0.256	0.362	0.226								
nh0 =	1.124	0.860	1.246	MY0	0.364	0.359	0.356								
nh1 =	1.119	0.850	1.248	MY1	0.315	0.318	0.308								
nh2 =	1.115	0.842	1.251	MY2	0.263	0.275	0.257								
nl0 =	0.557	0.860	0.557												
nl1 =	0.549	0.850	0.550												
nl2 =	0.543	0.842	0.543												
k0 =	3.636	3.636	3.637												
k1 =	3.593	3.592	3.592												
k2 =	3.548	3.548	3.548												

Economy 1: β_h=0.8 β_l=0.4; θ_h=1.4, θ_l=1.2.

Economy 2: β_h=0.62 β_l=0.62; θ_h=1.4, θ_l=1.4.

Economy 3: β_h=0.8*1.01 β_l=0.4*0.99; θ_h=1.3*0.99, θ_l=1.2*0.99.

Source: own estimates.

Chapter 3

Land frontier expansion: concepts and measures applied to settler economies in historical perspective (1850-1920)

In Chapter 2 we proposed a supplementary model to the Heckscher-Ohlin framework in order to explain the performance of recent settlement economies during the First Globalization. We constructed a model of specific factors to stress the importance of domestic conditions in countries exposed to the effects of the First Globalization up to WWI. In this context, the role of land frontier expansion becomes a central aspect in explaining how that globalization affected the economic performance of the Atlantic economy. The availability of land resources was the main comparative advantage that enabled these economies to participate in international markets. In order to better understand this process, we made modifications to the model to incorporate differing land quality. Our main contributions were in three important areas. First, an abundance of natural resources in countries exposed to the dynamics of the First Globalization was a mix of blessing and curse and its consequences differed in intensity depending on the quality of the natural endowments and the interaction with the institutional quality. Second, endogenous land frontier expansion shaped the dynamics of the process as it combined the effects of specific historical circumstances with the consequences of the formation of world markets. Third, our hypothesis is that in settler countries where the high quality land was occupied more intensively, the worsening in income distribution was exacerbated but with increased levels of income and agrarian production. This would be the result of greater differences in relative factor remuneration in favour of landowners (rentists) and to the detriment of workers and capitalists. However, this process interacted with the formation of institutions related to land –specific land ownership rights and the role of the national authorities– that, depending on their quality, they moderated or strengthened the curse and the blessing.

In our approach the expansion of the land frontier is one of the central themes. We need to make this notion operational if we are to test our hypothesis empirically. Therefore the first stage of our empirical strategy –and the aim of this chapter– is to identify different settlement patterns in the settler economies to evaluate the likelihood of our proposition. Initially, in Section 1, we present the concept of land frontier expansion and review the recent theoretical and empirical studies. In Section 2, we discuss the ways land frontier expansion can be measured, we consider recent efforts at quantification, and we examine the main shortcomings of these approaches. In Section 3, we present our quantification proposal based on the use of Georeferenced Information Systems (GIS). In this section, we explain how we can avoid the limitations of the previous approaches by considering different land aptitudes of potential vegetation and distances from “centres of gravity”.

We present our results for land frontier expansion in terms of land aptitude and an illustration –as a first approach to the question– of the consequences of the introduction of distances into the estimates (in the case of Argentina) in Section 4. Finally, in Section 5, we draw conclusions.

The trajectories of the different countries in our club were not homogenous and, when these countries faced the effects of the First Globalization, we can identify two patterns based on their dynamics of settlement. In the River Plate (Argentina and Uruguay) land frontier expansion was dominated throughout the period by land of high and medium aptitude, and this was also the pattern in Chile starting in the 1880s. On the other hand, land expansion in Australia and Canada moved to a different rhythm and characteristics. In Australia land expansion came before the First Globalization boom (1850s and 1860s) and it was dominated by low quality lands. In Canada, the expansion only became intensive at the end of the century and, in addition, the three types of land were equally important; medium and low quality land also made significant contributions. New Zealand showed features of both patterns. Like in Australia, land frontier expansion became more dynamic before the price boom, but the effect of high quality land was very important to explain. However, like in Canada, all three land types made their contribution to expansion.

1. Is land frontier expansion a classical concept that has come back?

The most famous study of the importance of frontier expansion for economic development was that of Frederick Jackson Turner, in the Annual Report of the American Historical Association of 1893, where he postulated what is known as the "Turner thesis". This is the notion that the frontier attracted a particular type of person, and this was crucial in determining the development path of US society and in explaining why that country was and is so exceptional. The frontier promoted individualism, social mobility, economic equality and freedom, and it was decisive to the development of democratic institutions in a process of "perennial rebirth".

Turner's frontier thesis enjoyed considerable popularity in the early 20th century. The "notion of an aggressive pioneering national spirit nurtured by repeated exposure to primitive conditions became a means to national self-glorification" (Hofstadter, 1970:23; quoted in Furniss, 2006:26) and to a large extent this idea explains why, in a lot of the literature, the concept is given the adjective "myth". Beginning in the 1920s, this thesis came in for a wide range of remarkable empirical and theoretical criticisms like the fact that its overemphasis on a single determinant influence in the frontier environment meant ignoring other forces such as the class struggle, urbanization, religion, gender, ethnic heterogeneity, slavery and the growth of international capitalism (Furniss, 2006). However, and probably due to the connection between the "Frontier Thesis" and American nationalism, Turner's ideas remained influential in economic, political and

social thought for decades.[47] It was not until the 1960s and 1970s that academic interest in the frontier revived and in the 1980s a new approach emerged to definitively challenge Turner's framework: this took the form of "New Western History". In this new perspective the environment was seen not as a barrier to expansion but a factor that changed with human interaction. Many participants in the debate have even rejected the use of the term "frontier" because of its nationalist, racist and ethnocentric connotations. However, not all reactions were so extreme and some academics re-introduced the term into the analysis and defined the frontier as an area of cultural interaction. Similarly, Slotkin (1985, 1992) turned around the idea of the frontier myth as a narrative marked by the boundaries and the encounter of opposites (civilization and savagery, man and nature, good and evil). These encounters were described in terms of conflict and violence, and eventually resolved through domination and conquest (the supposed subordination of indigenous peoples, nature and evil by the forces of progress, civilization and God). These ideas have constituted a fruitful line of research and have been applied in other regions in North America and in Australasia, South Africa, and Latin America (Hartz, 1964; Winks, 1971). This evolution in thinking about this subject reflects some of the changes and paths the history of the American West has undergone.

According to Burt (1965), if Turner had looked north when he wrote about the mass movement to the West, he might have discovered surprising evidence for his thesis in New France as "the westward movement was North American, not just American in the narrow sense of the word" (Mikesell, 1960:68). In any case, Turner's thesis remained of great interest throughout the first half of the 20th century. In the 1920s and 1930s, the "Frontier Thesis" was popular in Canadian historiography as an explanation of the country's development and to find parallels between the two North American "Wests". However, historians studying the Canadian West began to see more differences than similarities. Much of the credit for long-lasting interpretations of Canadian development belongs to Harold Innis, who suggested that the economic development of Canada should be approached from the standpoint of trade and staple production. This analytical line was identified with the "Laurentian School": it was a framework that emphasized the history of transport and the importance of urban development in Canadian history ("Metropolitan School"). In the second half of the 20th century academics have acknowledged the power of the mythic West and its imagery. Some embrace it and others attack it, but the thesis has remained part of the interpretation of national development. In the literature some authors take note of the interlocking nature of American and Canadian westward expansion (Burt, 1965) while others play down the similarities (Sharp, 1955) and identify "several wests" in the overall expansion (Winks, 1971). The

[47] The slogan that defined the themes of the political campaign of the American Democratic Party presidential candidate at the beginning of 1960, John F. Kennedy, was precisely "the New Frontier" (Slotkin, 1992).

historiography has been extensive and varied (Cross, 1970), and in recent years subjects related to the imaginary (Francis, 1992) and cultural issues have emerged (for a recent discussion, see Higham &Thacker, 2006). The long tradition of frontier studies in North America has comparable developments in other parts of the world.

The frontier is one of the most pervasive and evocative image underlying the creation of a national identity in Australia. Probably, the most influential interpretation of the Turner view in the Australian context was that in Russel Ward's 1958 study, *The Australian Legend*, although previous contributions (Alexander, 1947[48]; Sharp, 1955) of a Turner type had employed similar concepts and reached pessimistic conclusions about the supposed imperial utopia (Davis, 2006). Contemporary studies of the frontier follow one of two lines. On the one hand, there are interpretations of Turner's ideas, including considerations of several frontiers (Winks, 1971, 1981), in which New Zealand appears as a part of the process with particular characteristics (Coleman, 1958) and they recognize a lasting impact on national identity in remote regions such as the Northern Territory (Loveday, 1991). On the other hand, a variety of approaches have been introduced in the literature in which the frontier is considered as a discursive trope that settler society produces to reinforce the formation of civil society and cultural hegemony. In this conceptualization, a central point is the extent to which the nation-state "Australia" was founded on the violence and depredations of encounters in colonial times (Reynolds, 1987, 2003).

Like North America, many parts of Latin America were conquered and settled by Europeans in a process that seems, at least on the surface, to be similar to what happened on the Anglo-American frontier. However, except for Brazil and Argentina, Latin American academics have seldom seen the frontiers as important factors in the formation of national institutions and identities (Weber & Rausch, 1994). Various authors in the early 20th century argued that the shortage of "free land" –which causes the rigidity of social systems in Hispanic America (Belaúnde, 1923)– and the use of different institutions to deal with labour (such as missions and *encomiendas*) (Bolton, 1917) make it difficult to apply the thesis. Apart from some exceptions –like Aiton (1940), and Clementi (1986-1988)[49] – most Latin American historians consider their frontiers are unsuitable for a Turner-type analysis and seldom refer to Turner when they write about the frontier.

> "Few influential Latin Americans regarded their frontiers as places of regeneration that went through a temporary 'return to primitive conditions' as they gave birth to individual liberty. Instead, most nineteenth century Latin American urbanites and

[48] It is quoted in Davis (2006).
[49] It is quoted in Weber & Rausch (1994): xvii, xxxv.

> intellectuals saw their frontiers as violent, brutal places that engendered despotism rather than democracy" (Weber & Rausch, 1994: xviii).

Like in the literature about British Empire frontiers, notions in Latin America have changed progressively and the view emerged that it was not simply the physical environment that determined the impact of the frontiers on people, but the values that people brought to the physical environment. Hispanic colonizers wanted to incorporate those indigenous cultures into their own society, which is another reason why Latin American frontiers differed from those in North America (Zavala, 1965). One of the more obvious consequences of this different "attitude" was *"mestizaje"* (racial mixture), a trans-culturation process that introduced distinctive characteristics not present in North America. According to Mikesell (1960), the Latin American "frontier of inclusion" contrasted sharply with the Anglo-American "frontier of exclusion". This pattern changed in the 19th century when the Latin American countries achieved political independence and needed to define political boundaries with active settlement that legitimated the new states. Transatlantic migrants were arriving in search of a new livelihood, and the as yet unused land could be exploited economically to feed the industrial populations of Europe.

The most important of these movements,

> "… was the wave of settlement which spread from the estuary of La Plata northward across Uruguay and westward across Argentina. This occupation of arable and grazing lands, previously the habitat of hunting Indians, by immigrants from Southern Europe; the construction of a railway network … and the growth of the great cities of Buenos Aires, Rosario and Montevideo, are all in the classical tradition of the North America frontier". Besides, "other neglected lands ranging from the arid *pampa* of Atacama to the rain-drenched forest south of Chile's Bío-Bío river attracted attention" (Butland, 1966: 94).

In the Atacama, the focus was a long-established form of mining, and in the forest there was a central European pattern of farming "cut-over" land that was slowly won from the *Araucanians*. At the same time, profits to be made from sub-Antarctic pastoralism stimulated European penetration of the cold lands of Tierra del Fuego, and similarly, irrigation in agriculture brought about a more intensive settlement pattern from the Río Negro through the Andean oases of Mendoza and Tucumán (Butland, 1966: 94).

In the 1970s the notion of the frontier became less dominant (at least in its classical sense) and this opened the way for other conceptual frameworks to provide analytical support for the study of settler economies. In the recent literature about the expansion of the Atlantic economy during the 19th century and the first decades of the 20th century, the Stolper-Samuelson theorem from the

Heckscher-Ohlin trade theory is used to explain the performance of the New World (for a review see Chapter 1).

The 1870-1913 period was a real "golden age" for the settler economies. This expansion can be traced to the Industrial Revolution, a process that started in Britain in the second half of the 18th century and in subsequent decades spread to other European countries, transmitting technological growth impulses from the core to peripheral regions. The formation of world commodity markets, mass migration and capital flows combined to make up one of the most important processes in the world economy in the last two centuries. Recent studies by Lindert, O'Rourke, Taylor and Williamson on globalization, growth, and inequality have opened up a fruitful line of research and generated a debate about subjects that are very important to a better understanding of the expansion of the Atlantic economy during the period (see Chapter 2).

In every case the stimulus to development came from expanding markets in the world economy –usually expressed as rising prices– that led to an extension of the internal land frontier accompanied by considerable inflows of capital and immigrant labour (not only from outside the country but also from other regions within its political borders). The new sectors or activities that came into being were related to the production of primary exports, this generated additional demand for capital, labour and raw materials, and this demand was met partly from foreign sources. Therefore the international and inter-regional mobility of factors were part of the story. The expansion of the frontier has played a secondary role in the modern historical analysis of settler economies, in spite of the fact that the main "domestic contribution" to economic growth was precisely the incorporation of "new" land into production. Only recently have academics seriously returned to the notion of frontier expansion.

Arroyo Abad (2008) gives us a comparative view of some Latin American economies (Argentina, Mexico, Venezuela and Uruguay) during the 19th century and presents a theoretical framework that connects up the effects on inequality of factor endowments and trade. This article includes an analysis of the effect on income distribution of labour movement, changing terms of trade and land expansion. Inequality depends critically on the relative scarcity of productive factors and the distribution of their ownership. Land was not a fixed factor in these economies; at that time, large areas were incorporated into production and this enabled the settler economies to actively participate in international primary commodity markets. However, as populations grew, land became relatively less abundant and inequality increased. Findlay & Lundahl (1994, 2001) and Findlay (1995) present a model that captures the structural pattern of the process with a combination of the "vent-for-surplus" and "staples" theories, and regard the endogenous land frontier as a main factor. In this conceptual framework, land frontier expansion is taken as the

pivotal concept in an analysis of changes in relative prices, inflows of labour and capital, structural change and movements in income distribution. Neither of these analytical approaches is critical of the "mainstream" framework and they can be considered supplementary visions to the general view (in the tradition of the H-O-S model) of the First Globalization and the development of the Atlantic economy. However, there have been other approaches that are more critical.

In a recent article, Knick Harley argues that applying the H-O-S approach means we should consider price convergence as a pivotal concept in the definition, identification and measurement of globalization. But, as globalization can be "defined as a shift from an economy where local supply and demand fluctuations dominated price fluctuations to one in which the economy became a price-taker to global forces […] it need not depend on price convergence" (Harley, 2007:240-241). When we see 19th century globalization as a process in which peripheral economies were incorporated into the core of organized economic activity, we can consider their learning how to best exploit their natural resources, their mobilization of capital and labour for production, their use and distribution, and the setting up of new institutional arrangements in other terms. Bértola et al. (2010) propose a framework compatible with this vision to explain the evolution of inequality in the South American Southern Cone (Argentina, Chile, Brazil and Uruguay) during the First Globalization. According to this analysis, the effect of globalization on inequality depended on the expansion of the frontier and on institutions persisting from colonial times, and this changed in old and new areas.[50] Lastly, in a recent working paper, Camilo García-Jimeno and James Robinson show renewed interest in the frontier. They analyze the classical "Frontier (or Turner) Thesis" for North, Central and South America from the mid-19th century to 2007. In this approach, the consequences of the existence of a frontier depend on the nature of the political institutions which came into being in the early independence period. When institutions placed few constraints on the executive, having a frontier was bad for development in terms of economic growth, income distribution and democracy.

From these perspectives, the focus on frontiers –that is, the incorporation of regions that originally were scarcely occupied and outside European economic influence– adds another viewpoint to the mainstream approach and helps to explain new questions in this field. Land frontier expansion is a pivotal concept that makes it possible to connect considerations about technological progress and institutional configuration in a different way. This concept is based on endogenous growth in the use of the productive factors, and it can include regional (and local) perspectives. Our application of land frontier expansion is only instrumental (it has to do with the expansion of natural resource exploitation) and it does not attempt to explain or conceptualize the process in terms of Turner's conceptual framework. According to Furniss (2006), the frontier is a

[50] Rodríguez Weber (2009) proposes an argument in the same conceptual line.

concept that has been used in two quite distinct senses. On the one hand, it is used as a descriptive/analytical term to describe a presumably empirical reality. On the other hand, it represents a social construction and it is confined to cultural ideas in colonial societies or, to put it another way, it is an ethnographic construct. The option we choose is closer to the first position in which the notion of a frontier has an instrumental character, considering analytical questions in specific theoretical frameworks related to the *blessing* and the *curse* of natural resources.

2. Measuring land frontier expansion

The literature about the frontier has been rather imprecise as to how the concept can be defined. It is hard to think of the frontier as a dichotomous condition because usually the boundaries are not clear-cut. In historical analysis, the "obvious" conditions to define a frontier are the presence of native communities not subject to state control, the absence of significant numbers of settlers and the inexistence of state institutions. However, in much of the literature the conceptualization of the frontier does not go beyond interesting (and intuitive) discourse, and there have been very few efforts to quantify the process. [51] In this section we comment on some of these efforts and propose a new approach to represent the concept and apply it for the purposes of analysis.

2.1 Recent quantification efforts

In the H-O-S framework approach, land frontier expansion is a concept introduced to consider changes in factor endowments, and the expansion itself is represented by the land/labour ratio.

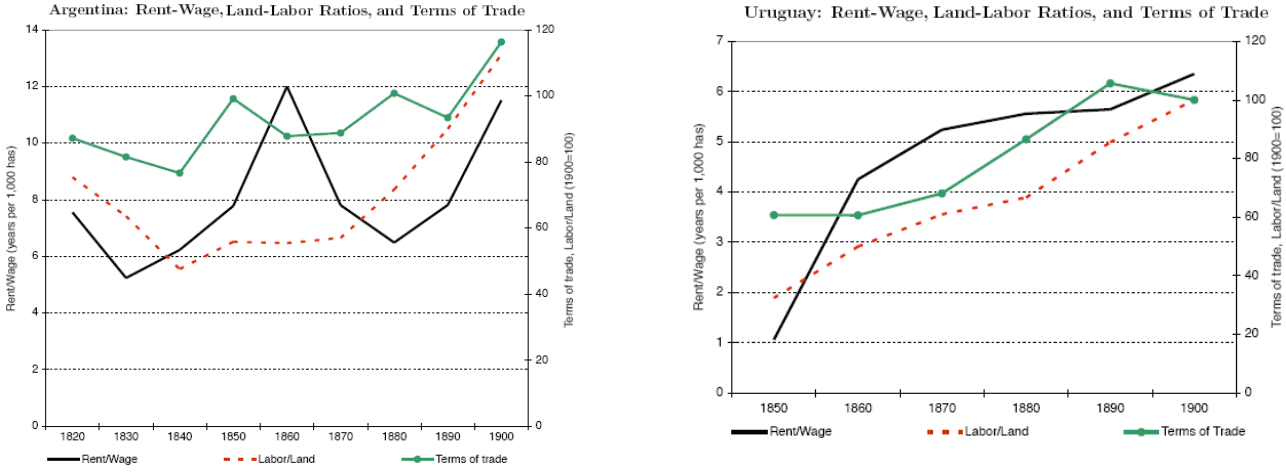
> "The land-labour ratio may decline in the long run as positive Malthusian forces associated with labour scarcity encourage early marriage, high fertility in marriage, and high child survival rates. Labour scarcity may also encourage across-border migration and thus an even greater and quicker decline in the land/labour ratio. Alternatively, high and rising wage-rental ratios may foster land settlement, a frontier experience that has received considerable theoretical and empirical attention in the literature." (Williamson, 2002:77).

Probably, this "considerable theoretical and empirical attention" that Williamson mentions refers to the literature that we previously reviewed but we consider –as do other scholars– that the "frontier experience" is a concept that offers new insights into the issue. Various studies in this line of thought have included, where possible, both arable and pasture land so as to measure the process of the expansion of occupied land against labour.

[51] Even Turner was never very precise in his statistical or demographic definitions of the frontier. At one time the concept meant quite literally the region which lay beyond a continuous line which might be drawn down the map of America from north to south. At other times it is represented by the same line but it is accepted that there are pockets of settlement beyond that fringe. And at other times the notion of a line is abandoned, and cultural, economic or social criteria are introduced (Winks, 1971).

Arroyo Abad (2008) takes this working line and introduces additional questions. She provides a brief analysis of land frontier expansion considering the institutional and political conditions that characterized the incorporation of new land into production. In general, she refers to the percentage of arable land transferred to private ownership when she considers land indicators. Empirically, her paper concentrates on simulation exercises, and to evaluate the impact of a fixed supply of land she assumes that no land expansion occurred after 1850. Therefore, land became progressively scarcer over the century, which made for unfavourable conditions for labour and a worsening in income distribution. Her evidence for Argentina and Uruguay is given in Figure 3.1.

Figure 3.1 (a: Argentina; b: Uruguay)
LABOUR/LAND RATIOS: ARGENTINA AND URUGUAY (1820-1900)



Source: extracted from Arroyo Abad (2008): v-vi.

In both cases the evolution of the labour/land ratio goes up in the long run although with different trajectories. In Uruguay there was a rising trend, which would be consistent with a small territory and easy access to the different regions (Figure 3.1.b). In Argentina the trend was a decrease until the 1840s –according to this analysis, land frontier expansion only occurred up to the mid-19th century– and afterwards there were two periods with different intensity: from the 1840s to the 1870s the indicator shows moderate growth, and this accelerates until the end of the century (in the period of high immigration) (Figure 3.1.a).

García-Jimeno & Robinson (2009) study the effects of the frontier on economic development but choose a different strategy. They estimate the proportion of land which was frontier (non-occupied territory) in each independent country in the Americas in 1850. In their empirical work they use historical data about income per capita, democracy and inequality. They classify land with less than 2 people per square mile (0.7722 people per square kilometre) as frontier land (open frontier). They work with various historical atlases of the regions and use Georeferenced Information Systems (GIS) to measure the area occupied. The threshold of "2 people per square mile" was employed by the US Census Bureau and was the criterion used by the US office that declared the country had a

closed frontier in 1890. Therefore, the authors use the following index for the frontier:

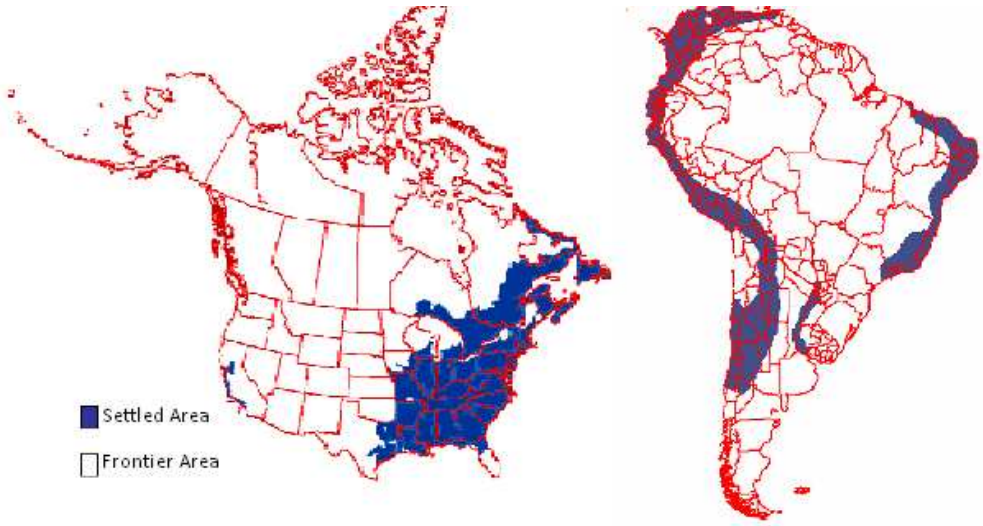
$$F_{i\,1850} = 1 - [OA_{i\,1850} / TA_{i\,current}] \qquad (1)$$

Where:

$OA_{i,\,1850}$: is the occupied area (in some surface measure such as square kilometres or square miles) of country *i* in *1850* (or any year around that time). Land is considered occupied when the population density is greater than 2 people per square mile.

$TA_{i\,current}$: is the total area of country *i*, current data.

Figure 3.2
THE FRONTIER IN NORTH AMERICA AND SOUTH AMERICA CIRCA 1850



Source: García-Jimeno & Robinson (2009): 28-29.

The estimates are mapped on a continental scale (we reproduce the North and South America maps in Figure 3.2) and the results are 72.5 per cent for the US and 85.3 per cent for Canada. Three calculations are proposed for the South and Central American countries: a narrow criterion, a wide criterion and a third source. In the wide criterion, the estimate is 74.2 per cent for Argentina, 52.7 per cent for Chile and 100 per cent for Uruguay.

2.2 Some observations and shortcomings

The two types of indicator are different proxies to the evolution of relative endowments. Williamson's indicators emphasize the flow dimension of the process and García Jimeno-Robinson's approach concentrates on the stock dimension. The former type is more appropriate to dynamic analyses but hide differences in the relative factor levels. The latter type are more useful for comparing endowment levels but have the disadvantage of being a static approach, which undermines the analytical power of the argument. In the neoclassical vision, the expansion of the frontier is important when it comes to conceptualizing movements in factor endowments, but beyond these considerations it is of only secondary interest. García Jimeno-Robinson's approach

focuses on the concept, and they propose a specific measurement using a new tool to study land frontier from a historical perspective. The connection between the expansion of the land frontier and settlement by colonizers is conceptually (and intuitively) correct and we follow the same strategy, but we have four observations to make about this.

First, and independently on the specific question we are dealing with, the choice of a threshold is always arbitrary and can always be disputed. This objection is not against the value adopted (2 persons per square mile) but against the rigidity that this involves. We might consider several different thresholds to present land frontier expansion "levels", and thus to open subsequently the possibility of incorporating the creation of markets and the economies of agglomeration more actively into the analysis. Second, the focus on just one period means we lose the dynamics of the process. The expansion of the land frontier is a concept in which movement is a fundamental dimension. By comparing different points in time we will be able to consider different "shapes" of how occupied land expanded, and capture the possibility that non-frontier land might revert to being frontier again. Third, the use of today's administrative divisions (national borders and internal boundaries) means not incorporating the formation of institutional arrangements at different times in history and therefore reduces the notion of "economic space" to "administrative space". Finally, the strategy of taking all of a country's national territory as a reference for "maximum frontier" is questionable.[52] On the theoretical level we might assume that all the land in a country can be occupied and exploited, but on the historical level it is arguable that for institutional and technical reasons there were regions of the country that were not accessible. We discuss these arguments and present alternatives to suggest ways to circumvent these limitations.

3. A proposal for approaching land frontier expansion

The starting point is to know how many inhabitants were settled in an area, because we are interested in the incorporation of land into market production and the consequent growing participation of settlers in international markets. We assume that the presence of a relatively high level of population is the best proxy for land incorporated into economic activity. Another approach would be to consider the setting up of institutions that establish property rights and state control over these regions.[53] In this Chapter our emphasis is on the first notion to stress the productive conditions of expansion of land for production. We focus on the institutional question in Chapter 5.

3.1 How can we solve the shortcomings of the previous approach?

Initially, we pay attention to three first shortcomings. First, it is possible to work with several levels of frontier expansion using different thresholds and accepting that the concentration of people

[52] It is even controversial to argue about the idea of a "national" territory in the Latin American countries in 1850.
[53] However, this would mean assuming that the native people's rights would not be valid.

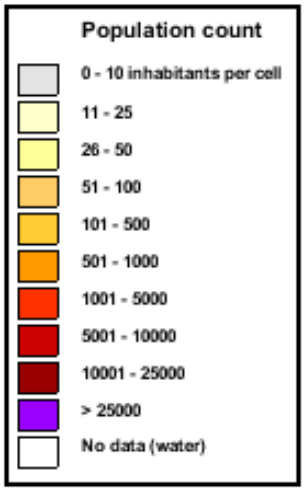
can "shape" land frontier expansion. It is clear from demographic studies that expansion was not always a continuous outward movement from established nuclei. What is more, difficult land such as marshes, mountains, forests and deserts meant there were gaps and "population islands" were formed in the settlement process. We work with four levels; we start our analysis with the standard threshold of 0.7722 inhabitants per km^2 ("medium"), then we divide this value by two ("lower"), double this value ("upper"), and finally we do not use any threshold and we consider only land "without" people as frontier. Thus we propose as thresholds progressively more rigorous criteria to identify regions in transition. Second, we construct our indicator for 10-year periods between 1850 and 1920 to overcome the static perspective of the previous approach. Third, primary sources of the data consider today's local administrative divisions as a reference framework, but the use of different measures of population density makes it possible to "paint the map" (to identify different regions in the territory) independently on local jurisdictions.

We illustrate our approach with a series of maps (Figure 3.3) showing the evolution of population counts in three large regions (Oceania, North America and the Southern Cone of South America) for six benchmark years (every 20 years from 1830 to 1930) and with ten ratings, from 0-10 inhabitants to more than 25,000 per cell (Figure 3.3.a). Georeferenced information represents data referred to spatial localization of the values of variables in cells of 69.4 km^2. [54]

The aim of this exercise is to identify periods in which the process of land frontier expansion was more intense and to capture the dynamic in different regions. In general, the evidence shows that the location of new economic activities and the movement and settlement of population was an intense process in the settler countries at the turn of the century, but it became exhausted before the 1930s and the evolution within the club was not homogenous.

Figure 3.3: POPULATION COUNT

Figure 3.3.a. References



[54] See an explanation of the Georeferenced Information Systems and the application to our issue in Appendix to Chapter 3.

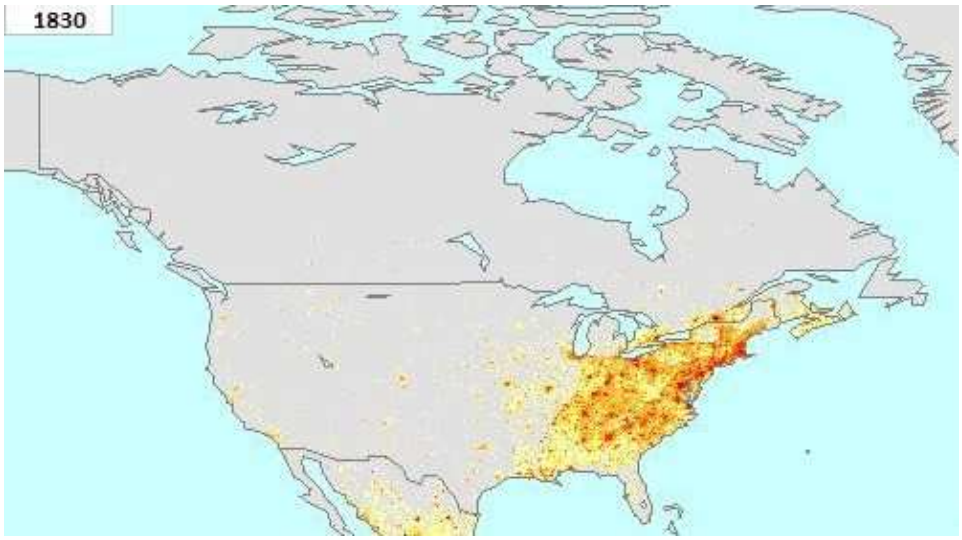
Figure 3.3.b. Oceania: Australia and New Zealand

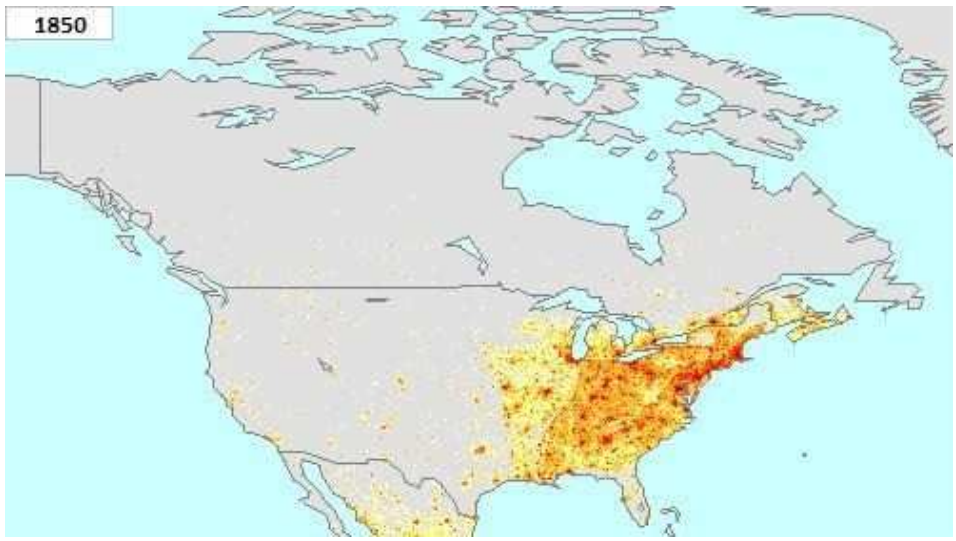

1890

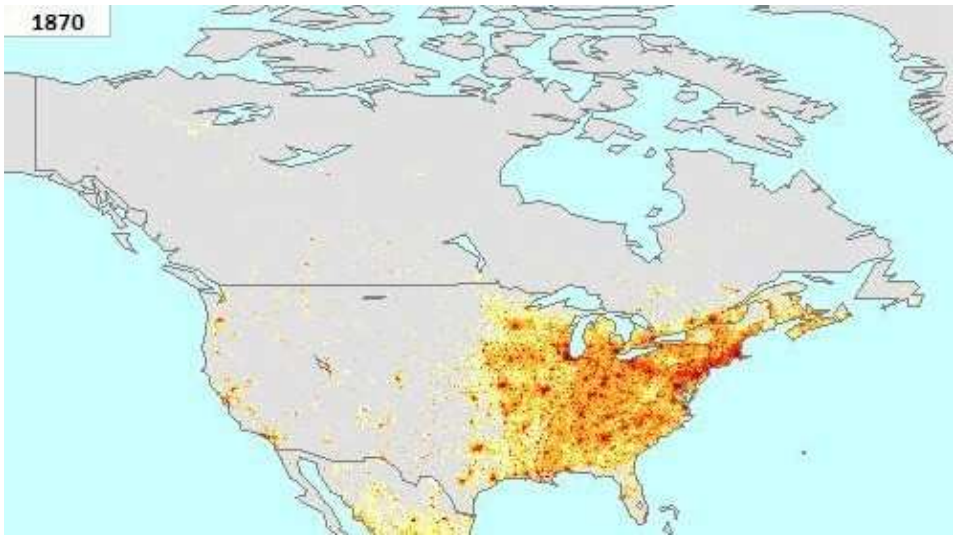

1910

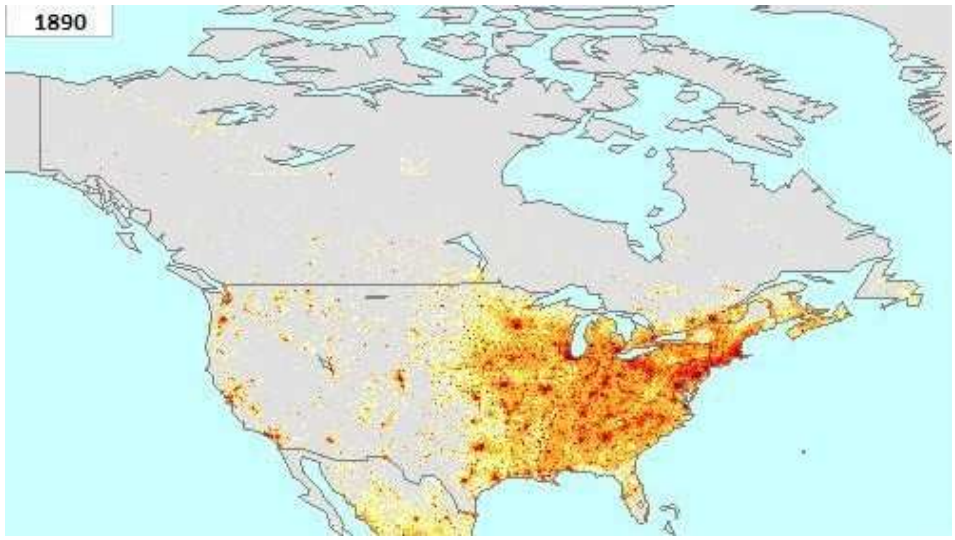

1930

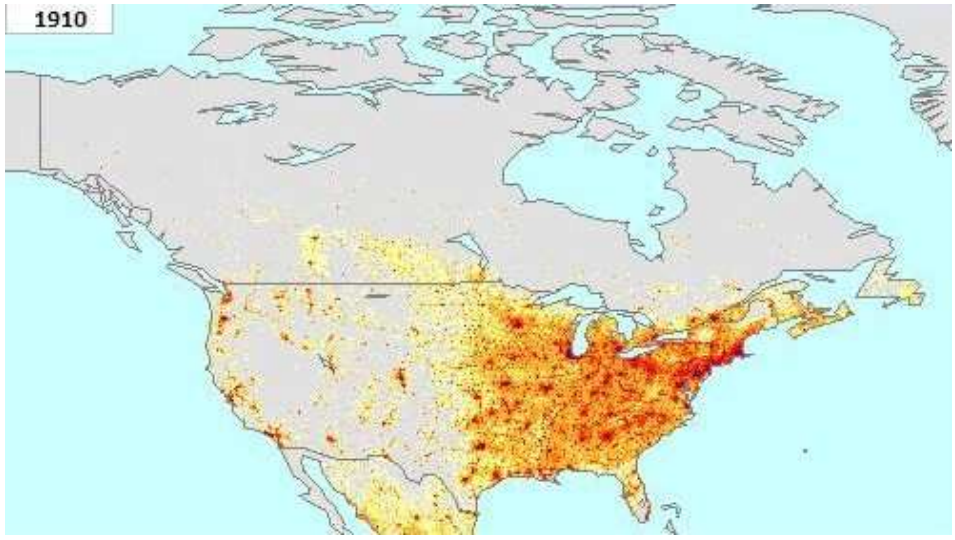
Figure 3.3.c. North America: Canada and US








1890


1910

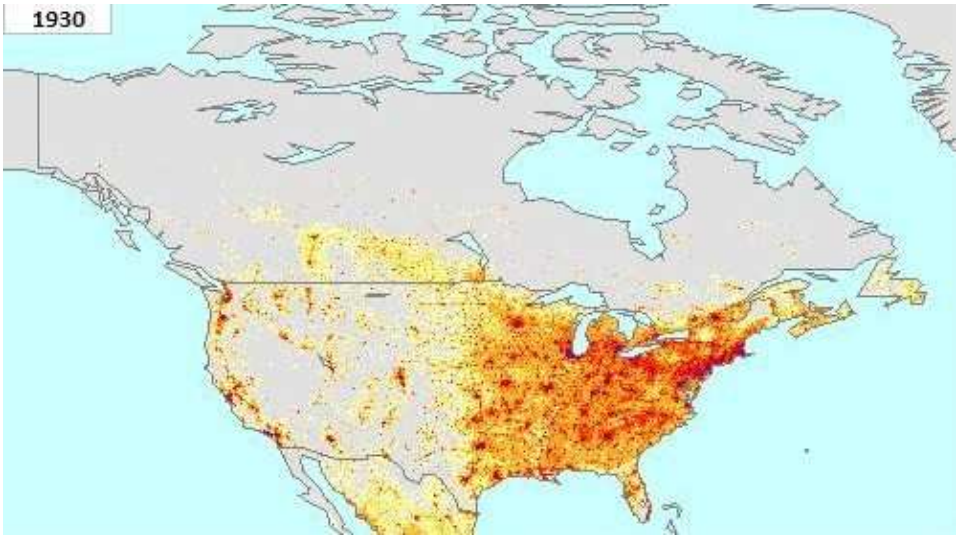
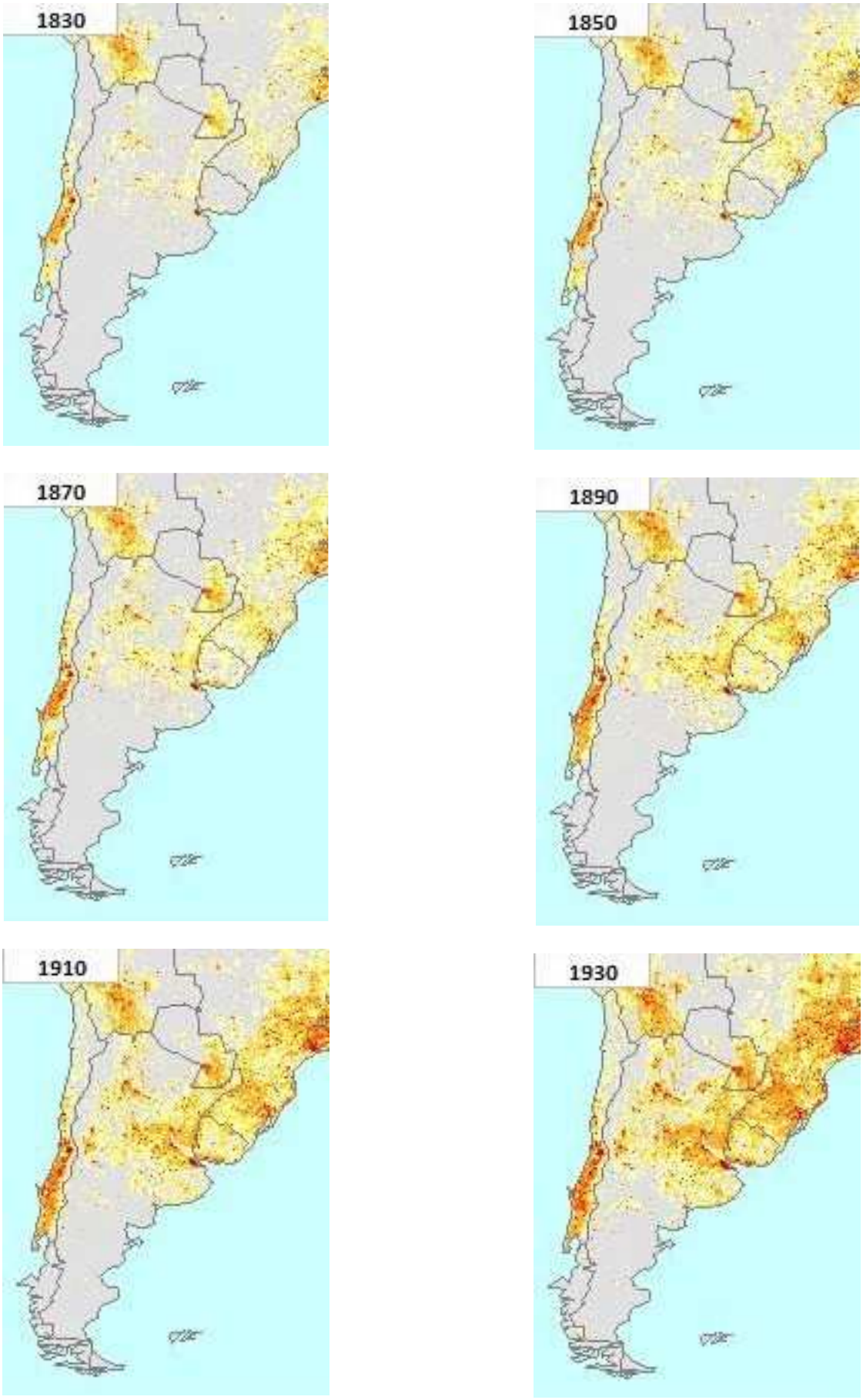

1930

Figure 3.3.d. Southern Cone: Argentina, Chile and Uruguay



Source: Netherlands Environmental Assessment Agency.

Initially Australia's population was located in coastal areas with rural settlements around the wet periphery of the continent, and this was the forerunner of the type of occupation that subsequently occurred in the semi-arid interior (a similar characterization can be found in Williams, 1975: 65-66). The south-eastern (Victoria and Tasmania) and north-eastern (New South Wales and Queensland) regions were the first to be occupied and population density was increasing, and it was not until the end of the century that people began moving into the south-west of the country (Western Australia, around Perth). Historically South Australia and the Northern Territory have the characteristics of an open frontier and the advance of the settlers on territory was disperse and less intense. In New Zealand in the period 1840 to 1860, settlers firmly established themselves in a number of areas scattered across both islands. The main initial colonization took place in the areas of Auckland, Bay of Islands, Plymouth, Wanaque and Wellington in North Island, and Nelson, Christchurch and Dunedin in South Island (McKinnon, 1997). The area around Auckland, where the colony's seat of the government was located, was the biggest centre of settlement, and most of the population was in North Island (75 per cent). The settlement of South Island, with its rugged terrain and extreme climate, was somewhat delayed (Figure 3.3.b). However, the form that expansion took changed quickly –particularly with the gold rushes of the 1850s-1860s–, and in 1874 more than half the population (55 per cent)[55] was in South Island.

Canada was an immense territory and the early colonizers settled in the east. It was not until the last decade of the 19th century that the fertile central prairies were occupied, a process that was made possible by the coming of the transcontinental railways (Figure 3.3.c).

In the Southern Cone of South America the expansion of the frontier around the River Plate followed more or less the same pattern in Uruguay, the Argentinean provinces of Buenos Aires (around the port), La Pampa and Córdoba (in the west-centre), Santa Fe and Entre Ríos (on the Littoral) and even in the south of Brazil (in the state of Rio Grande do Sul). In Chile the most intensive settlement was in the Núcleo Central. During the last two decades of the century, Chile progressively expanded to the north after the *Guerra del Pacífico* (1879-1883) and took over land with rich nitrate deposits. During the first decades of the 20th century, the settlement of the South was associated with agricultural expansion after the defeat of the Araucanian (Figure 3.3.d).

Our mapping offers another interesting subject, the early development of large cities, because land frontier expansion was accompanied by a quick urbanization process. Clear examples of this are Sydney, Melbourne, Adelaide and Perth in Australia, Auckland and Wellington in New Zealand, Ottawa and Quebec in Canada, Santiago in Chile, Buenos Aires, Rosario, Tucumán and La Plata in Argentina and Montevideo in Uruguay.

[55] In 1858 the total population was 115,462 and in 1874 it was 344,984 (NZOYB, 1990).

3.1.1 Settlement and potential vegetation

We can describe the movement of population into a territory, but how was the area effectively achievable? Bearing in mind the fourth limitation mentioned above, we do not take the total surface area of a country as a reference for the "maximum frontier" because this option is not consistent with the historical development of the settler economies in terms of production. Is all the territory suitable for the creation of the means to sustain the population (food, clothes)? Are colonizers willing to settle anywhere? Are all places safe enough? The answers to all these questions are no.

Colonizers will initially settle in places suitable for human habitation. Early settlers in large parts of the planet (especially settler economies like North America in the 18th century and the South American Southern Cone and Australasia in the 19th century[56]) were quite restricted in their options as to where people could settle and develop agriculture. Geography (swamps, mountains, dense forests, and poor soils), climate (extreme temperatures, wetness) and hostile indigenous populations limited access to many regions. Besides this, large areas of the world could not be reached because infrastructure was lacking. The early spread of people (and agriculture) was considerably restricted.

What exactly was the "wildness" that 18th and 19th century settlers had to face in our regions? Can we replicate those historical conditions to understand the settlers' decisions and possibilities? Some concepts from environment and climate change literature can be useful to help us answer these questions. Data representative of the world's "potential vegetation" are a proxy for the natural environment that people in settlement times had to confront. The world's potential vegetation is the vegetation that would most likely exist now in the absence of human activities.[57] It has been estimated in accordance with georeferenced information about today's ecosystem frameworks, various other information sources, and some hard work on classification and analysis (Ramankutty and Foley, 1999). We are interested in identifying land able to "support" settlers and potentially able to produce goods for international commodity markets. In the case of the settler economies, a basic condition is to consider land that can be used to raise livestock. An alternative criterion would be to consider arable land or land suitable for crops (typically wheat, in our "club"), but this would be an excessively rigorous criterion.[58] Settler economies had extensive areas where it was (almost) impossible to cultivate the land but where cattle or sheep could be reared successfully. Therefore we consider that the "maximum frontier" will include regions of the country that could be used to raise livestock, which in general means the territory's allocation of grassland. Figure 3.4 shows the

[56] South and North Africa had similar patterns.
[57] These data do not necessarily represent the real pre-agricultural vegetation because vegetation types have changed with changes in environmental conditions such as climate and CO_2 concentrations (Ramankutty and Foley, 1999:1001) although they represent a good proxy.
[58] In general, the land conditions (fertility, roughness, temperature) to raise livestock are less strict than those to raise crops (especially cereals, one of the main products of the settler economies).

distribution of biome types according to the potential vegetation for our regions. Biomes are climatically and geographically defined regions with similar ecological climate conditions such as communities of plants, animals and soil organisms, and they are often referred to as ecosystems (University of California, Museum of Paleontology, 2009). Biome types are defined by plant structures (trees, shrubs, grasses), leaf types (broadleaf and needleleaf), plant spacing (forest, woodland, savanna) and climate (Figure 3.4.a). The biome types that can be classed as grassland are shown in Table 3.1. Klein Goldewijk & Van Drecht (2006) assign ordinal values and construct a ranking of grasslands including grassland and steppe, open shrubland, savanna, dense shrubland, tundra and several varieties of woodland.

Figure 3.4
POTENTIAL VEGETATION: BIOME TYPES
Figure 3.4.a. References

Figure 3.4.b. Oceania: Australia and New Zealand

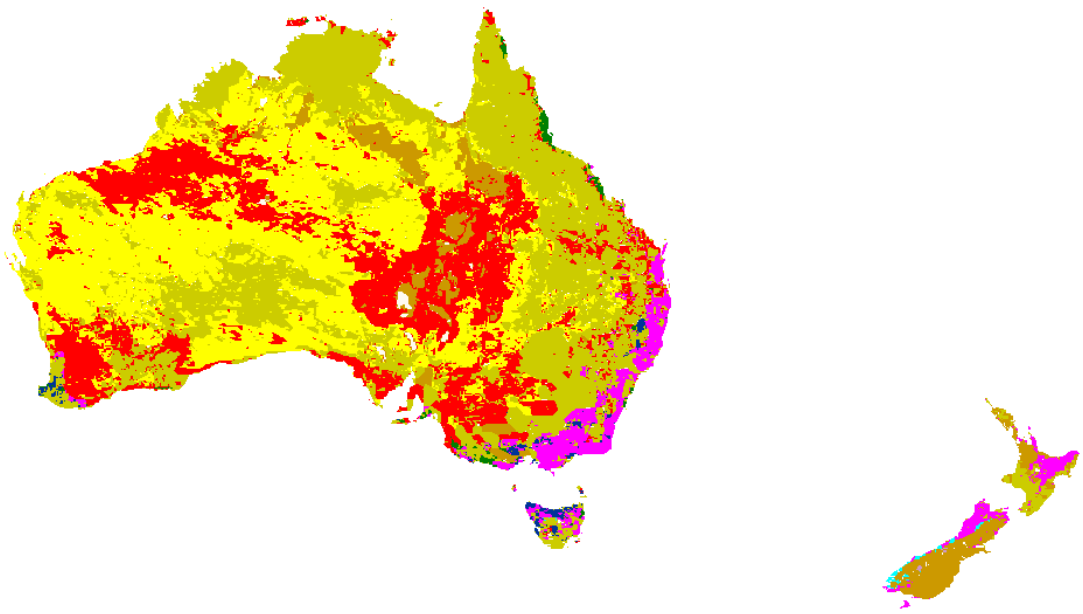


Figure 3.4.c. North America: Canada and the US

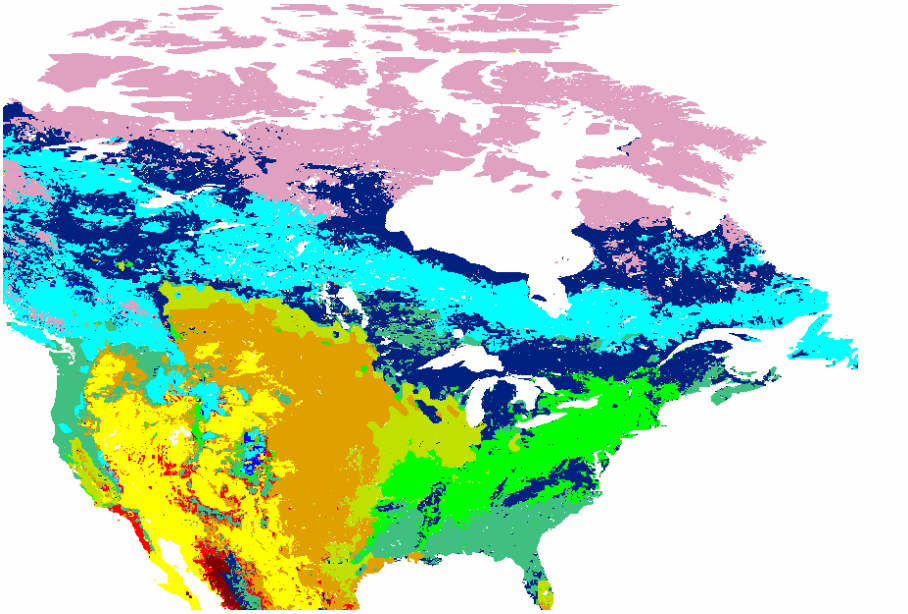
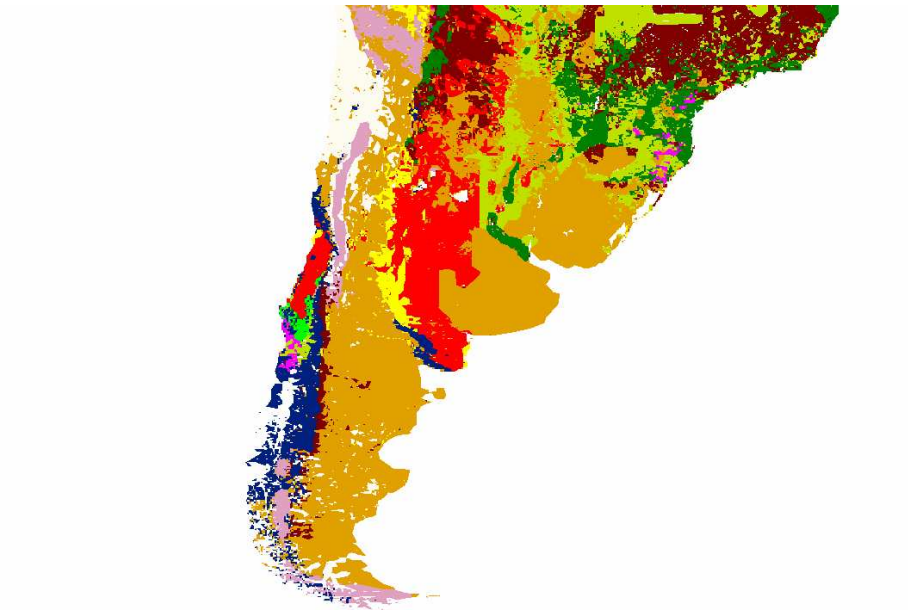


Figure 3.4.d. Southern Cone: Argentina, Chile and Uruguay



Source: CSGE-Atlas of the Biosphere.

It is clear that settlers faced different "wildness" depending on each country and the land in that country that was occupied. Starting with Oceania (Figure 3.4.b), in Australia shrubland and savanna predominated and only a very small part of the total was grassland/steppe. In New Zealand, on the other hand, grassland/steppe was the main vegetation biome (although with big differences between the two islands). In Canada (Figure 3.4.c) there was grassland and open shrubland on the prairies but there were large swathes of tundra and boreal forest between this central region and the Atlantic and Pacific coasts. Finally, in the Southern Cone (Figure 3.4.d), grassland predominated in

Argentina and Uruguay, and the wide range of variation in Chile from hot desert in the north to polar desert in the south is obviously represented by the succession of colours.

Therefore, following García Jimeno-Robinson's methodology, we can calculate the index:

$$F_{i\,t}=1 - [OA_{i\,t}/PVG_i] \quad (2)$$

Where:

$OA_{i\,t}$: is the occupied area (in km^2) of country i in period t, with $t=1850, 1860, \ldots and\ 1920$.

PVG_i: is the "potential vegetation grassland" area (in km^2) of country i which represents that part of the national territory suitable to graze livestock.

3.1.2 Frontier expansion and agricultural aptitude

Soils are not homogenous throughout a territory, climate changes and terrain slopes differ significantly, and this imposes a specific set of constraints and creates different conditions for the development of agricultural activities. The ranking shown in Table 3.1 enables us to distinguish three land types as "high", "medium" and "low" aptitude (*HA*, *MA*, and *LA*) for grassland. We group categories 6 and 5 together, 4 and 3 together and 2 and 1 together (the sum represents our *PVG*). Based on this we can construct two sets of indicators.

Table 3.1
BIOME TYPES AND THE ALLOCATION OF GRASSLAND

	Rank
Grassland / steppe	6
Open shrubland	5
Savannah	4
Dense shrubland	3
Tundra	2
Evergreen / deciduous mixed forest / woodland	1
Temperate broadleaved evergreen forest / woodland	1
Temperate deciduous forest / woodland	1
Temperate needle leaf evergreen forest / woodland	1
Tropical deciduous forest / woodland	1
Polar desert / rock / ice	0
Boreal deciduous forest / woodland	0
Boreal evergreen forest / woodland	0
Tropical evergreen forest / woodland	0
Hot desert	0

Source: Klein Goldewijk & Van Drecht (2006):105.

First, the following indicators show the "extensive" character of land frontier expansion considering the shares of each type of land occupied in the total grassland area.

$$OA^{HA}_{i\,t}/PVG_i \quad (3)$$

$$OA^{MA}_{i\,t}/PVG_i \quad (4)$$

$$OA^{LA}_{i\,t}/PVG_i \quad (5)$$

Second, the following indicators show the "intensive" character of the process considering the shares of each land type occupied in each land aptitude category. I^{HA}, I^{MA} and I^{LA} represent the intensity in the use of land of high, medium and low intensity in each period t.

$$OA^{HA}_{i\,t}/PVG^{HA}_i=I^{HA}_{i\,t} \quad (6)$$

$$OA^{MA}{}_{i\,t}/PVG^{MA}{}_{i} = I^{MA}{}_{i\,t} \qquad (7)$$

$$OA^{LA}{}_{i\,t}/PVG^{LA}{}_{i} = I^{LA}{}_{i\,t} \qquad (8)$$

Besides, considering that:

$$OA_{i\,t}/PVG_{i} = OA^{HA}{}_{i\,t}/PVG_{i} + OA^{MA}{}_{i\,t}/PVG_{i} + OA^{LA}{}_{i\,t}/PVG_{i}$$

$$= OA^{HA}{}_{i\,t}/PVG_{i} * PVG^{HA}{}_{i}/PVG^{HA}{}_{i} + OA^{MA}{}_{i\,t}/PVG_{i} * PVG^{MA}{}_{i}/PVG^{MA}{}_{i} + OA^{LA}{}_{i\,t}/PVG_{i} * PVG^{LA}{}_{i}/PVG^{LA}{}_{i}$$

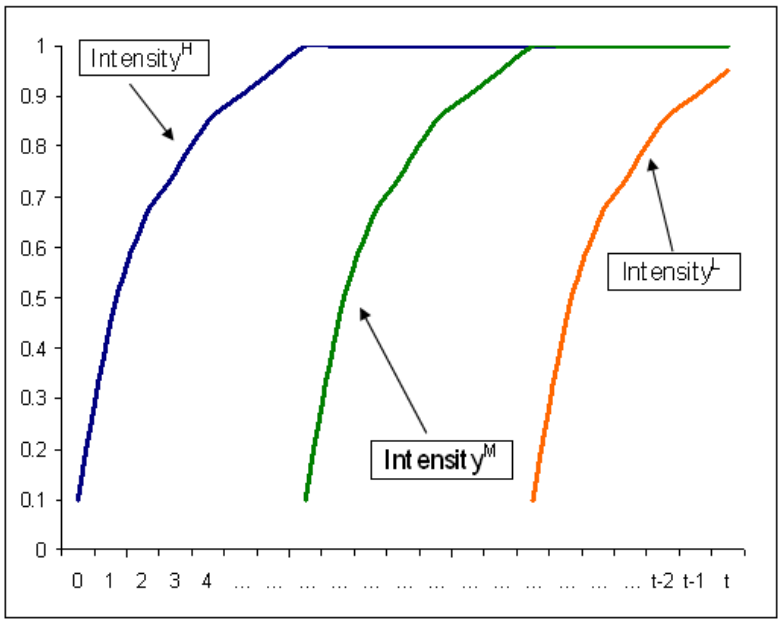
$$= PVG^{HA}{}_{i}/PVG_{i} * I^{HA}{}_{i\,t} + PVG^{MA}{}_{i}/PVG_{i} * I^{MA}{}_{i\,t} + PVG^{LA}{}_{i}/PVG_{i} * I^{LA}{}_{i\,t} =$$

$$= \beta_1 . I^{HA}{}_{.} + \beta_2 . I^{HA}{}_{.} + \beta_3 . I^{LA} \qquad (9)$$

Where β_i are fixed, known and represent the share of each type of land on the total PVG, and I^{HA}, I^{MA} and I^{LA} change along the time and tend to 1 in the long run. Therefore, evaluating the evolution of the intensity in the use of land we can identify patterns of land frontier expansion.

Suppose that land frontier expansion followed the "Ricardian Model", in which the more fertile land is cultivated first and then, when population and the need to raise food production come into play, the less fertile land came into production. The evolution of our indicators would follow a pattern similar to that shown in Figure 3.5. The indicators show the different phases of expansion depending on the fertility and amount of land used for the agricultural production. We hope that each economy presents a specific path depending on its particular circumstances –historical, institutional and geographical– and that each has different outcomes in terms of economic growth and income distribution.

Figure 3.5
RICARDIAN MODEL AND INTENSITY INDICATORS



The determination of PVG is an adequate criterion when land is used to produce consumption goods. Was this always the case? Sometimes the decision to move from a location to an uninhabited place was related to economic activities other than biological production. A typical example of this would be mining.[59] This is an important question because Australia and Chile, and to certain extent Canada and New Zealand, developed mining considerably in the period, and population movement –and the

[59] The economic history of many countries includes "gold rushes", and the 19th century was a prolific period for stories of this kind.

frontier– could be related to factors other than those associated with the *PVG*. Therefore we should include frontier land that is unsuitable for grazing but can be mined. Strictly speaking, these considerations deserve specific research with a different approach. Instead of working with settler economies as the central category –which gives a bias towards the study of agricultural activities– we would need an approach that captures the development of mineral extraction in these areas. On this point, Denoon (1983) argue that Chile is a limit case of settler economies,[60] and we make changes in our conceptualization to capture this special case.

In Chile the First Globalization coincided with the expansion of nitrate production as a consequence of the acquisition of large regions with rich mineral deposits after the Pacific War (*Guerra del Pacífico,* 1879-1883). Antofagasta (a province of Bolivia) and Tarapacá (a province of Peru) were annexed to Chile at the beginning of the 1880s, and mineral production became the main determinant of economic growth in the country until the Great Depression of the 1930s (Cariola & Sunkel, 1982). According to our distribution of biome types, both provinces are desert regions and would not be considered as potentially colonisable land. We include both provinces as part of Chile's "PVG" to calculate our indicators, and since the nitrate deposits were very rich, we consider them as "high aptitude" land. The decision is not fanciful because Chile showed a high specialization in agricultural production from the mid-19th century to the 1880s and a production profile perfectly comparable with the rest of the "club". The point is less important for the other members of the "club" because the agrarian specialization was clearly dominant during the period

3.1.3 Frontier expansion and distance

Is it enough to know agricultural aptitude to be able to categorise occupied land? In settler economies land quality depended not only on agricultural aptitude but also on the distance from the production regions to the markets and the ports. The effective exploitation of natural wealth depended on participation in international commodity markets. Therefore our indicator must consider that excellent soils that are very far away are in fact bad soils in productive and economic terms, or alternatively that distant land –with similar agricultural aptitude– is low-value land, in a comparative sense. How can we introduce this idea of distance?

In the recent literature several concepts that emerged from economic geography are applied to economic history analysis (Crafts, 2005; Martínez-Galarraga, 2009; Rosés, 2003; Schulze, 2007; Tirado, et al., 2006). In particular, the concept of "market potential" incorporates distance as a main factor and therefore may be useful for our purpose. The Harris market potential equation (Harris, 1954) can be defined as:

[60] Denoon (1983) argues the same idea about South Africa.

$$MP_i = \sum_{j=1}^{j=n} \frac{M_j}{d_{ij}} \qquad (10)$$

Where M_j is a measure of the size of region j (state, province or other division), usually GDP, and d_{ij} is the distance, usually represented as the bilateral transport costs between i and j.

We can estimate an indicator of "land quality" in accordance with agriculture aptitude "adjusted" by the distance to specific places that were in some sense "centres of gravity" because of their economic, political or historical condition. We consider geographical points that spread population in different directions as centres of gravity. When did interior distance become important? During the first decades of the settlement, distance did not matter. Expansion into the territory was undertaken by people looking for adventure and wealth, but it did not respond significantly to productive objectives. Although each economy had its own characteristics we can choose 1850 as the time when land frontier extension was considered from an economic perspective and distances became an important matter. We illustrate our issue with the diagrams in Figure 3.6.

Georeferenced information presents data in terms of grid cells, and our database represents the distribution of population with a global 5x5 minute resolution. Therefore we have grid cells that are approximately 8.3 km in length, 11.8 km in diagonal and have a surface area of 69.4 km^2. We can assume that Figure 3.6.a represents the situation for a country in 1850. The occupied surface area contains 89 cells, which gives a total area of 6,177 km^2 (*CG* is the centre of gravity). In 1910, the total occupied surface is represented by 140 cells which means an increase of 3,539 km^2 (the difference between 9,716 km^2 and 6,177 km^2). Land frontier expansion was the result of successive extensions, and these are represented by areas of different colours. However, from an economics perspective, incorporating the first 89 cells was not the same as incorporating the following 51 cells. In accordance with our analytical framework (see Chapter 2) the cost of clearing land is an increasing function on the quantity of land incorporated into production.[61] We can apply this idea here and consider that each cell incorporated into production has a different area that depends on its distance from the centre of gravity. As a result, 69.4 km^2 would be an "average" of the closer cells (that have low values) and the distant cells (that have high values). Therefore we need a coefficient that "penalizes" the former group of cells and "rewards" the latter, and we use a measure of distance between each cell and the centre of gravity. We multiply 69.4 by a potential function of the distance (of each cell) s_1 and then we re-scale the total surface of each type of land to maintain the true cell average (69.4 km^2) (note that we have as values of distance as number of cells). Potential function allows us to apply a higher value to the distant cells (the land that is more expensive to incorporate)

[61] $K_A=\phi(N)$. With $\phi'(N)>0$ and $\phi''(N)>0$. $\phi'(N)$ is the cost of "clearing" a unit of land. $\phi(N)$ is a convex function of the amount of land cleared.

than closer ones, and at the same time we can test our theoretical assumption with the numerical exercises proposed in Chapter 2. It is important to re-scale the series so we keep the total surface of endowments (in terms of agricultural aptitude and quality) and hence we can make comparisons.

Figure 3.6: MEASURING DISTANCE

Figure 3.6.a: 1850

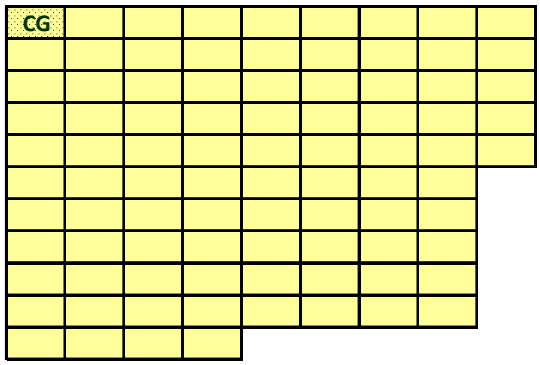
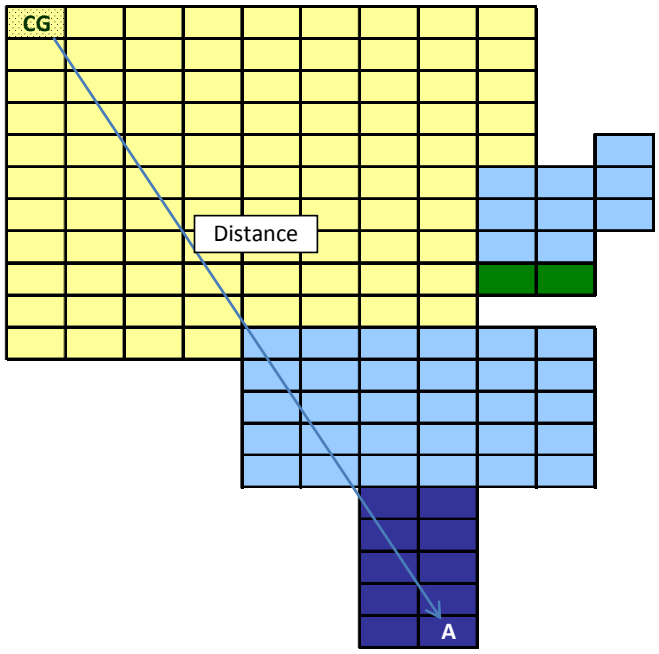


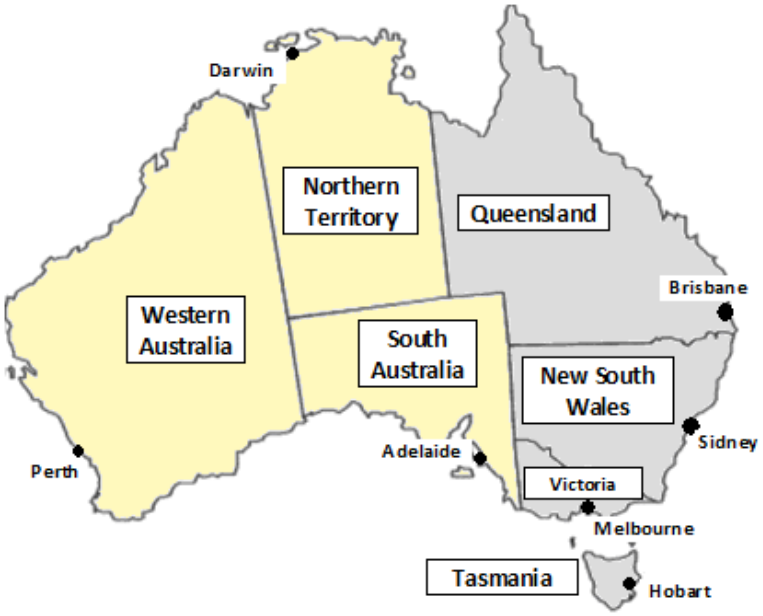
Figure 3.6.b: 1910



How can we make our definitions operative? Distance is an important factor in the large economies of the group –Argentina, Australia and Canada– but less so in the small economies –Chile, New Zealand and Uruguay. However, even in the latter, certain geographical conditions would make it necessary to consider distance. Settler economies based their expansion on external conditions associated with the First Globalization, so ports are natural candidates to be considered "centres of gravity" or an expansion axis. However, in some cases we need to take into account other possibilities. Initially, we choose some important ports as fixed reference points for measuring distances. We assume that the producers decide to direct their products to the closest port in the province, state or large region. It is impossible to know the real destination of the production but we consider that our assumption is reasonable. In cases in which there is another type of "centre of gravity", we can argue about the feasibility of our assumption. We discuss this question for all the economies in our club but we only present empirical evidence for Argentina (in sub-section 4.3). We choose this country to illustrate the analytical effects of incorporating distance for two reasons. First, Argentina is a large economy and distance was important in its economic history, and second, Argentina had the most intensive land frontier expansion during the period. In the next stages of our research we will extend the analysis to other settler economies and we will improve the results by

including real distance instead of air distance (to consider geographical accidents, infrastructure and transport costs).

Figure 3.7
AUSTRALIA: CENTRES OF GRAVITY



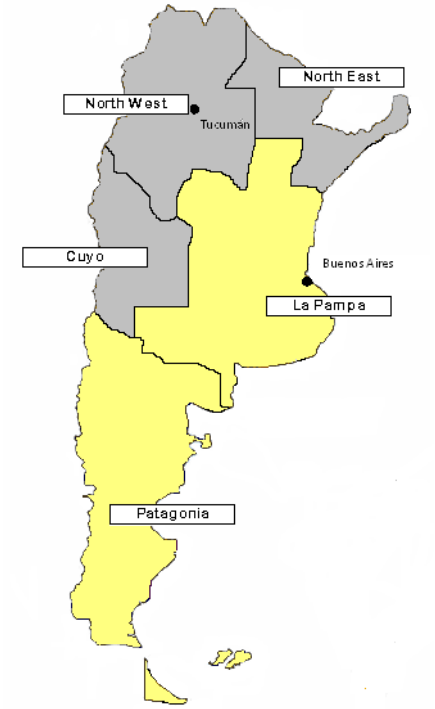
The 1910 Official Yearbook of Australia includes a description of the main ports of the Commonwealth classified by states and ranked by importance in the region (including data like width of entrance, depth, facilities, security and cargo capacity). We choose one port per state as a reference. In New South Wales we consider Port Jackson, which is the harbour of Sydney city. In Victoria, we consider Port Phillip in the Hobson's Bay at the mouth of Yarra River, which is the harbour of Melbourne city. In Queensland, the most important port is Brisbane, which is at the mouth of the Brisbane River close to Moreton Bay. In South Australia, we consider Port Adelaide in the city with the same name. In Western Australia, since the beginning of the 20th century the most important port has been Fremantle, at the mouth of Swan River and 19 km southwest of Perth. North Australia only had one main harbour, Port Darwin, in the city with the same name. Finally, Tasmania had several ports and the most important was Hobart, at the mouth of Derwent River. Figure 3.7 shows the locations of the ports we could use as reference points to calculate distances.[62]

In Argentina (see Figure 3.8) the most important port was Buenos Aires, while the other harbours in the Republic were fundamentally specialized in coasting ship. The national census of 1914 reported that 56 per cent of all cargo went to Buenos Aires (including sailing and steam ships) and that almost 180 of the 610 vessels were large ships (deep draught). We use Buenos Aires as one of our reference markers for distance. However, we also need to consider a second reference because land expansion in Argentina developed along two axes. The coastal (*litoral)* and Pampas *(pampeana)* regions developed from the beginning of 19th century with a strong foreign stimulus and Buenos Aires was their port. But there was also the inland Andean (*andino)* region, which had its roots deep in the colonial past of Spanish South America, which had always been centred on *Alto*

[62] Coghlan (1904):222-223 notices that some figures –such as statistics from Melbourne– are inflated because the great ocean steamers were counted twice (entering the port and leaving). However, this limitation is not important for our purposes because the adjustment does not change the ranking within each state.

Perú (Bolivia) and the rich zone of Potosí, and this area influenced the north of Argentina (Cao & Rubins, 1996). Tucumán city was one of the most important economic and political centres. It had strong demographic development and was located in a region with a productive structure based on plantations (sugar), which contrasted with the pastoral activity of the south and east of the country. We take it as our second reference point for distances. We had defined five regions in Argentina (Willebald, 2009) and we propose the same regional classification here: the North-West (Jujuy, Salta, La Rioja, Tucumán, Catamarca and Santiago del Estero); the North-East (Formosa, Chaco, Misiones and Corrientes); Cuyo (San Juan, San Luis and Mendoza); La Pampa (Córdoba, Santa Fé, Buenos Aires, the Federal Capital, La Pampa and Entre Ríos); and Patagonia (Neuquén, Río Negro, Chubut, Santa Cruz and Tierra del Fuego). Buenos Aires is the "centre of gravity" for La Pampa and Patagonia, and Tucumán is our reference point for distances in the North West, North East and Cuyo.

Figure 3.8
ARGENTINA: CENTRES OF GRAVITY



Canada is a very large country with Atlantic and Pacific coasts and initially it would be suitable to consider both these "exit doors" to international markets (Figure 3.9). In 1913-1914, the four most important ports in the country in terms of cargo shifted were Halifax and Montreal on the east coast (in Nova Scotia and Quebec provinces, respectively) and Vancouver and Victoria on the west coast (both in British Columbia). Both ports in the east handled approximately the same amounts of cargo in tonnage[63] but average cargo per vessel was significantly greater in Montreal, so we

Figure 3.9
CANADA: CENTRES OF GRAVITY

[63] Annual averages 1913-1914: Halifax 3.5 million tons, Montreal 3.9 million tons.

take this as our eastern reference point. In the west, there are only minor differences between Vancouver and Victoria and they are located very near each other (Statistics Canada, 1914:474, and 1915:501-502). However, an examination of the dynamics of settlement raised doubts about the importance of these two ports as "centres of gravity". The demographic development of the middle areas of the country was more related to expansion from the east than from the west, so we need an alternative distance reference point (see Figure 3.3.c). Winnipeg, the capital of Manitoba, is near the longitudinal centre of North America, in south central Canada, close to the eastern border of the Canadian Prairies, at the confluence of the Red and Assiniboine Rivers. Historically, this area played an important regional role as a fur trading post (18th century) and as an important post for the Hudson's Bay Company (during the first half of the 19th century), and it enjoyed rapid progress after the coming of the Canadian Pacific Railway in 1881. Like for Argentina, in a previous paper (Willebald, 2009) we identified a classification of regions in Canada that facilitated the analysis. These regions are as follows: Atlantic Canada (Nova Scotia, New Brunswick, Prince Edward Island, Newfoundland and Labrador); Quebec; Ontario; the West (Manitoba, Saskatchewan, and Alberta); British Columbia and the North (Northwest Territories, Yukon and Nunavut). We consider the three first regions as the "East", where Montreal constitutes the "centre of gravity" and the three last as the "West", with Winnipeg as the distance reference point.

When we come to the small economies in our "club" it may be interesting to consider some geographical conditions.

Figure 3.10
CHILE: CENTRES OF GRAVITY

Chile is 4,270 km long and an average of 175 km wide, and it has a particular shape that gives it almost all kinds of climates and very varied topography (Hurtado, 1966). We can consider three ports as distance reference points, corresponding to the North, South and Central regions (see Figure 3.10). In Willebald (2009), we propose the following regional classification: the North: Tarapacá, Antofagasta, Atacama, Coquimbo and Arica y Parinacota; the Núcleo Central: Valparaíso, Santiago (Metropolitan Region), Libertador General Bernardo O'Higgins, Maule, Northern Biobío (Ñuble); and the South: Southern Biobío (Arauco, Bío Bío, Concepción), Araucanía, Los Ríos, Los Lagos, Aisén del General Carlos Ibáñez del Campo and Magallanes and Chilean Antarctica. In the North the main port was Iquique, in Tarapacá, followed by Tocopilla and Antofagasta in Antofagasta province. In 1910, the former exported a volume of nitrates that exceeded the total for both the other ports together (Cariola & Sunkel, 1982: 133).[64] In the South, the most important port –especially for the trade in

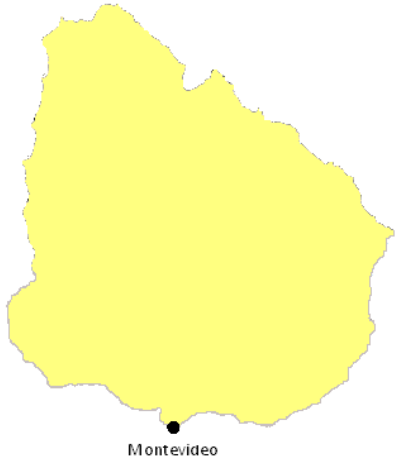
[64] About the ports of the northern region see Badía-Miró (2008).

cereals such as wheat– was Talcahuano, which at the end of 19th century and the first decades of 20th century exceeded the movement of other ports such as Constitución or Tomé. Finally, the main port in the Núcleo Central, the region with the highest population concentration and with a long history of agricultural development, was Valparaiso, which dates from the colonial times. Therefore we could use three ports as distance reference points: Iquique, Talcahuano and Valparaiso.

Figure 3.11
NEW ZEALAND: CENTRES OF GRAVITY

New Zealand is made up of two main islands. At the beginning of 20th century, the two ports with the greatest total tonnage entered and cleared were Auckland in North Island (followed closely by Wellington) and Bluff Harbour in the South Island (Coghlan, 1904:223). (See Figure 3.11). However, in South Island there is another interesting geographical case for our exercise: Christchurch. The urban development of this city would have justified choosing it as our distance reference point. This will be tackled in a later stage of our research.

Figure 3.12
URUGUAY: CENTRE OF GRAVITY



Finally, in Uruguay, since colonial times Montevideo has been the main port and the economy's international "exit door" (see Figure 3.12).

3.2 Data

Recent literature about the negative effects of economic growth on environment and global climatic change includes historical approximations to the evolution and geographical location of people, consumption and production on a world scale that is very useful for our purpose. The "Netherlands Environmental Assessment Agency (MNP)" includes two programmes: the History Database of the Global Environment (HYDE 3.1) and the Integrated Modelling of Global Environmental Change (IMAGE). Information about population is available on the website.[65] Data corresponding to biome types is from the *Atlas of the Biosphere*, a product of the Center for Sustainability and the Global Environment (SAGE), part of the Nelson Institute for Environmental Studies at the University of Wisconsin, Madison.[66] We work with Georeferenced Information Systems (GIS) and the data are presented in terms of grid cells that represent the distribution of

[65] http://www.pbl.nl/en/themasites/hyde/index.html
[66] http://www.sage.wisc.edu/atlas/

population with a global 5x5 minute resolution and 15 biome types (like those presented in Table 3.1). In the Appendix to Chapter 3 we give a critical discussion of the data and propose some adjustments to overcome their main limitations.

Current land areas by administrative units are from GeoHive Populations Statiscs (http://www.geohive.com/).

4. Land frontier expansion in terms of "quality": our results

We propose several measures of land frontier expansion from the mid-19th century to 1920. Initially we present the simpler approach to this question following the García Jimeno-Robinson method, although we introduce some changes because we consider different times and inhabitant benchmarks in the indicators to improve the analysis (subsection 4.1; they are absent aspects in that approach). Then we review the series in accordance with our proposal. First, we consider land aptitude in term of its suitability to support grassland vegetation (low, medium and high aptitude) (subsection 4.2). Second, we illustrate the application of distance in our measures in the case of one of the large economies of the club: Argentina (subsection 4.3).

4.1 In accordance with the country's current surface area

Following an equation similar to *(1)*, we calculate the ratio between the area of occupied land and the area of the country's current territory, and this result is subtracted from the value one, for each decade from 1850 to 1920. We consider two modalities of occupied areas: (i) a benchmark of 0.7722 inhabitant/km^2 like García Jimeno-Robinson; (ii) without considering any benchmark; that is, territory is considered occupied regardless of the number of people there. Table 3.2 shows the indicators for all the settler economies.

The indexes fall systematically, which indicates the open frontier was decreasing (or the occupied area was expanding). The results show clearly the differences between the large and the small economies. Argentina, Australia and Canada began the period with large parts of their territory as open frontier and show a gradual population advance into these areas up to WWI. In general our numbers are consistent with García Jimeno-Robinson's records. Their calculations (with the wide criterion that they define and our equivalent definition) are 74.2% for Argentina, 52.7% for Chile and 85.3% for Canada (around 1850). In the case of Uruguay the difference is greater because García Jimeno-Robinson propose a ratio of 100%, which means that Uruguay would have had a completely open frontier in the mid-19th century, a result that contradicts the historical evidence. However, it is important to take into account that these similar results emerge when we do not consider any benchmark (the lower part of Table 3.2), while García Jimeno-

Robinson's numbers have a benchmark of 0.7722 inhabitants per km^2. With this more rigorous benchmark the results differ more significantly. We are not able to replicate their estimates but, evidently, we work with different databases. In the Figures 3.13 and 3.14, we show the evolution of the indicators without benchmarks, to be consistent with the comparison and show a whole illustration of the advance of the population across the territory regardless of the settlement density.

Table 3.2
LAND FRONTIER EXPANSION INDICATORS
In accordance with the current national territories and a benchamark of 0.77 inhab/km^2

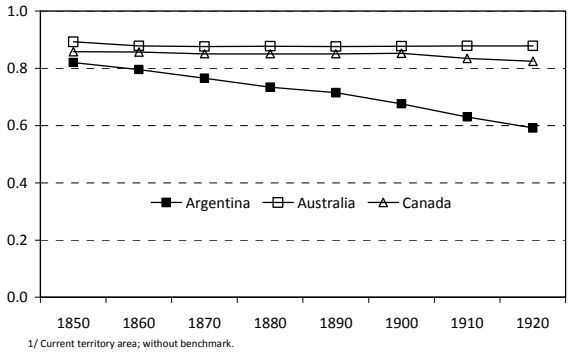
	1850	1860	1870	1880	1890	1900	1910	1920
Argentina	0.94	0.93	0.91	0.90	0.87	0.85	0.81	0.78
Australia	0.98	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Canada	0.95	0.94	0.95	0.95	0.94	0.94	0.93	0.92
Chile	0.73	0.72	0.71	0.70	0.69	0.70	0.70	0.71
New Zealand	0.95	0.93	0.85	0.76	0.73	0.69	0.66	0.62
Uruguay	0.91	0.87	0.81	0.76	0.66	0.58	0.54	0.49

In accordance with the current national territories and without benchamark

	1850	1860	1870	1880	1890	1900	1910	1920
Argentina	0.82	0.80	0.77	0.73	0.71	0.68	0.63	0.59
Australia	0.89	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Canada	0.86	0.86	0.85	0.85	0.85	0.85	0.83	0.82
Chile	0.59	0.58	0.57	0.56	0.53	0.52	0.52	0.54
New Zealand	0.51	0.50	0.49	0.48	0.44	0.41	0.39	0.37
Uruguay	0.72	0.56	0.46	0.38	0.28	0.22	0.20	0.18

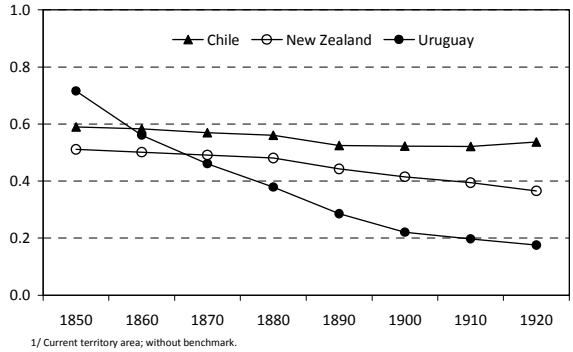
Source: own elaboration from Netherlands Environmental Assessment Agency, HYDE 3.1 and IMAGE Programmes, http://www.geohive.com/

Figure 3.13
LAND FRONTIER EXPANSION INDICATORS
Large economies 1/



1/ Current territory area; without benchmark.
Source: own elaboration from Netherlands Environmental Assessment Agency, HYDE 3.1 and IMAGE Programmes, http://www.geohive.com

Figure 3.14
LAND FRONTIER EXPANSION INDICATORS
Small economies 1/



1/ Current territory area; without benchmark.
Source: own elaboration from Netherlands Environmental Assessment Agency, HYDE 3.1 and IMAGE Programmes, http://www.geohive.com

First, as regards the large economies (Figure 3.13), the indicators for Australia and Canada fall slightly during the period while the index for Argentina shows a steady decline. Second, the small economies began with relatively low indexes, these fell rapidly towards the end of the period, but the rate of the processes was different in different places (Figure 3.14). In the mid-19th century, Uruguay had the more extensive open frontier, although its territory was occupied quicker than in

New Zealand and Chile. In 1850, almost the 60 per cent of Chile's current territory was frontier, and the indicator for this country declined more slowly than those for the other small economies.[67]

4.2 In accordance with grassland: our proposal

The literature on the economic development of the settler economies has traditionally discussed the timing of frontier expansion, and the comparison between these regions has attracted many scholars (see Chapter 1). What do our indicators tell us about this question? As a first dimension, our estimates consider four levels of density settlement: one without a benchmark (like in the second part of Table 3.2), a medium level of 0.7722 inhabitants per km^2, an upper level of 1.545 per km^2 and finally a lower level of 0.3863 per km^2. We compare the results considering, firstly, all the current territory (like García Jimeno-Robinson) and, then, the land suitable to allocate grassland as a second dimension. [68]

Considering the first dimension, the evolutions are similar in all the cases, but the indicators present differences in levels depending on the strictness of the benchmark. Higher benchmarks are associated with higher indicators that show larger open frontiers. The introduction of the second dimension does not significantly alter the results. In general, the indicators follow the same trend with lower levels, which denote quicker advances on the open frontier. Our countries are abundant-land economies and the differences in terms of surface area between total territory and grassland are not huge.[69] The pattern of settlement in grassland was similar to the rest of the territory in terms of dynamics, but the intensity was greater.[70]

Figures 3.15 and 3.16 show the indicators for Argentina. Levels differ but trajectories are similar. The evolution in Argentina contrasts with that in Australia (Figures 3.17 and 3.18), where the trend to decrease was slight and there are backward movements. In Australia the decrease is similar among the indicators but this is not so for Argentina, where the changes differ significantly. In Australia, the decrease from 1850 to 1920 in the "lower", "medium" and "upper" indicators are 0.6, 0.7 and 0.7 per cent, respectively, and in Argentina they were 24.3, 18.4 and 11.5 per cent, respectively (we refer to grassland indicators). As the results change when we use different benchmarks we may think that land frontier expansion in Argentina was a process of gradual dispersion of the population (because less strict indicators "incorporate" occupied land more quickly), but this was (almost) absent in the case of Australia.

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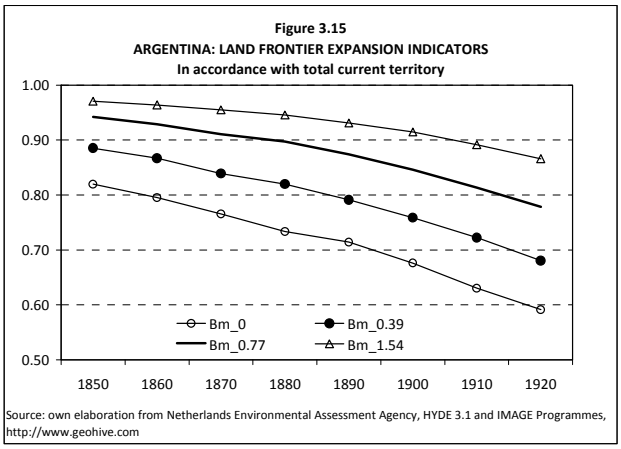
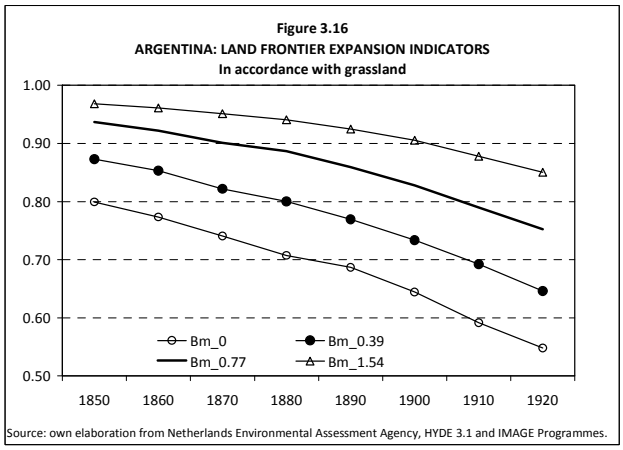
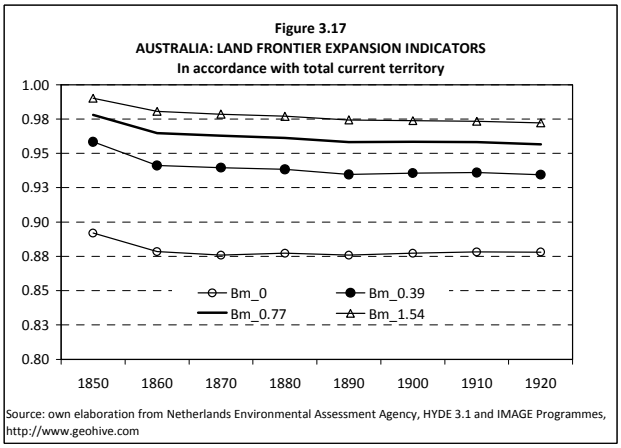
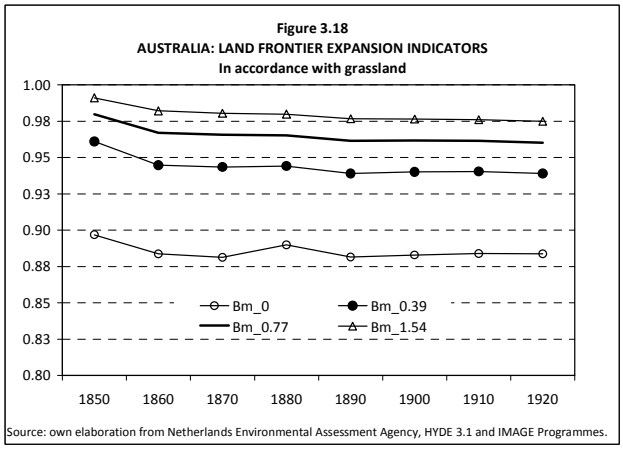
[67] Chile's national boundaries changed significantly during the period. The interpretation of the index is limited.
[68] "Bm" signifies "benchmark".
[69] Grassland in total territory is as follows: Australia (98%), Argentina (81%), Canada (66%), Chile (77%; with the adjustment proposed in sub-section 3.1.2), New Zealand (88%) and Uruguay (100%).
[70] By their construction, our indicators leave people out the calculation. People that settled in territories non-suitable to allocate as grassland are excluded. In the average of the period, the proportions of population excluded are the following: Argentina (14%), Australia (15%), Canada (11%), Chile (6%), New Zealand (12%) and Uruguay (0%).

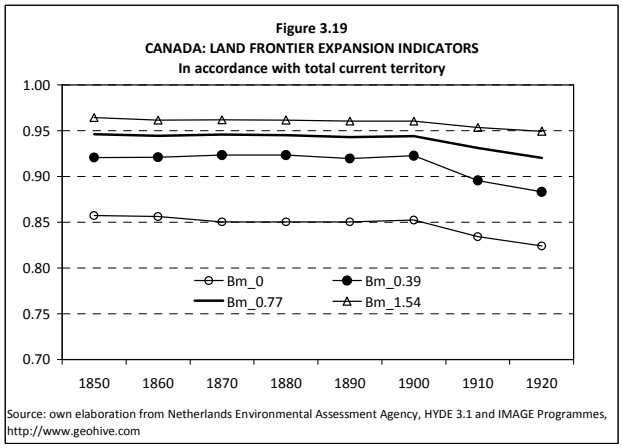


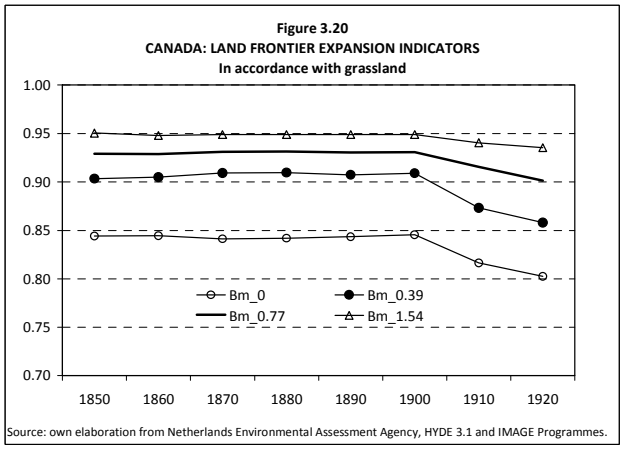




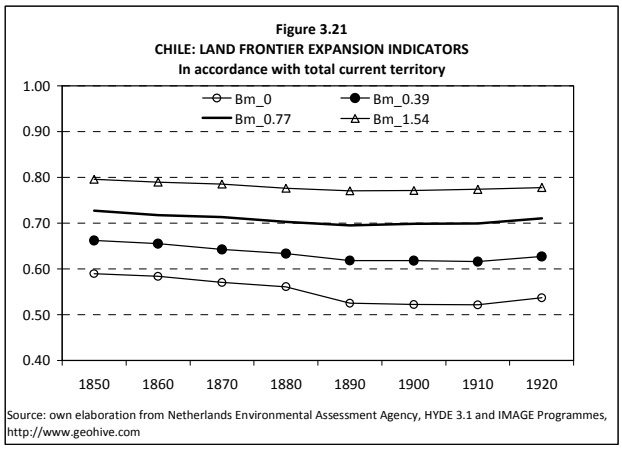


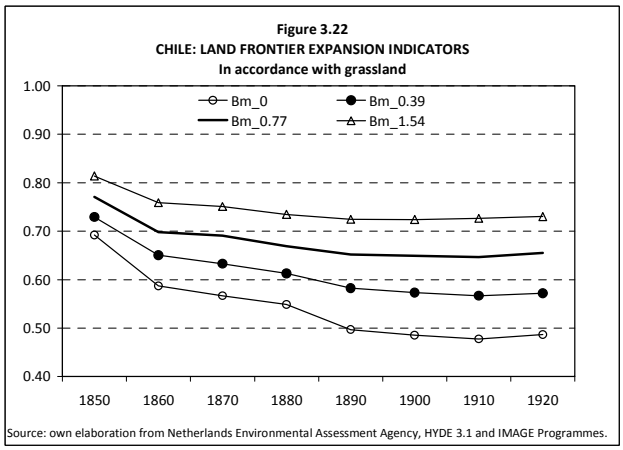
Canada (Figure 3.19 and 3.20) shows evolutions similar to Australia until the last decade of the 19th century. However, after the price boom of the 1890s the frontier expanded significantly with a decreasing movement between 1890 and 1920 (around 4 per cent), although the process was less intense than in Argentina.



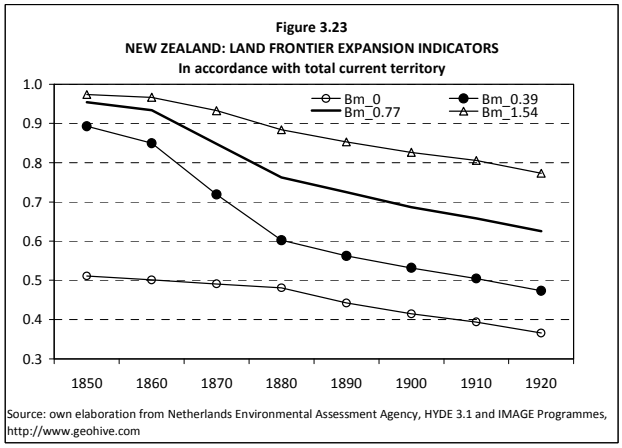


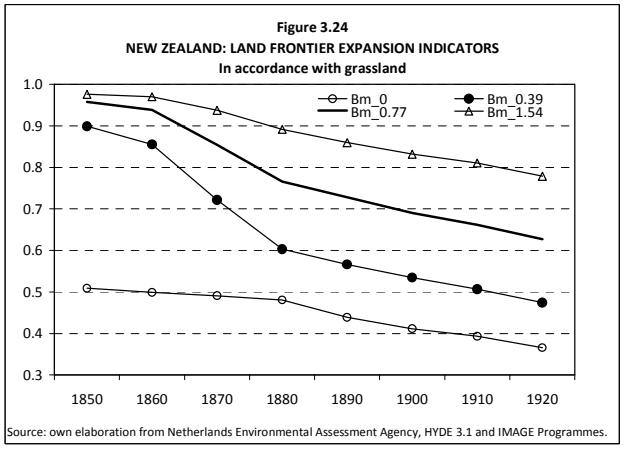
Chile (Graphs 3.21 and 3.22) showed an intense process of frontier expansion up to 1890, consistent with the extension of the territory to the north. Afterwards, the process followed a moderated decreasing trend that seemed exhausted by the 1910s.

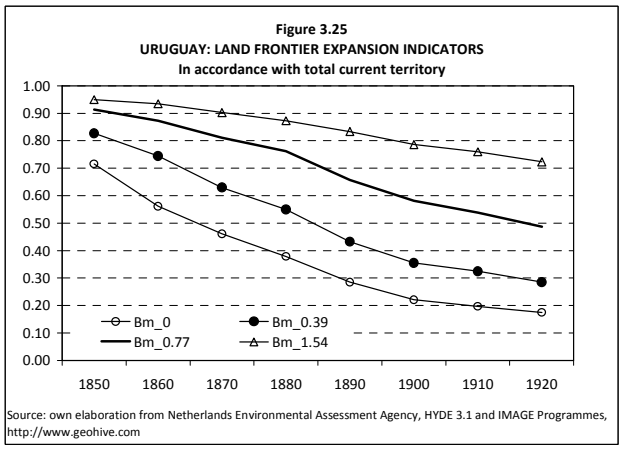


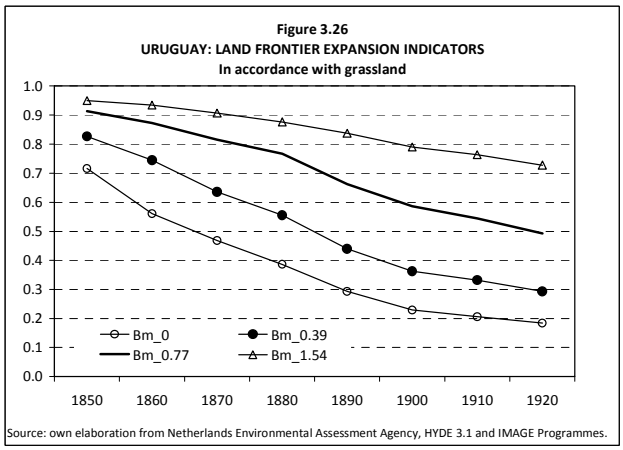


Finally, considering that New Zealand (Figures 3.23 and 3.24) and Uruguay (Figures 3.25 and 3.26) are similar economies in terms of population, demographic dynamics and size (see Álvarez, 2008), we could suppose similar evolutions. The movements of the corresponding land frontier expansion indicators would confirm our expectations for the long run.







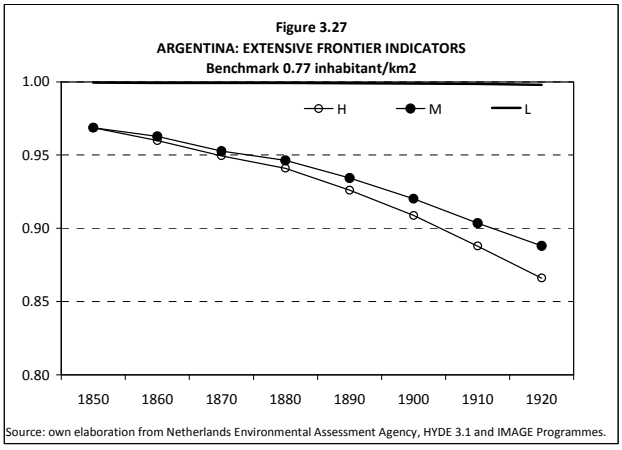


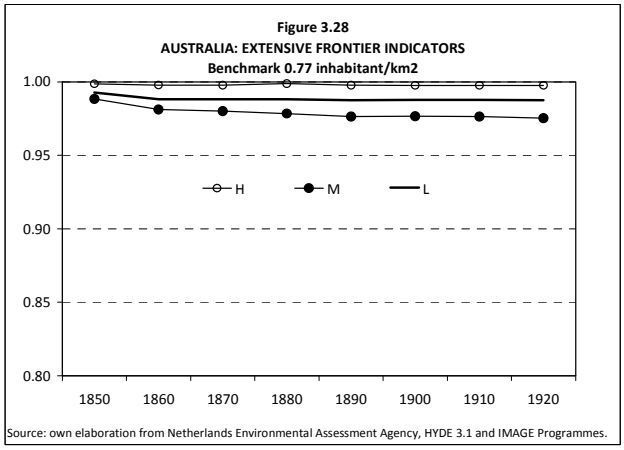
Both economies began the 19th century with their territory practically uninhabited and a frontier almost 100 per cent. The rate of the processes was similar, they advanced without ruptures, but in New Zealand this slowed down in the end of the century (with the exception of the Bm_0). An interesting point is that the indicator without a benchmark for New Zealand at the beginning of the

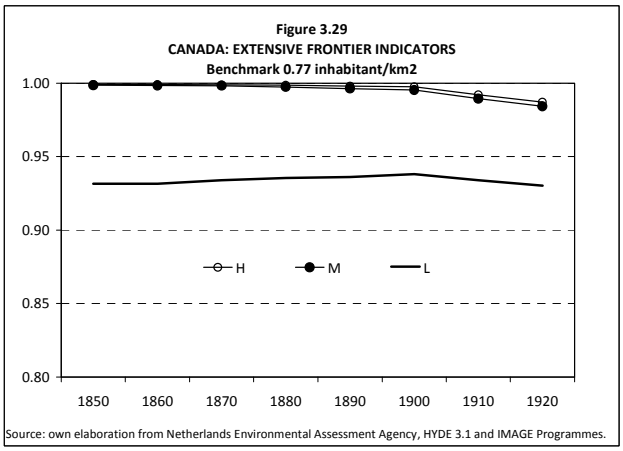
period is very different to the other indexes. This is evidence of a more dispersed population across the territory, which was probably a consequence of the fact that New Zealand had many access points from the sea, which facilitated the settlement in both islands.

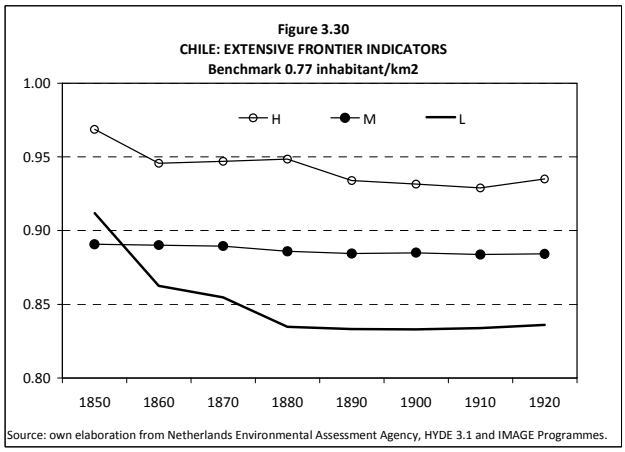
Considering the limitations of the previous analyses (see sub-section 2.2), we contrast different land frontier expansion indicators that take as a reference the aptitude of the land suitable for agricultural activity (in terms of grassland). First, we propose exercises with our "extensive indicators". They measure the proportion of each type of land "incorporated" into the economy –high, medium and low aptitude– on total grassland (we consider the medium benchmark, 0.7722 inhabitants/km^2; equations *(3)*, *(4)* and *(5)*), discounted from the unity. A decreasing trend represents the expansion of the frontier or alternatively a decline in the amount of open frontier (the decrease in natural wealth in relative terms).

Argentina moved its frontier across medium and high land aptitude (Figure 3.27). This evolution contrasts with Australia (Figure 3.28) –where land of medium attitude was occupied but without an intense advance on the frontier– and Canada (Figure 3.29) –where at the turn of the century the expansion advanced on the three types of land.



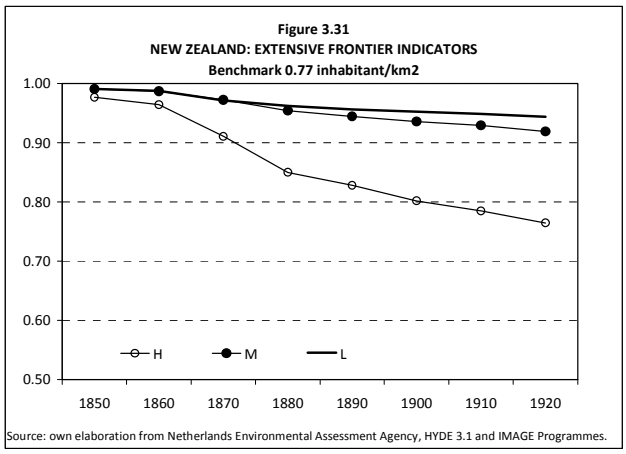


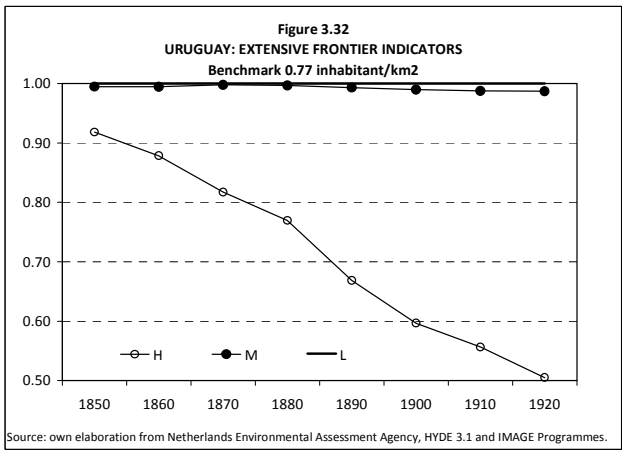




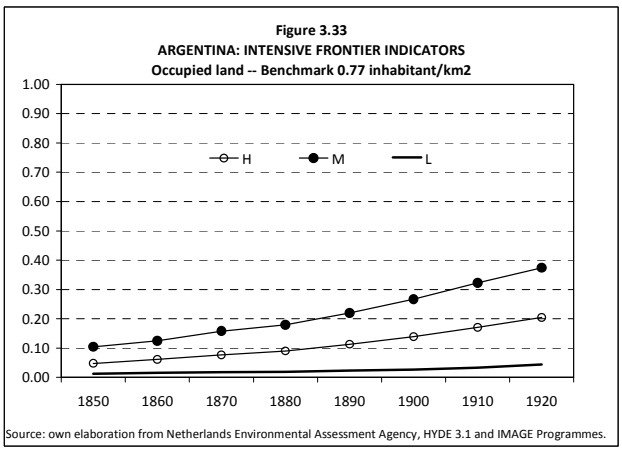
In the case of the small economies, we have different rates and dissimilar changes in the structures. The expansion of the frontier in Chile in the period 1860-1890 included a first stage of

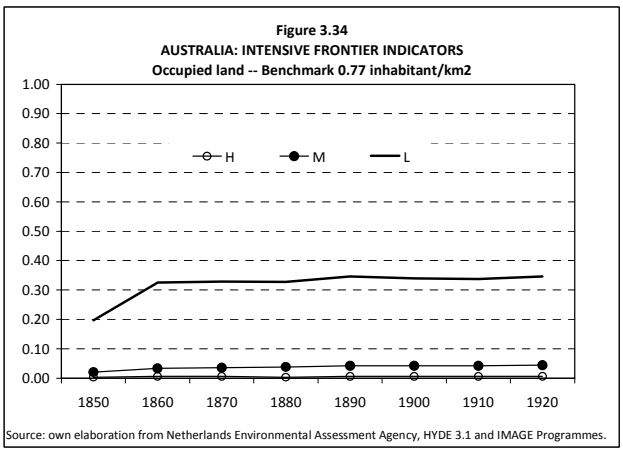
movement onto low aptitude land (1850-1880) and a second stage to high aptitude land (1880-1890) (Figure 3.30). New Zealand (Figure 3.31) showed –in a similar way to Canada, but with higher intensity– an evolution through the three types of land although the biggest movement was onto high aptitude land. This contrasts with Uruguay, where frontier expansion occurred fundamentally onto high aptitude land (Figure 3.32).

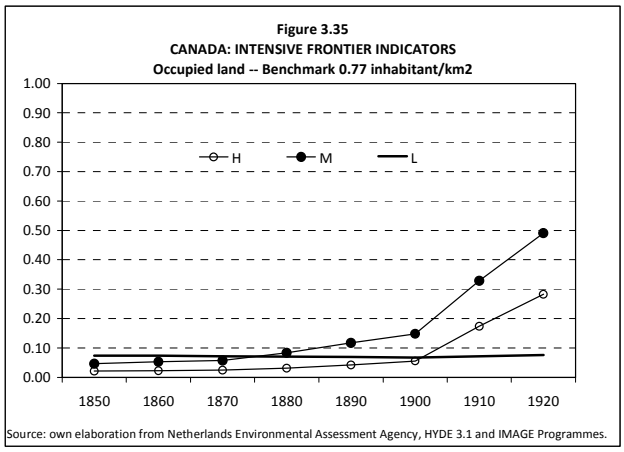


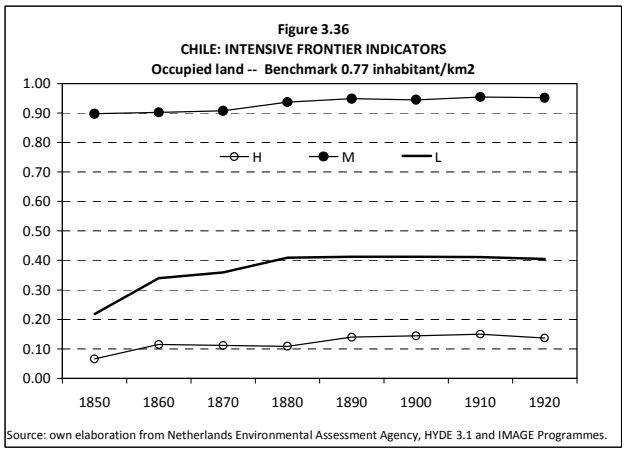


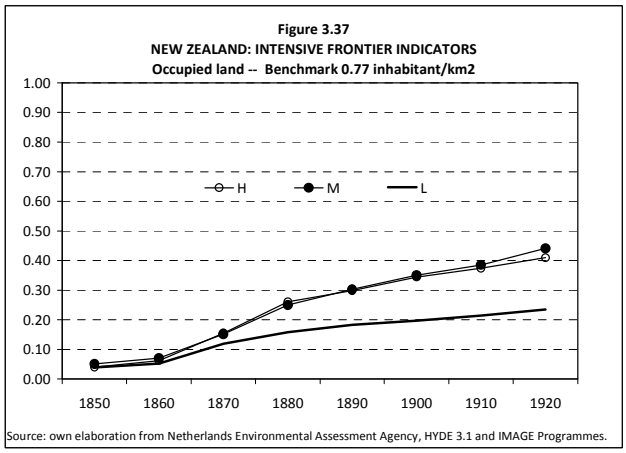
Consideration of our "intensive indicators" of occupied land offers additional insights into the question. They measure the proportion of each type of land "incorporated" into the economy –high, medium and low aptitude– of each respective land aptitude endowment. We represent the pattern of the expansion as in the case of Figure 3.5 with the assumed Ricardian Model, where each indicator trends to 1 in the long run and we apply equations *(6)*, *(7)* and *(8)*. Argentina (Figure 3.33) and Uruguay (Figure 3.38) advanced on their high and medium aptitude land. This pattern coincided with the evolution in New Zealand except that a significant amount of low aptitude land was also occupied (Figure 3.37). Australia (Figure 3.34) mainly occupied low aptitude land. This was also the pattern in Canada (Figure 3.35) until the 1880s, when the country reacted to the price boom and expanded its frontier with a pattern similar to that of Argentina. At the beginning of the period, Chile (Figure 3.36) had almost completely occupied the medium aptitude land and afterwards it advanced into low (first stage) and high aptitude land (from the 1880s).

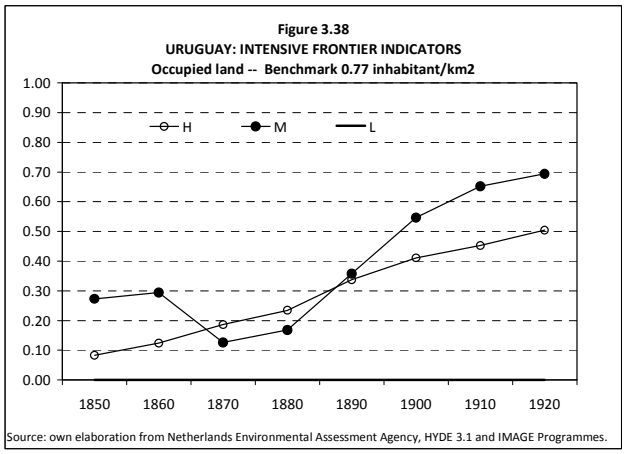












The last important subject is to characterize the dynamics of the process. For this we use the "intensive indicators" of the previous analysis but to explain land frontier expansion instead of occupation of land. In other words, we measure the proportion of each type of land "incorporated" into the economy –high, medium and low aptitude– on each respective endowment, discounted from the unity. Therefore decreasing trajectories mean expansion of the frontier (a decrease of the "open" frontier). With scarce data it is not possible to use sophisticated techniques to find breakpoints so we calculate and compare growth rates by grassland and the different land aptitudes.

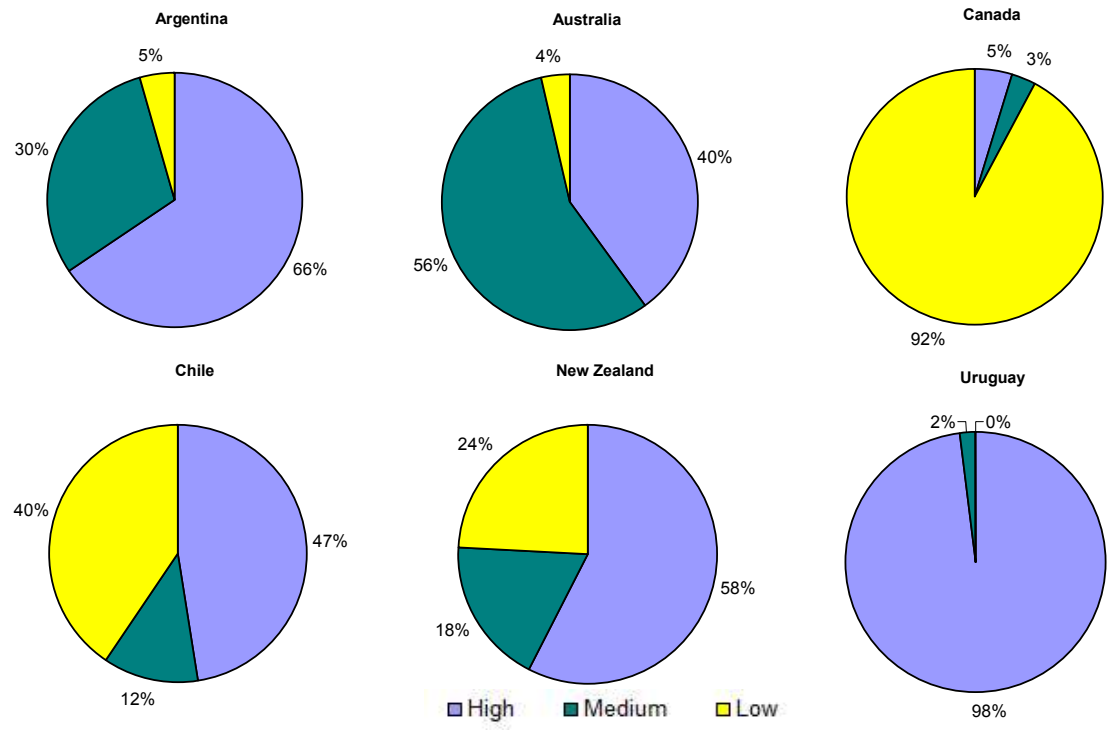
A shortcoming of our previous analysis is that the evolution of the indicators depends critically on the magnitude of the endowments. Clearly, it is more likely to run out a type of land when it is scarce in the economy. In Figure 3.39 we present our classification of grassland into land types for each country in the "club". We use these shares to weight the different variations and calculate the contribution of each type of land to total expansion (the way the indicators are constructed means negative variations indicate land frontier expansion). The share of each contribution to total variation is given in Table 3.3 (in percentages).

Argentina had a clear pattern of land frontier expansion (Figure 3.40) that accelerated during the period and was encouraged by high aptitude land (Figure 3.41). Over the whole period this land

contributed with the 56 per cent of the total variation (Table 3.3). Initially we could expect that the process was similar to that in Canada (Figure 3.44), but there are important differences.

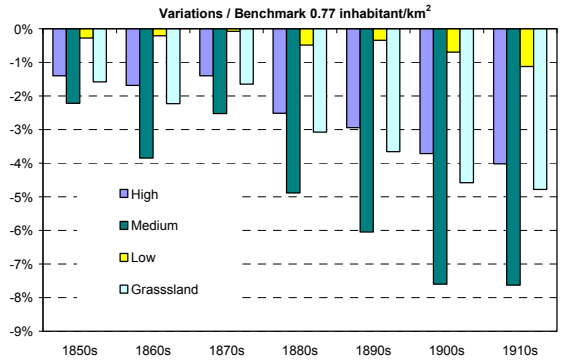
Canada had periods of reversion of the process, which can be explained by low aptitude land (Figure 3.45), and the acceleration was just apparent from the beginning of the 20th century. In this last extension of the frontier, the contribution of low aptitude land exceeded the 25 per cent of the total variation and the leader was the medium quality land (Table 3.3). The third large economy in the "club" showed a completely different pattern.

Figure 3.39
LAND APTITUDE ENDOWMENTS
In percentage by type of land suitable to allocate grassland



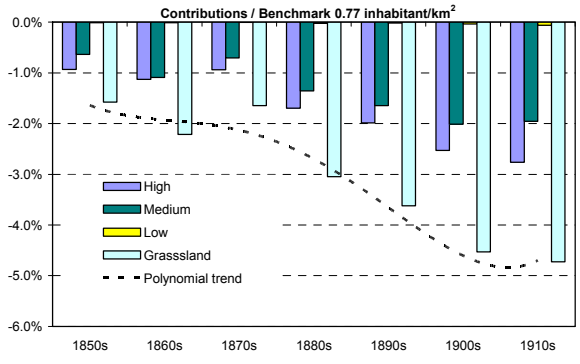
Source: own elaboration from CSGE-Atlas of the Biosphere.

Figure 3.40
ARGENTINA: INTENSIVE FRONTIER INDICATORS
Variations / Benchmark 0.77 inhabitant/km²



Source: own elaboration from Netherlands Environmental Assessment Agency, HYDE 3.1 and IMAGE Programmes.

Figure 3.41
ARGENTINA: INTENSIVE FRONTIER INDICATORS
Contributions / Benchmark 0.77 inhabitant/km²



Source: own elaboration from Netherlands Environmental Assessment Agency, HYDE 3.1 and IMAGE Programmes.

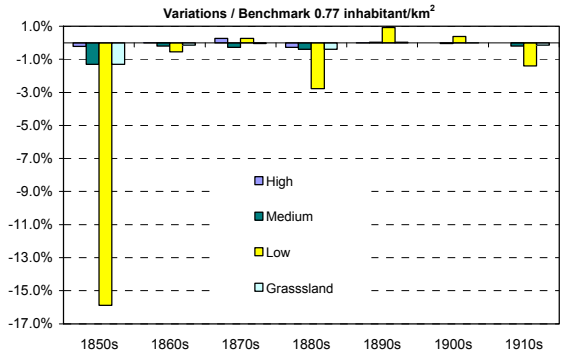
Table 3.3
INTENSIVE LAND FRONTIER EXPANSION INDICATORS: CONTRIBUTIONS ON TOTAL VARIATION
In percentage / By land quality

	1850s	1860s	1870s	1880s	1890s	1900s	1910s
Argentina							
High	59.2%	50.8%	57.3%	55.6%	55.0%	55.9%	58.4%
Medium	40.3%	49.3%	42.9%	44.4%	45.4%	44.5%	41.4%
Low	0.8%	0.5%	0.2%	0.8%	0.5%	0.8%	1.3%
Australia							
High	7.1%	3.4%	-229.7%	28.2%	-13.9%	23.5%	2.5%
Medium	56.6%	86.3%	343.6%	54.4%	47.2%	135.3%	74.1%
Low	36.6%	10.3%	-14.2%	17.5%	66.7%	-58.8%	23.4%
Canada							
High	25.0%	-3.1%	-181.4%	63.3%	-234.1%	35.8%	36.5%
Medium	67.9%	-5.7%	-490.6%	128.1%	-394.8%	38.1%	37.7%
Low	7.1%	108.9%	772.8%	-91.5%	730.0%	26.6%	26.2%
Chile							
High	32.2%	-18.3%	-6.5%	84.3%	111.1%	84.6%	69.7%
Medium	0.8%	8.3%	16.3%	8.4%	-22.2%	38.5%	4.1%
Low	69.1%	109.9%	90.5%	7.7%	11.1%	-23.1%	25.9%
New Zealand							
High	65.6%	64.8%	70.5%	59.2%	69.0%	62.3%	58.1%
Medium	18.9%	17.9%	21.1%	26.1%	23.3%	23.5%	29.5%
Low	16.0%	19.7%	10.9%	16.1%	9.0%	15.3%	13.9%
Uruguay							
High	99.1%	105.1%	98.5%	97.0%	95.8%	95.6%	98.6%
Medium	1.0%	-5.5%	1.6%	3.4%	4.8%	4.7%	1.5%
Low	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source: own elaboration from Netherlands Environmental Assessment Agency, HYDE 3.1 and IMAGE Programmes.

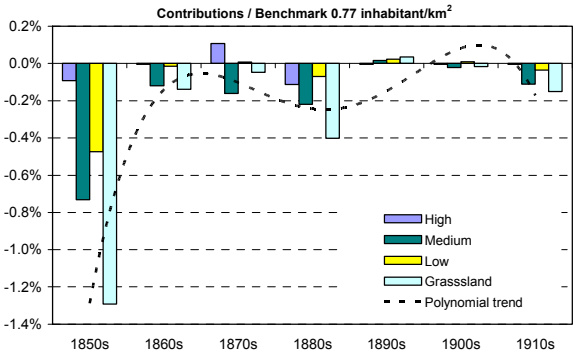
The expansion of the frontier in Australia occurred earlier than in the other large countries (Figure 3.42) and it became less intense in the last decade of the 19th century. The expansion movement recovered in the 1910s (Figure 3.43). Throughout the period the main component was medium aptitude land, which apart from in the 1890s, made a higher positive contribution to total variation (Table 3.3). Therefore of the large economies only Argentina had a persistent land expansion process, and it was dominated by high aptitude land with almost no move onto land of low agricultural aptitude.

Figure 3.42
AUSTRALIA: INTENSIVE FRONTIER INDICATORS
Variations / Benchmark 0.77 inhabitant/km²

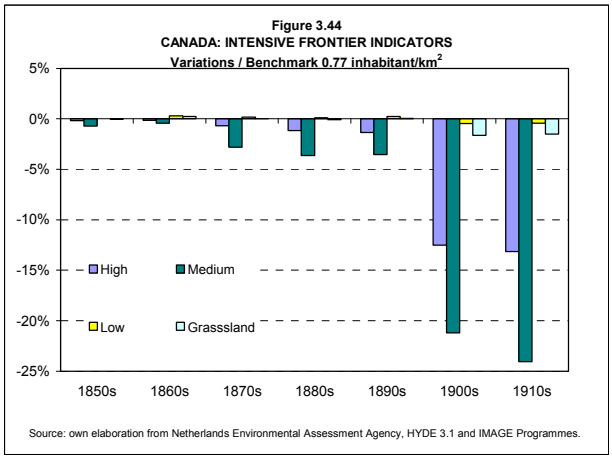


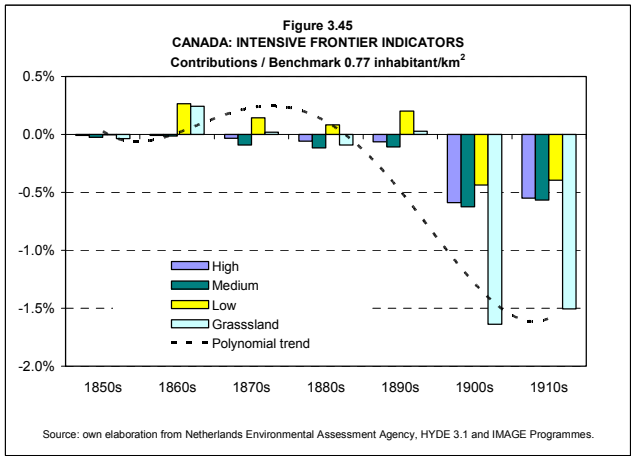
Source: own elaboration from Netherlands Environmental Assessment Agency, HYDE 3.1 and IMAGE Programmes.

Figure 3.43
AUSTRALIA: INTENSIVE FRONTIER INDICATORS
Contributions / Benchmark 0.77 inhabitant/km²

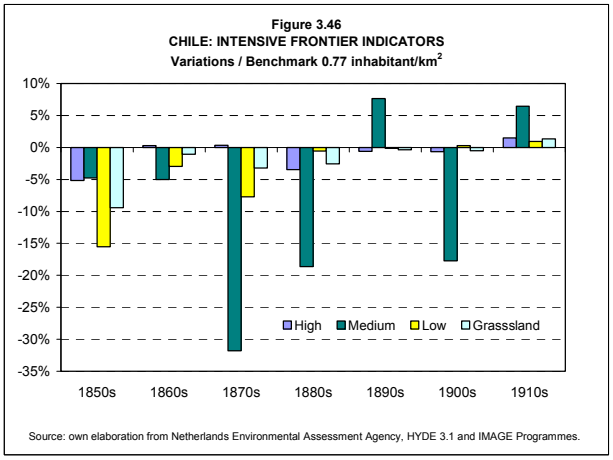


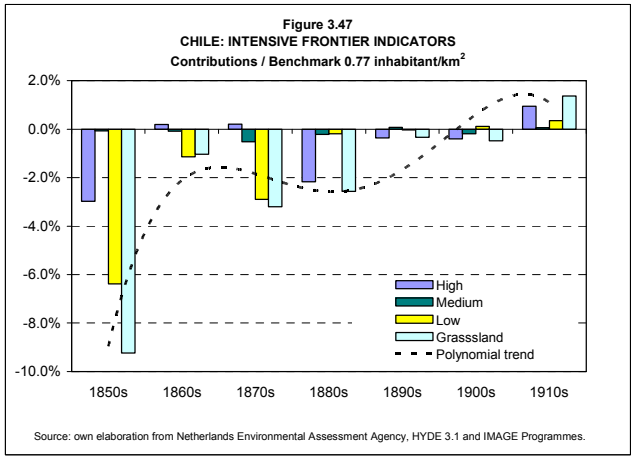
Source: own elaboration from Netherlands Environmental Assessment Agency, HYDE 3.1 and IMAGE Programmes.



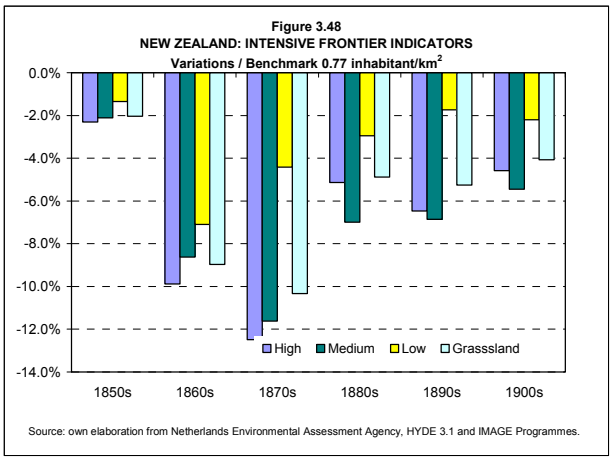


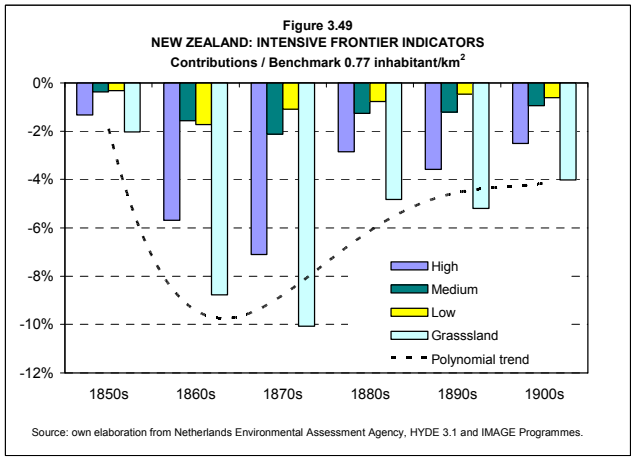
The small economies in the "club" share similar characteristics in terms of the dynamics of the process because the pace of expansion declined in the period, but the timing was different. In Chile this last trend was more intensive and land extension reverted in the 1910s (Figure 3.46). In the 1850s-1870s, the main expansion was onto low aptitude land (Figure 3.47), but this characteristic changed in the 1880s and high aptitude land accounted for more than 80 per cent of the expansion (except in the 1910s) (Table 3.3). The highest expansion rates in New Zealand were in the 1860s and 1870s (Figure 3.48) and the move was mainly onto high aptitude land (Figure 3.49). However, the share of medium and low aptitude land was never negligible; almost 40 per cent of the variation in the period was due to these two types (on average). This pattern contrasts with that of Uruguay, where the highest expansion rates came later than those in New Zealand (the 1880s and 1890s) (Figure 3.50) and the contribution of high aptitude land dominated the evolution (Figure 3.51). During the period, this contribution exceeded 95 per cent of total variation.

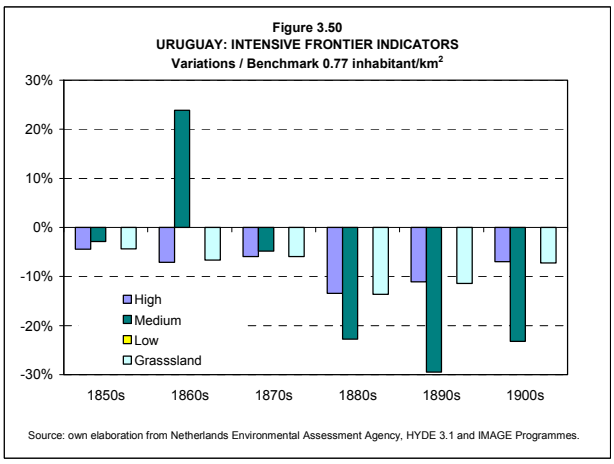


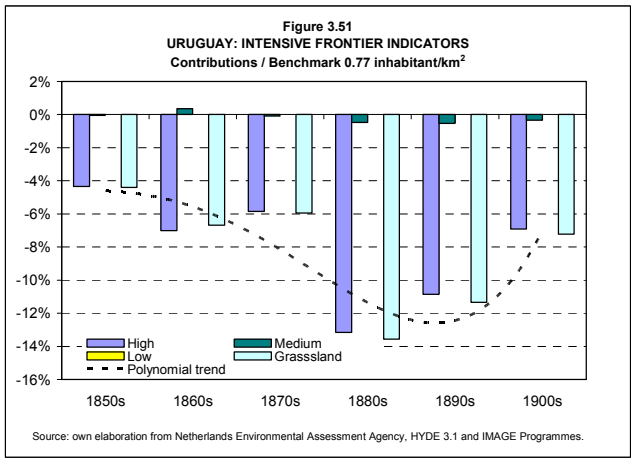


According to our framework, these different intensities in the incorporation of land of differing aptitudes can constitute an important factor that explains the economic performance of the settler economies. Therefore we can make our approach to this concept more precise by constructing "contributions indexes".







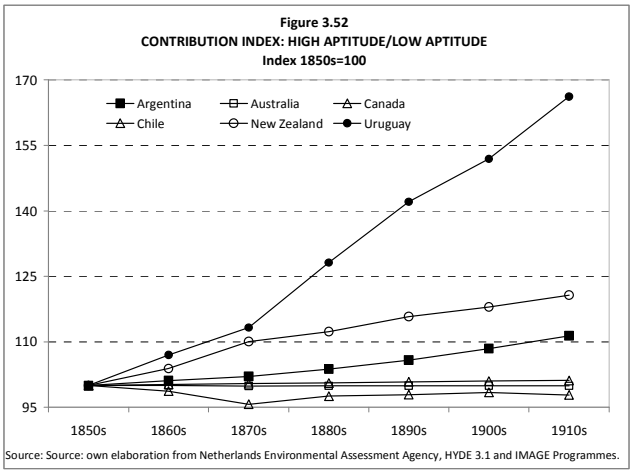


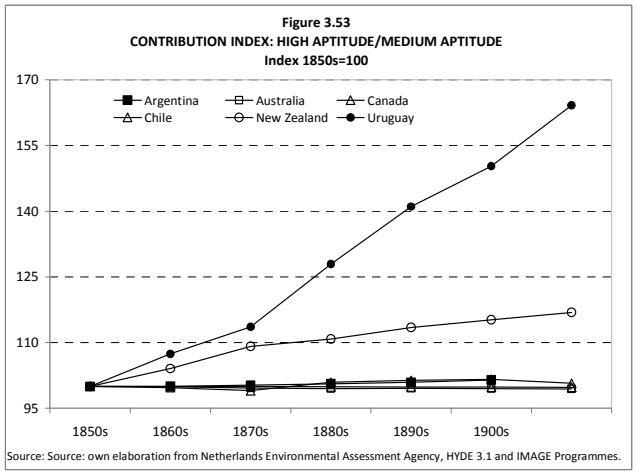
From the contributions calculated in the previous analysis, we elaborate indicators of contribution by type of land (1850s=100) and we contrast them in terms of the relative contribution of high and low land (*H/L*) aptitude (Figure 3.52) and between high and medium (*H/M*) land aptitude (Figure 3.53). We calculate the indexes considering contributions with the opposite sign because this provides a better illustration. Higher numbers represent wider gaps between the contributions of high aptitude land and other types of land. [71]

The gap between high and low aptitude was very great in Uruguay throughout the period, and after two decades when the New Zealand index increased more than the Argentine, the two indicators followed a similar trend. Canada and Australia did not show substantial differences between the two categories and Chile had an irregular trajectory. Chile started the period with indexes below 100 (in the 1860s and 1870s), and then it recovered and evolved in a way similar to Canada and Australia. The gap between high and medium aptitude shows a similar picture, but there are three important differences. The increasing evolution of Argentina is more moderate, the

[71] Contributions represent percentage points of the variation of our indicators of land frontier expansion and, by construction, these variations are predominantly negative. In Chapter 5, where we present our statistical exercises, we will work with the original sign of the contribution.

trajectory of Chile is more stable than in the previous case and the index for New Zealand converges to the others.





4.3 In accordance with grassland and distance: an illustration of "land quality"

Land quality improves the concept of land aptitude as it incorporates distance into the economic impacts of endowments. We discuss these analytical consequences and as an illustration we give evidence for Argentina in 1850 and 1910, which we choose as the reference years because they are the time period extremes in our previous analysis. We choose this country because Argentina was one of the larger economies in the "club" that underwent more intensive land frontier expansion during the period. We repeat some exercises from the previous sub-section to compare results. In accordance with our discussion in sub-section 3.1.3., we need a coefficient (s) for correcting area by distance and we define it as the result of a potential function like the following: $s=\gamma\ (distance^{\theta})$, where we assume γ =10 and θ=1.7, which are the same values assumed in our numerical exercises in Chapter 2 (sub-section 2.2).

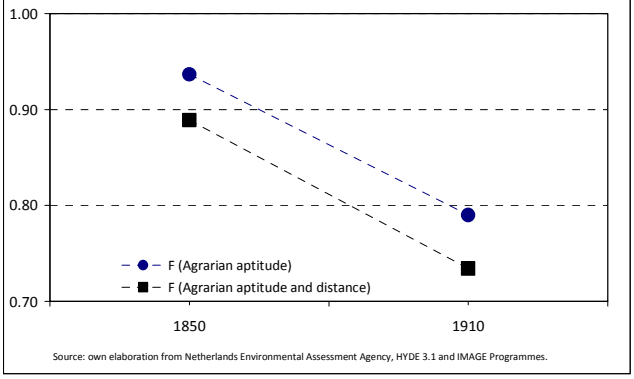
In terms of agrarian aptitude to allocate grassland, the indicator of frontier expansion (F) fell from 0.94 to 0.79 between 1850 and 1910 (see Figure 3.15), but the indicator adjusted by distance (a proxy for "land quality") decreased from 0.89 to 0.73. Therefore the fall in the index that incorporates the effects of distance was greater (17.4 per cent against 15.7 per cent) and had lower levels (Figure 3.54). Therefore when we introduce distance into the analysis, land frontier expansion is seen to be a more intense process. An additional exercise is to calculate our "intensive indicators" to gauge the evolution of the frontier in accordance with different types of land.

High quality land frontier expansion (Figure 3.55) shows a similar pattern to the high aptitude but, as before, with lower levels and a more intense decline (16.1 per cent against 12.9 per cent). On the contrary, when we include distance in the case of medium quality land (Figure 3.56), the levels of the indicator are higher and the decrease is lower (22.9 per cent against 24.3 per cent). In other words, the inclusion of distance in the calculations reduces the index for high aptitude land and

increases it for medium. Indicators of low quality land evolved in a similar way to those of medium quality land (Figure 3.57).

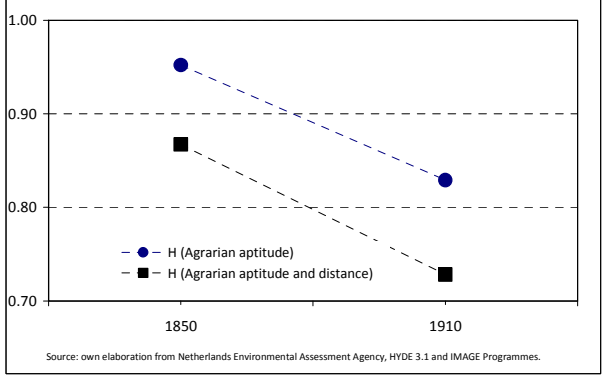
Land frontier expansion was not a lineal process and sometimes we find "islands" of expansion in the territory. However, considering productive specialization and the key role of ports, the progressive and radial expansion from Buenos Aires that Argentina underwent was an expected process. But the way to take possession of the high aptitude land of the Pampas and the South was precisely to incorporate medium aptitude land, particularly dense shrubland.[72] This explains the different evolutions between aptitude and quality indicators and the "sense" of the discrepancy. Agents looked for and occupied the best land in spite of distance and incorporated it endogenously into the production of commodities.

Figure 3.54
ARGENTINA: LAND FRONTIER EXPANSION ACCORDING TO AGRARIAN APTITUDE AND DISTANCE



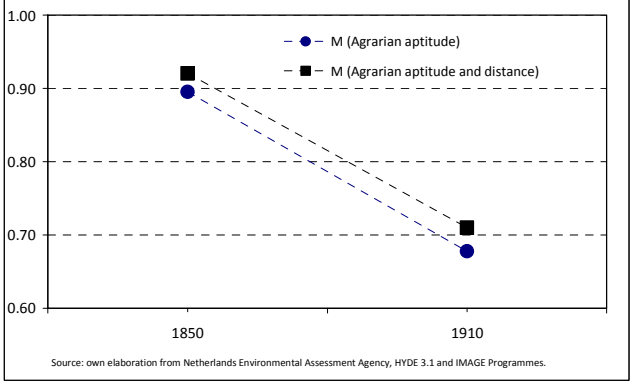
Source: own elaboration from Netherlands Environmental Assessment Agency, HYDE 3.1 and IMAGE Programmes.

Figure 3.55
ARGENTINA: INTENSIVE LAND FRONTIER EXPANSION BY HIGH LAND - ACCORDING TO AGRARIAN APTITUDE AND DISTANCE



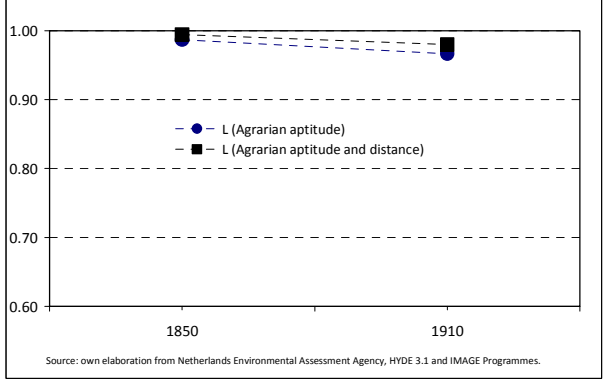
Source: own elaboration from Netherlands Environmental Assessment Agency, HYDE 3.1 and IMAGE Programmes.

Figure 3.56
ARGENTINA: INTENSIVE LAND FRONTIER EXPANSION BY MEDIUM LAND - ACCORDING TO AGRARIAN APTITUDE AND DISTANCE



Source: own elaboration from Netherlands Environmental Assessment Agency, HYDE 3.1 and IMAGE Programmes.

Figure 3.57
ARGENTINA: INTENSIVE LAND FRONTIER EXPANSION BY LOW LAND - ACCORDING TO AGRARIAN APTITUDE AND DISTANCE



Source: own elaboration from Netherlands Environmental Assessment Agency, HYDE 3.1 and IMAGE Programmes.

In Chapter 2, Section 3, we insisted on the importance of distinguishing land qualities and we proposed different costs of clearing land depending on the types of land (high or low quality). We can replicate the same idea and repeat the exercises considering θ_H=1.4 and θ_L=1.2 for high and medium-low land aptitude instead of θ=1.7. Our estimates confirm our previous conclusions. The indicator of frontier expansion (F) adjusted by distance decreased from 0.87 to 0.71. Therefore the

[72] Coloured red in Figure 3.4.d.

fall in the index that incorporates the effects of distance was greater (18.2 per cent against 15.7 per cent) and with even lower levels. These changes can be basically explained by changes to high quality land frontier expansion while the indicators for medium and low quality had only marginal variations. This exercise reinforces the accuracy of our simulations of Chapter 2.

In the case of Argentina, where land aptitude and distance are important, our indicators show that distance to centres of gravity matters when we represent land frontier expansion, and particularly so when we characterize the dynamics of the process in terms of types of land. Our agenda includes extending this analysis to other members of the "club" in next stages of the research.

5. Conclusions and final remarks

We propose alternative measures of land frontier expansion to characterize the process and understand how it differed among the settler economies. The trajectories of the countries in the "club" were not homogenous, and when these countries faced the effects of the First Globalization two patterns based on the dynamics of settlement emerge.

On the one hand, in the River Plate, land frontier expansion was persistent and it was dominated by high and medium aptitude land throughout the period, and this was also the pattern in Chile from the 1880s. On the other hand, the timing of the land frontier expansion in Australia and Canada was different. In Australia it came before the First Globalization boom, and in Canada the process only became intensive at the end of the 19th century. In addition, and in contrast to Australia, the contribution of the three types of land was important for Canada. New Zealand showed features of both patterns. Like in Australia, land frontier expansion became more dynamic before the price boom, but high aptitude land featured heavily. Nevertheless, like in Canada, all three kinds of land played their part in the expansion.

We present an illustration of the analytical effects of introducing distance into the analysis. It clearly shows that consideration of land quality instead of land aptitude would make a big contribution to improving our study. This is one of the main analytical lines we will follow in the next steps of our research.

In accordance with our theoretical framework, we can expect that the different intensity of movements by differing natural resources would have resulted in a greater worsening of income distribution in the Southern Cone of South America –where the expansion by relatively better lands was more intensive– than in Australasia and Canada. Our aim in Chapter 4 is to present our estimates of the evolution of income distribution (in the agrarian sector) to contrast our results.

Appendix to Chapter 3
Historical application of GIS tools and methodological questions

Georeferenced Information Systems (GIS) is a structure for capturing, storing, checking, retrieving, integrating, analyzing and displaying spatial information, and to coordinate data bases with maps to obtain relationships between economic and social processes and geographical locations. In recent years these systems have developed considerably in Economics but they have hardly been applied to Economic History. Academics generally share the perception that geography "explains" to a great extent the history of economies, but the main restriction in this field has been a lack of available information. Authors writing about the adverse effects of economic growth on the environment and global climatic change propose historical approaches to the geographical location of population, consumption and production in a world scale. This theoretical and empirical framework offers functional data for our purpose. We use data about two issues.

First, the "Netherlands Environmental Assessment Agency (MNP)" includes two programmes: the History Database of the Global Environment (HYDE 3.1) and the Integrated Modelling of Global Environmental Change (IMAGE). Information about population is available on their website.[73] For data about biome types we used the *Atlas of the Biosphere* from the Center for Sustainability and the Global Environment (SAGE), part of the Nelson Institute for Environmental Studies at the University of Wisconsin, Madison.[74] Georeferenced information presents data in terms of grid cells and our database represents distribution of population and biomes with a global 5x5 minute resolution. Therefore we have grid cells of 69.4 km^2, which are approximately 8.3 km in length and 11.8 km in diagonal.

The aim of this Appendix is to describe the methodological strategy developed to apply GIS tools in our analysis (Section 1), and to comment on its main limitations and on the strategies we used to circumvent them (Section 2).

1. GIS: methodological strategy

Geographic Information Systems (GIS) are computer-based systems that can deal with virtually any type of information about features that can be referenced by geographical location (Lillesand et al., 2004). They are a powerful tool for analyzing the spatial distribution of an event and how it behaves over time. Also some functions such as being able to overlay data layers from various

[73] http://www.pbl.nl/en/themasites/hyde/index.html
[74] http://www.sage.wisc.edu/atlas/

sources and to reclassify information according to preset thresholds and weighting for a particular area (conditions we wish to stress, biogeographical features, proximities to centroids) enables researchers to incorporate spatial analysis parameter modelling. Much of the power of a GIS comes from the database which contains the attribute data. This study is based on information provided by HYDE 3.1 developed under the authority of MNP with data on the population count every 10 years between 1800 and 1950, and also the biomes in the different countries considered.

We basically used a raster data model integrating gridded population (total, urban and rural counts, densities) and biome areas (gridded cropland and pasture land use) extracted with a vector mask (Klein Goldewijk, et al., 2010). The grid is made up of 8.3 km squares (69.4 km^2). In the raster (grid cell or pixel) format the location of geographic objects or conditions is defined by the row and column position of the cells they occupy. The value stored for each cell indicates the type of object or condition that is found at that location over the entire cell (Lillesand and et al., 2004).

The methodological steps included:

- To extract areas of interest from images with global population data through a mask vector for each country. In order to make this with a single source it was applied administrative boundaries shapefiles of the Free Country level and Spatial Data provided by the of Diva GIS webpage.
- Once the areas of interest were isolated, they were classified for each year based on defined thresholds (0.3861, 0.7722 and 1.5444 inhabitants/km^2). The attribute table enables us to know the number of cells and therefore the variation of population at each location for each decade.
- Another task was to extract the biome area of each country and its classification in accordance with potential for agriculture development. There were 15 different ecosystems types grouped into 6 classes in order to their suitability for agricultural production (grassland). There is also a "no qualification" class.
- Subsequently the area occupied by each group was calculated as people present at each extension for the periods of study.
- Finally, in the case of Argentina, the pixels were weighted according to the distance from the historical developed nodes identified for each land area (Buenos Aires and Tucumán).

This work was implemented using ESRI products like ArcGIS 9.3 and ArcView with Spatial Analyst Tools extension. The commands used most were "extraction" –to extract by mask, which extracts the cells of a raster that correspond to the areas defined by a mask– and "reclass", which is to reclassify the values in the raster file.

2. Critical analysis of the data: limitations and decisions

The accuracy of our land frontier expansion indicators depends critically on the original population data, and the aim of this section is to discuss the methodology and data of our source. It is an area closely related to ecology and environmental sciences and we consult articles and studies of the best Journals of the field. The interest in the historical evolution of occupied land by region of these sources is based on the consequent demand for food, services and building materials, and their consequences for the earth in terms of forestation and the conversion of land cover.

In accordance with Klein Goldewijk, et al. (2011), the historical population numbers are mainly from McEvedy & Jones (1978), Livi-Bacci (2007) and Maddison (2001). These estimates are supplemented with sub-national population numbers from Populstat (from Lahmeyer, 2004) and many other sources, including time series that were constructed for each province or state of every country of the world.[75] They obtained spatial patterns by using weighting maps based on the population density map patterns of Landscan (2006) for current time periods, and gradually replacing them, as they moved back in time, with weighted maps based on proxies such as distance to water and soil suitability. Klein Goldewijk et al. (2010) give a full description of this methodology. In recent economic history research the usual population source is Maddison (2001, 2003) and we use these data as our control variable to evaluate the accuracy of our source. When data derived from this differs in amounts greater than 5 per cent, we adjust (proportionally and by pixel) the figures to achieve perfect coherence with Maddison (2001, 2003). In Table A3.1 we present Maddison's (2001, 2003) series, data from our source (derived from the mapping processing), the ratio between the two sources and the definitive data for each country.

Table A3.1
POPULATION DATA
Total and ratios

	ARGENTINA				AUSTRALIA			
	(1)	(2)	(2)/(1)	(3)	(1)	(2)	(2)/(1)	(3)
1850	1,100,000	1,081,504	0.98	1,081,504	605,000	521,684	0.86	605,000
1860	1,405,560	1,383,622	0.98	1,383,622	1,326,000	1,180,805	0.89	1,326,000
1870	1,796,000	1,845,921	1.03	1,845,921	1,775,000	1,768,650	1.00	1,768,650
1880	2,462,376	2,462,376	1.00	2,462,376	2,197,000	2,302,783	1.05	2,302,783
1890	3,376,000	3,446,894	1.02	3,446,894	3,107,000	3,189,664	1.03	3,189,664
1900	4,693,000	4,854,945	1.03	4,854,945	3,741,000	3,817,625	1.02	3,817,625
1910	6,836,000	6,870,068	1.00	6,870,068	4,375,000	4,521,329	1.03	4,521,329
	CANADA				**CHILE**			
	(1)	(2)	(2)/(1)	(3)	(1)	(2)	(2)/(1)	(3)
1850	2,485,000	2,478,348	1.00	2,478,348	1,409,885	1,294,094	0.92	1,409,885
1860	3,369,000	3,400,058	1.01	3,400,058	1,660,659	1,663,954	1.00	1,663,954
1870	3,781,000	3,900,934	1.03	3,900,934	1,944,569	1,958,608	1.01	1,958,608
1880	4,384,000	4,557,542	1.04	4,557,542	2,264,042	2,276,984	1.01	2,276,984
1890	4,918,000	5,136,497	1.04	5,136,497	2,607,769	2,583,152	0.99	2,583,152

[75] For reasons of simplicity, current administrative units are kept constant over time and every historical source is adjusted to match the current boundaries of HYDE 3.1 (i.e. by taking fractions of former larger administrative units).

1900	5,457,000	5,563,944	1.02	5,563,944		2,958,986	2,899,299	0.98	2,899,299
1910	7,188,000	7,303,061	1.02	7,303,061		3,317,166	3,346,023	1.01	3,346,023
		NEW ZEALAND					**URUGUAY**		
	(1)	(2)	(2)/(1)	(3)		(1)	(2)	(2)/(1)	(3)
1850	90,000	311,894	3.47	90,000		132,000	133,694	1.01	133,694
1860	132,000	363,665	2.76	132,000		212,782	212,782	1.00	212,782
1870	291,000	425,275	1.46	291,000		343,000	342,607	1.00	342,607
1880	520,000	496,868	0.96	496,868		464,000	465,725	1.00	465,725
1890	665,000	662,703	1.00	662,703		686,000	686,735	1.00	686,735
1900	807,000	828,507	1.03	828,507		915,000	916,076	1.00	916,076
1910	1,045,000	993,992	0.95	993,992		1,081,000	1,048,769	0.97	1,048,769

(1)	MADDISON, Angus (2001): *A Millenial Perspective*. Development Centre Studies, Organization for Economic Cooperation and Development (Update 2009). MADDISON, Angus (2003): *The World Economy: Historical Statistics*. Paris, OECD
(2)	KLEIN GOLDEWIJK, Kees, BEUSEN, Arthur, DE VOS, Martine, and VAN DRECHT, Gerard (2011): "The HYDE 3.1 spatially explicit database of human induced land use change over the past 12,000 years". *Global Ecology and Biogeography,* 20 (1): 73-86. KLEIN GOLDEWIJK, Kees, BEUSEN, Arthur, and JANSSEN, Peter (2010): "Long term dynamic modeling of global population and built-up area in a spatially explicit way". *HYDE 3.1, The Holocene* 20 (4): 565-573.
(3)	Our Data.

The most important discrepancies between the two sources are for Australasia in the 19th century. In all cases we use Maddison (2001, 2003) for total population and rescale, by cell, the results from our source. The rest of the differences are not so great and our indicators, by construction, are not significantly sensitive to these discrepancies.

Chapter 4
Inequality patterns: concepts and measures applied to settler economies in historical perspective (1870-1913)

In Chapter 2 we proposed a complementary framework to the H-O-S model in order to explain the economic performance of settler economies during the First Globalization. In the literature it is usual to consider the evolution of GDP per capita to refer to the *curse* or the *blessing*. However, we want to go beyond this restricted concept and consider an idea that is more like a development notion, and then we will evaluate the curse or blessing in terms of economic growth and income distribution. Our hypothesis, which accords with our framework and the preliminary evidence, is that in recent settlement countries where the better land (high quality) was occupied first (or, in our terms, more intensively occupied), the worsening in income distribution was more pronounced. This evolution would be a consequence of agents obtaining greater differences in relative factor remuneration in favour of landowners and to the detriment of other income-earners (workers and capitalists). Therefore, we need to operationalize these concepts to be able to test our hypotheses empirically. Our empirical strategy –and the aim of this chapter– is to identify different distributive patterns in the settler economies so as to evaluate the likelihood of our propositions.

When we identify different "distributive patterns" in settler economies we focus on two dimensions of the distributive process in the agrarian sector. As agriculture was the most important productive activity in the settler economies and one of the main sectors that drove land frontier expansion, a study of the evolution of inequality in this sector will be of interest. We consider inequality in terms of assets –land distribution– and incomes –functional income distribution– because both dimensions have immediate relationships with our conceptual framework. They refer to the ownership of the natural resource and to the appropriation of the rents derived form it. Asset distribution in settler economies is a common subject in the literature but up to now it has scarcely been measured or analyzed from a comparative perspective. In Section 1 we discuss land distribution in settler economies –and accept regional differences in large economies– on the eve of WWI. After that, in Section 2, we present the notion of functional income distribution and discuss the existence of two distributive patterns: in the countries that were British colonies it was capitalist relationships that predominated, but those countries that were colonies of Spain economic relationships were based on agrarian rental incomes. During the period, income distribution worsened in the Australasian economies and Canada, but it worsened even more in the South American Southern Cone countries, and the two groups had different dynamics of expansion onto new land. The ex-British colonies "moved" the frontier through the worse quality land (in relative terms) or, in other terms, low and medium quality lands contributed actively in the land frontier

expansion. In addition, the process was not such persistent as in the River Plate. In Australia and New Zealand, the land frontier expansion was more intense previous to the prices boom and, in Canada, it was just notorious at the end of the 19th century. In accordance with our measures of land frontier expansion, and with support from our theoretical framework, we argue that different endowments and the productive application of natural resources explain these differences, at least partially. In Chapter 5 we will test our hypothesis and introduce the consideration of institutional arrangements to supplement our analysis.

1. Land distribution in the eve of WWI

1.1 Data and results

A question that is discussed repeatedly in the context of the historical evolution of the formation of land ownership rights in settler economies is land distribution and its consequences in terms of economic performance. What does the evidence tell us about inequality? Is it clear that, as a result of different evolutions, different distributive patterns developed?

In a recent working paper, the relationships between inequality and economic growth are reviewed in the light of new evidence. Ehrhart (2009) establishes that, in the empirical field, the econometric estimates of the direct and indirect links from initial inequality to future growth led to overall results that were rather mixed. Cross-section reduced form regressions show that inequality of wealth (human capital and land) significantly and negatively affects the future growth rate. Asset inequality turns out to be a more robust determinant of growth than income inequality. Findings from cross-section structural form estimates reveal that only the endogenous fertility approach and the explanation based on political instability are substantially supported by the data. Finally, in panel data regressions, initial inequality of assets has a significant and negative effect on the future growth rate. Similar results were obtained by Deininger & Squire (1998) and Deininger & Olinto (2000) some years ago. A study permanently referenced as Barro (2000) has been recently updated to review the relationships with a similar approach as before but better data. International data would reveal that the Kuznets' curve is a clear empirical phenomenon. A cross-country growth framework shows a negative effect from income inequality on growth, holding fixed a usual group of other explanatory variables. This effect diminishes as per capita product rises and may be positive for the richest economies (Barro, 2008:9). In the literature various different channels have been suggested to explain how inequality affects growth (political economy, imperfect capital markets, social conflicts, residence segregation, friction in factor markets, natural resources, and the creation of institutional arrangements)[76] but the debate is still open theoretically and empirically.

[76] Willebald (2006 and 2007) and Willebald & Bértola (2011) present an analysis of these relationships for settler economies in historical perspective, and now we propose a new step in this direction considering a different framework.

To compare and evaluate differences within the "club" we present land ownership inequality indicators, which include Gini and entropy indexes,[77] percentiles and average establishment size. The specifications (year, area ranges[78] and sources) are detailed in Table 4.1. The indicators are for the eve of WWI, which can be considered the "end" of the First Globalization era and is a good point in time to compare "results" (Table 4.2).

Table 4.1
SPECIFICATIONS IN THE CALCULATIONS OF LAND INEQUALITY INDICATORS

PAÍS	YEAR	AREA RANGES	SOURCE
Argentina	1914	9 classes expressed in hectares. Less than 25 26-50 51-100 101-500 501-1000 1,001-5,000 5,001-10,000 10,001-25,000 25,001 and over	REPUBLICA ARGENTINA (1916): *Tercer Censo Nacional, 1914, Argentina*. Tomo V: Explotaciones Agropecuarias. Capítulo 1: Las explotaciones agropecuarias clasificadas por escalas de extensión, pp. 3-6
Australia	1911	9 classes expressed in acres. 1-50 51-100 101-500 501-1000 1,001-5,000 5,001-10,000 10,001-20,000 20,001-50,000 50,001 and over	VAMPLEW, Wray (Ed.) (1987): *Australians: historical statistics*. Fairfax, Syme and Weldon, Canberra. Table AG 19-27 Landuse, Colonies, States and Territories, 1850-1980, p. 73.
Canada	1911	7 classes expressed in acres Under 1 1-5 5-10 11-50 51-100 101-200 201 and over	STATISTICS CANADA (1914): The Canada Year Book 1913. Ottawa. V.-Production-Agriculture pp.167-169, 171; http://www66.statcan.gc.ca/eng/acyb_c1913-eng.aspx?opt=/eng/1913/191301960169_p.%20169.pdf Table 14. Distribution of Farm Holdings, 1901-1911 Table 16. Areas occupied and Areas possible of Occupation as Farm Land Canada, 1914
Chile	1929-1930	6 classes expressed in hectares. 0-5 5-50 50-200 200-1000 1001-5000 5000 and over	DIRECCIÓN GENERAL DE ESTADÍSTICA (1933): *Censo Agropecuario 1929-1930*, Santiago de Chile. 1. Número y extensión de los predios rústicos incluidos en el Censo del año 1929-1930, por comunas, departamentos y provincias, pp. 4-7
New Zealand	1911	12 classes expressed in acres 1-10 11-50 51-100 101-200 201-320 321-640 641-1,000 1,001-5,000 5,001-10,000 10,001-20,000 20,001-50,000 50,001 and over	CENSUS AND STATISTICS OFFICE OF THE DOMINION OF NEW ZEALAND (1919): *The New Zealand Official Year-Book, 1919.* Wellington. Section XVII - Land tenure, settlement, etc. Subsection D - Occupation and Ownership of land Occupation of land, pp. 506-507.
Uruguay	1908	12 classes expressed in hectares. 0-10 11-100 101-500 501-1,000 1,001-2,500	BARRÁN, José y NAHUM, Benjamín (1977): *Historia Rural del Uruguay Moderno. Tomo VI: "La civilización ganadera bajo Batlle (1905-1914)"*. Ed. EBO, Montevideo, p. 277, based on DIRECCIÓN GENERAL DE ESTADÍSTICAS (1910): *Censo General de 1908*,

[77] See definitions in Appendix 1 to Chapter 4.
[78] The number and size of ranges or classes impose limitations on the comparison of inequality indicators. However, the differences do not determine the general conclusions.

		2,501-2,750 2,751-5,000 5,001-7,500 7501-10,000 10,001 and over	Montevideo. MILLOT, Julio y BERTINO, Magdalena (1996): *Historia Económica del Uruguay*. Tomo II (1860-1910). Ed. Fundación de Cultura Universitaria. Montevideo. Cuadro III, p. 95. DIRECCIÓN GENERAL DE ESTADÍSTICA: Anuario Estadístico de la República Oriental del Uruguay. Tomo II - Parte II, Montevideo, Propiedades rurales clasificadas por superficie, p. 1149 (total holdings exclude 285 estates with activity non-specified).

1.2 Analysis and shortcomings

When we compare two of the large economies –Argentina and Australia– we find that the former had significantly higher levels of inequality, and this result is consistent with the predominant view about high land concentration in the River Plate (see Willebald, 2006, for a review of the literature).

On the Gini Index, Argentina has a value of 0.85, which is almost 10 points higher than the value for Australia, and the sense of the discrepancy is confirmed by all entropy indices. The average sizes of holdings in the two countries were similar (531 and 552 hectares, respectively) but there are big differences between regions within these countries. In Australia, the most unequal regions were New South Wales and Tasmania, which were colonized first (see the indicators of occupied land in Chapter 3). This would be linked to the different timing of the settlements, and as the agents were learning from the process they were able later on to implement more effective policies in terms of intensification and the division of the estates. In South Australia, Western Australia and Victoria the authorities implemented a more egalitarian land ownership rights distribution system and the results were favourable. Thus this evidence brings out the structural character of land distribution and indicates that policies were effective when they were systematically implemented from the very beginning of the settlement.[79] We will discuss this point in Chapter 5. The distributive pattern in Argentina was different.

The less unequal regions differ considerably as regards the timing of their settlement –La Pampa (0.76) was colonized early and Patagonia (0.74) was colonized late– and as regards the size structure of land ownership (the average holding size in Patagonia is 9 times greater than in La Pampa). The entropy indexes confirm this perception; Patagonia had the lowest *GE(1)*, which indicates that it was a case of "equality among riches" and that policies of land intensification or division were not successful. In addition, these regions have different productive specializations (La Pampa is suitable for crops, especially wheat, and Patagonia for the wool industry) and their production scale requirements were dissimilar, which explains some of the differences between them. The most unequal region was Cuyo, a fact probably related to the long colonial history of that

[79] It is probable that certain productive features contributed in the same direction (remember the increasing mining activity during the 1850s and 1860s in these regions) but we can not be conclusive in this argument.

area and the persistence of traditional property structures.[80] These features are extensible to the entire region that has Tucumán as the centre of gravity (see Chapter 3, sub-section 3.1.3).

Table 4.2
LAND OWNERSHIP IN SETTLER ECONOMIES: INEQUALITY INDICATORS

Percentile ratios

	p90/p10	p90/p50	p10/p50	p75/p25
Argentina	73.4	9.2	0.13	20.9
Australia	129.3	6.6	0.05	17.4
Canada	155.6	3.1	0.02	4.9
Chile	64.3	5.6	0.09	11.5
New Zealand	180.3	10.4	0.06	9.3
Uruguay	148.6	9.9	0.07	6.7

Generalized Entropy indices (GE), Gini coefficients and holding average size

	GE(-1)	GE(0)	GE(1)	GE(2)	Gini	Avg. Size (Hectares)
Argentina	11.11	1.99	2.07	14.37	0.85	531
La Pampa	*4.51*	*1.36*	*1.61*	*9.78*	*0.76*	*355*
North East	*10.76*	*2.23*	*2.13*	*12.08*	*0.88*	*515*
North West	*19.22*	*2.56*	*2.06*	*9.84*	*0.88*	*621*
Cuyo	*38.83*	*3.34*	*3.06*	*30.48*	*0.94*	*666*
Patagonia	*20.50*	*1.71*	*1.22*	*2.91*	*0.74*	*3,285*
Australia	6.87	1.52	1.50	10.30	0.76	552
New South Wales	*9.83*	*1.89*	*1.95*	*15.26*	*0.82*	*591*
Victoria	*3.31*	*1.04*	*0.95*	*3.22*	*0.65*	*426*
South Australia	*5.63*	*1.25*	*0.97*	*2.92*	*0.66*	*550*
Western Australia	*10.74*	*1.31*	*0.95*	*3.55*	*0.64*	*993*
Tasmania	*4.96*	*1.56*	*1.93*	*21.71*	*0.80*	*417*
Federal	*7.30*	*1.52*	*1.58*	*5.43*	*0.78*	*1,232*
Canada	5.42	0.74	0.46	0.52	0.50	154
Prince Edward Island	*1.64*	*0.42*	*0.30*	*0.35*	*0.40*	*84*
Nova Scotia	*3.62*	*0.84*	*0.60*	*0.78*	*0.57*	*98*
New Brunswick	*2.25*	*0.58*	*0.46*	*0.58*	*0.50*	*119*
Quebec	*4.42*	*0.62*	*0.32*	*0.29*	*0.42*	*98*
Ontario	*4.78*	*0.75*	*0.47*	*0.58*	*0.50*	*97*
Manitoba	*6.07*	*0.51*	*0.26*	*0.22*	*0.35*	*271*
Saskatchewan	*0.86*	*0.20*	*0.16*	*0.15*	*0.27*	*297*
Alberta	*2.01*	*0.29*	*0.21*	*0.21*	*0.32*	*289*
British Columbia	*10.73*	*1.59*	*1.10*	*1.73*	*0.73*	*138*
Chile	25.16	2.85	3.48	49.99	0.93	187
New Zealand	16.75	2.01	2.13	21.44	0.83	220
Uruguay	7.73	1.52	1.37	4.31	0.77	394

Regions of Argentina: (i) La Pampa: Buenos Aires, Córdoba, Entre Ríos and Santa Fe; (ii) North East: Corrientes, Chaco, Formosa and Misiones; (iii) North West: Catamarca, Jujuy, La Rioja, Los Andes, Salta, Santiago del Estero, Tucumán; (iv) Cuyo: Mendoza, San Juan and San Luis; (v) Patagonia: Chubut, Neuquén, Río Negro, Santa Cruz and Tierra del Fuego.

Source: see Table 4.1.

[80] The cities of Mendoza and San Juan were founded in 1561 and 1562 as part of the expansion of Chile under the authority of the Viceroyalty of Peru. Buenos Aires was founded later (1580) –after a failed attempt in 1536– as an

The situation in Canada was quite equitable; its Gini Index value was only 0.50, which contrasts sharply with that of the Anglo-Saxon countries in the southern hemisphere. "Even the strictest enforcement of the conditions that the selection laws prescribed could not have made Australia a nation of small independent farmers such as grew in this country [the US] and Canada". (Burt, 1965:75). The eastern provinces (Prince Edward Island, Nova Scotia and New Brunswick) had small estates and their rating fluctuated around the average for the economy as a whole. But the really interesting point is that the provinces that were formed at the end of the 19th century through land frontier expansion (Manitoba, Saskatchewan and Alberta) had values close to 0.32 (simple average). The land ownership regime in these provinces was based on the farming system and holding sizes were in accordance with productive requirements (these holding sizes are the biggest in Canada and close to the sizes in La Pampa, in Argentina[81]). Finally, British Columbia had a distributive pattern close to other settler economies but its holding sizes were below average.

When we compare the small economies –New Zealand and Uruguay– our results initially contradict the high-concentration distributive pattern in the River Plate region that we noted in the analysis of Argentina and Australia. In New Zealand the authorities made efforts to implement distributive land policies (see Chapter 5) but the Gini index remained at high levels (0.83 against 0.77). However, the two countries were very different as regards average holding size. The indicator for Uruguay was almost 80 percent greater that the ratio for New Zealand, which indicates that the two countries had very different property size structures (see Álvarez, 2008, for an approach to this question). Starting in the 1890s, the authorities in New Zealand made an effort to break up the large estates and establish a holding size structure more suitable for the new economic conditions, especially the changes wrought by the introduction of refrigeration, the expansion of the dairy industry and the introduction of cooperative land tenure systems. The evolution of the indicators gives a clear picture. In 1891, the values of the Gini index and the *GE(0)* were very similar to their 1911 levels (0.84 and 2, respectively) but *GE(1)* decreased (from 2.26 to 2.13), which indicates changes in the higher segments of the distribution.[82] Rural changes was speeded up by further enabling legislation in the early 1890s and by the opening of large areas of crown land in North Island, which had hitherto been preserved from falling under the control of the big sheep farmers by Maori resistance. New Zealand then became a nation increasingly dominated by small independent farmers who formed the backbone of society. This achievement is in striking contrast to what

autonomous development linked to Atlantic Ocean trade, and it had a secondary economic role until the 19th century.

[81] The average holding size in the "West" of Canada was 80 per cent of that of La Pampa. It was the region most similar to Argentina as regards production –land quality, crops and comparable technological options– and this would explain why their productive requirements looked alike.

[82] Entropy indices *E(c)* are a "family" of indicators where *c* is a parameter (positive). As *c* decreases, *E* becomes more sensitive to transfers in the low segment of the distribution. Then *E(1)* is more sensitive to changes in the situation of "rich" people (in this case, with much land) and *E(0)* is a better reflection of changes among "poor" agents.

happened in Australia but it is not at all surprising because New Zealand had what Australia lacked: a combination of soil and climate that was ideal for close agricultural settlement (Burt, 1965).[83] Another interesting aspect that highlights the importance of the regional differences is the comparison between Uruguay and La Pampa in Argentina. Gini Indexes (0.77 and 0.76) and holding sizes (394 and 355, respectively) were similar and this probably indicates comparable productive specializations and land ownership structures. Lastly, on the eve of the Great Depression (1929-1930), Chile's Gini Index was over 0.9, which was the outcome of a long-run evolution in which the colonial heritage and the political power elite combined to maintain high levels of inequality in its various dimensions (incomes, productive activities and assets) (see Bértola and Rodríguez Weber, 2009; Rodríguez Weber, 2009; and Rodríguez Weber and Willebald, 2010).

The Kuznets' indicators (percentile ratios) clearly confirm that the "shapes" of the distributions are not uniform and there are several features that make it difficult to find clear patterns. For instance, the narrowest gaps between the rich and the poor (the lowest *p90/p10*) were in Argentina and Chile, but according to the Gini Index these were the most unequal economies in the group. In contrast, the third most unequal country (New Zealand) had the highest indicator. Land inequality in Australia and Uruguay was very similar, and the gap between rich and poor was also comparable, but there are big (and contradictory) differences in other percentile ratios. Finally, the most equitable economy –Canada– had the lowest value for the middle segments (*p75/p25*), which confirms a distribution with low concentration. These warnings are not new. Willebald & Bértola (2011) find that differences in land distribution in the "club" are not enough to explain differences in economic performance. Their analysis suggests that the dynamics of the generation of incomes is a better approach when it comes to explaining these differences.

In other recent literature there are criticisms of the empirical approach to this question. Measures of land inequality only capture inequality among landholders and ignore people who do not have land (Erickson & Vollrath, 2004). Besides this, it is probable that the dispersion of the proprietors' income was low and stable, which undermines the representativeness of the effect of inequality on economic performance. Therefore we supplement our analysis by considering the evolution of functional income distribution in the agrarian sector as the second dimension of the distributive pattern of settler economies in the period.

2. Agrarian functional income distribution

In the recent literature, research into inequality trends in countries that participated in the global economy in the second half of the 19th century and up to WWI looks at two kinds of empirical

[83] Our analysis of inequality indexes does not consider differences in types of lands. In nexts steps of the research we will include land adjusted by quality in the calculations of the index, so as to reflect different agricultural conditions.

evidence. First, it considers the relative evolution of factor prices –typically land rental/unskilled wage (*r/w*)– and incomes –average income by worker/unskilled wage (*y/w*). Second, recently there have been efforts to estimate inequality directly from the economic conditions of the population and poverty in the long run, using diverse indices (see the review in Chapter 2). As a third alternative we work with estimates of functional income distribution, an intermediate line that circumvents the limitations of the first approach (we pay attention to the simultaneous movements in earn rates and quantity of the productive factors) and contributes to the second one by adding details to the characterization (especially because we include sector considerations).

Functional income distribution is a depiction of how income (at the national or sector level) is distributed among the different groups involved in production. As a result, it shows how incomes earned by the owners of the various factors of production (labour, land and capital) are shared out in terms of remuneration (or wages), land rents and profits (dividends or interests). Therefore, in these terms, not only it is important to consider the evolution of the different earning rates (which is what the recent literature is concerned with) but we should also take account of changes in the quantities of factors applied to production. When we consider that agriculture was the main productive sector in the settler economies, and together with its productive linkages it was the main strength in the economic boom at the end of the 19th century, then a study of the evolution of income distribution in this sector will yield some interesting insights.

We estimate functional income distribution in the agrarian sector during the First Globalization (from 1870 to the eve of WWI) in our settler economies (Argentina, Australia, Canada, Chile, New Zealand and Uruguay). More specifically, we survey and estimate the agrarian product, wages and total land incomes in the agrarian sector while the profits were obtained as a residual. We select benchmark years in accordance with the long run evolution of the settler economies and the information available. We choose years that correspond to points in time prior to the strong expansion in the 1870s and 1880s, in the "initial boom" in the 1890s and in the period before WWI. Our sources and methodology to construct the series are given in detail in the Appendix 2 to Chapter 4. In the recent literature, attempts have been made to introduce these categories into the historical analysis by Álvarez (2008), Álvarez, et al. (2011) (both for New Zealand and Uruguay) and Álvarez & Willebald (2009) (for Argentina, Australia, New Zealand and Uruguay). Now we improve our estimates with more and better sources and thus make our assumptions more precise, and we can extend the analysis to include more countries (Canada and Chile).

2.1 Two distributive patterns

We can identify two "patterns" in the average for the period (see Table 4.3). In the countries in the South American Southern Cone –the River Plate countries (Argentina and Uruguay) and Chile–

income composition is dominated by land rents, with shares of over half total agrarian income. On the other hand, this share is smaller in Canada and New Zealand, with ratios of 47 and 43 per cent, respectively, and Australia with an average of 50 per cent. This relatively smaller share for land rents contrasts with the situation in the Southern Cone, but with different modalities.

Table 4.3
AGRARIAN SECTOR: FUNCTIONAL INCOME DISTRIBUTION
Shares on the total Agrarian GDP (%)

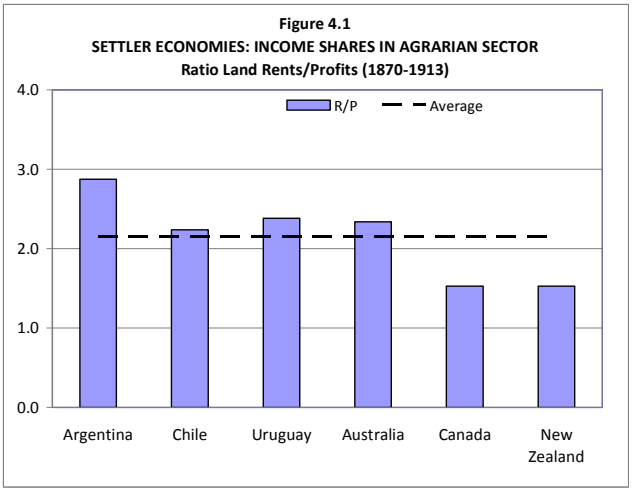
	ARGENTINA				AUSTRALIA		
	Wage	Rent	Profit		Wage	Rent	Profit
1869	34%	54%	12%	**1871**	31%	51%	18%
1875	27%	59%	14%	**1881**	28%	46%	26%
1888	32%	48%	21%	**1891**	26%	60%	14%
1895	24%	41%	35%	**1901**	34%	53%	13%
1914	21%	67%	12%	**1911**	25%	39%	36%
Average	**28%**	**54%**	**19%**	**Average**	**29%**	**50%**	**21%**
	CANADA				**CHILE**		
	Wage	Rent	Profit		Wage	Rent	Profit
1871	22%	48%	30%	**1875**	18%	61%	21%
1881	23%	44%	33%	**1885**	14%	57%	29%
1891	27%	55%	19%	**1895**	17%	62%	20%
1901	20%	37%	43%	**1907**	21%	49%	30%
1911	21%	50%	29%	**1915**	15%	57%	28%
Average	**23%**	**47%**	**31%**	**Average**	**17%**	**57%**	**26%**
	NEW ZEALAND				**URUGUAY**		
	Wage	Rent	Profit		Wage	Rent	Profit
1874	23%	33%	44%	**1874**	37%	46%	17%
1881	35%	42%	22%	**1883**	26%	49%	24%
1891	30%	41%	29%	**1893**	21%	49%	29%
1901	26%	48%	26%	**1903**	25%	48%	27%
1911	30%	51%	20%	**1912**	21%	68%	11%
Average	**29%**	**43%**	**28%**	**Average**	**26%**	**52%**	**22%**

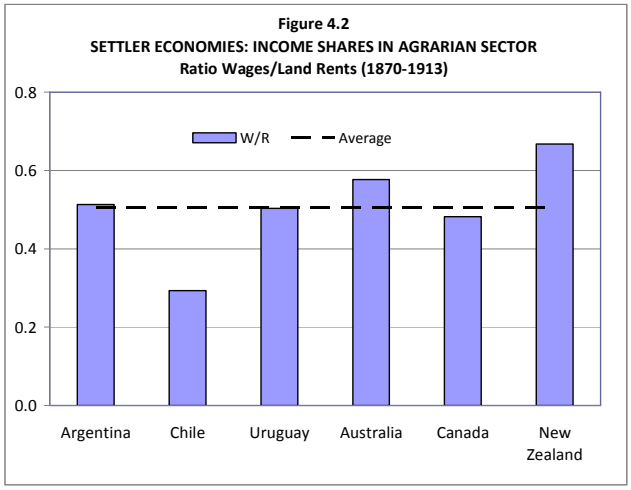
Source: see Appendix 2 to Chapter 4.

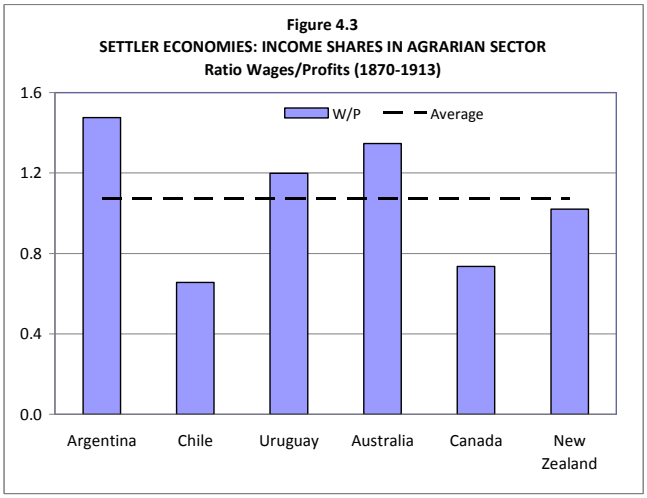
On the one hand, in Australasia there was higher total wages in the agrarian sector, with ratios of almost 30 per cent. The "Australian settlers ranged in a gamut extending from the humble poor to the propertied middle class … More of the upper class was omitted from the fragment of British society which was Australia. The working classes predominated in its founding, and their attitudes were of a special character." (Rosecrance, 1964: 282). In Australia, "…the cleavage between labour and capital was much more pronounced than in North America. Even farming was more capitalist … The average Australian was not his own economic boss. He was a wage earner, like the native of Britain…" (Burt, 1965: 75). On the other hand, the high share of profits in the Canadian distribution (an average of more than 30 per cent) can probably be explained by the fact that there were many family farms and small producers so property capital was a significant income source. New Zealand was very like Australia except that it had more intensive and more effective land policies, (at least

from 1890 onwards; see Chapter 5) and its pattern of high wages and profits make its income structure comparable to that of Canada.

One problem in evaluating the structure of income distribution is that the three components are all moving at the same time and the proportions change in diverse directions. To help understand the figures, we present indicators that relate income shares: land rents/profits (*R/P*), wage/land rents (*W/R*), and wage/profits (*W/P*) (see Figures 4.1, 4.2 and 4.3). In the graphs, to illustrate the differences we show the averages in the period for each ratio compared to the mean for the "club".[84]







Source: see Appendix 2 to Chapter 4.

R/P ratios are significantly higher in the River Plate, Chile and Australia than in New Zealand and Canada (Figure 4.1). Argentina (2.8), Chile (2.2), Uruguay (2.4) and Australia (2.3) had ratios where the land rent share was more than twice the profit share. Note that the ratios for New Zealand and Canada have a narrower gap (1.5 in both cases). At the same time, when we consider *W/R* ratios the "club" has a similar profile in which land rental predominates over wages (ratios lower than 1), although the Southern Cone shows the more intensive pattern. Canada has the same characteristic

[84] Strictly speaking, the graphs do not cover the period 1870-1913 but they consider data from the 1870s to around WWI.

while Australia and New Zealand present the contrary feature, with relatively higher wages (Figure 4.2). The relatively lower land rents in New Zealand are a common result in the comparison with profits and wages, while this outcome is true in the case of Australia and Canada when we compare rents with, respectively, wages and profits (Figure 4.3). It is interesting to distinguish between two distributive patterns. In one of them, the Spanish ex-colonies, the economic relationships based on agrarian rental incomes predominated, and in the other, the British ex-colonies, where capitalist relationships were predominant and encouraged the dynamics of larger markets.

In economies in which a large proportion of the total wealth is in the form of land, total savings can be used either to accumulate capital and attend to market demand or to invest in land (Kurz & Salvadori, 1995; Foley & Michl, 1999). When land is still relatively abundant, investment in this asset is aimed at reaping the benefits that would come from rising land prices. As land prices go up, owners of capital spend a larger part of their wealth on land, and this slows down capital accumulation. On the other hand, when land is not abundant –the frontier is closed– rises in land rents depress profits and boost capital expenditure up to the point at which investment in physical capital virtually stops. In both cases resources are diverted from their alternative destination –capital accumulation– in a sense very close to the idea of the crowding out approach to the curse of an abundance of natural resources (see Chapter 1) and it bases our interest on a "rentist income structure" in some of the members of the "club". When we consider that capital accumulation is one of the main sources of growth and technical change, economies in which land rents and/or opportunities for land speculation are greater, they will find obstacles to the structural change which will affect development in the long run. This expectative is not incompatible with stages of economic growth during the period of land frontier expansion. Difficulties arose when this incorporation of "new" productive factor ran out its influence and the economies faced the challenge of the industrialization. In our framework, these differences between economies may be understood in terms of the possibility of land to generate differential rents –more favourable on higher quality land– and the quality of the institutions that can moderate the "curse".

2.2 Income evolution in the face of the First Globalization

What was the impact of the First Globalization? Or more specifically, what were the reactions to the price boom in the 1890s to WWI period? Again, instead of comparing wages and land rental rates as is proposed in the more extended literature (Williamson, 2000, 2002, was the precursor of extensive literature on this subject[85]), we can contrast the evolutions of total wages, rents and profits. This approach differs from the traditional analysis because our ratios include the double effect of changes in earning rates (wages, land rentals, profit rates) and in the number of earners

[85] See Chapter 1, Section 1, for a review.

(workers, hectares and capital units).[86] Considering that landowners are a minimal proportion of the population –and that these economies expanded during the period– the increasing share of land rental against wages (and profits) represents worsening inequality. However, the relation between profits and wages in the agrarian sector is not so evident. Estimates of the number of "capitalists" are even more imprecise than estimates of the number of workers, and the farm ownership structure means there are overlaps in these productive roles. In other words, while in some regions "capitalists", "workers" and "landowners" are clearly different agents, in others (especially where family farms predominate) the returns to capital and labour can accrue to the same individual. Then, to focus the discussion on income distribution, we do not consider the *W/P* ratio as a reference and we take *R/P* because we want to catch the "rentist" character of the agrarian sector. Therefore, in our exercise we compare land rentals with wages (*R/W*) and profits (*R/P*). In both cases it is important to consider levels (by what factor do total rents exceed total wages and total profits?) and the evolution (rising trajectories represent a higher share for rental incomes in agrarian society). Although all settler economies underwent "rental drifts" during the First Globalization, the timing and intensity of the process was different in each case.[87]

Until the 1890s, the average in the "club" was that total land rents amounted to twice total wages,[88] but the commodity price boom and land frontier expansion in the First Globalization from the 1890s to WWI caused this ratio to increase to 2.7. The impact was not immediate; it only came after a period when the indicator decreased (see Figure 4.4). This result is consistent with our theoretical framework that considers that the incorporation of "new" land requires time and the application of resources to clear land, and this may delay the yield of the investment (which, depending on the type of the factor, may be rents or profits). At the same time, wages on the frontier may be higher for workers –wage-premium– and they may even be able to press for higher pay in other regions (see Harley, 2007, for an explanation about Canada).

Canada (Figure 4.6) had levels and followed a trend very similar to the average for the settlers' "club" (steady at around 2.1). In Australasia (Figures 4.5 and 4.8) levels were generally lower than the average although the evolutions followed different trajectories. The worsening impact in Australian income distribution was felt in the 1890s, before the other settler countries. It was probably linked to that country having an earlier process of land frontier expansion (see Chapter 3). Afterwards the ratio returned to the previous level. In New Zealand, worsening income distribution

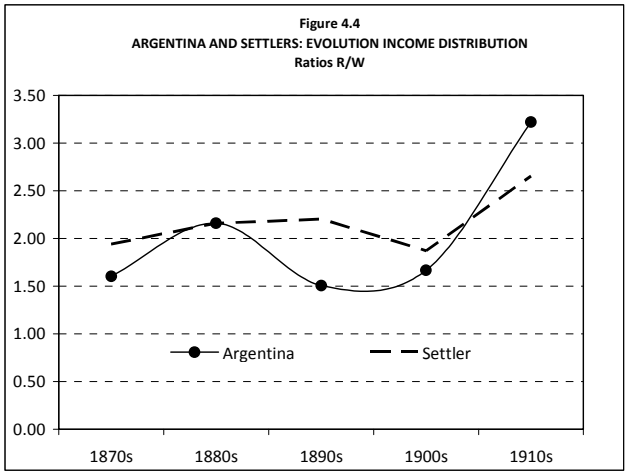
[86] We are assuming that the different groups are homogenous and the dispersion within the group is low. This simplification may lead to errors when the economies become more "sophisticated", and when the owners of productive factors combine the roles of workers, capitalists and landowners. Our countries preserved features of traditional economies during the period so our assumption should not bias the results.

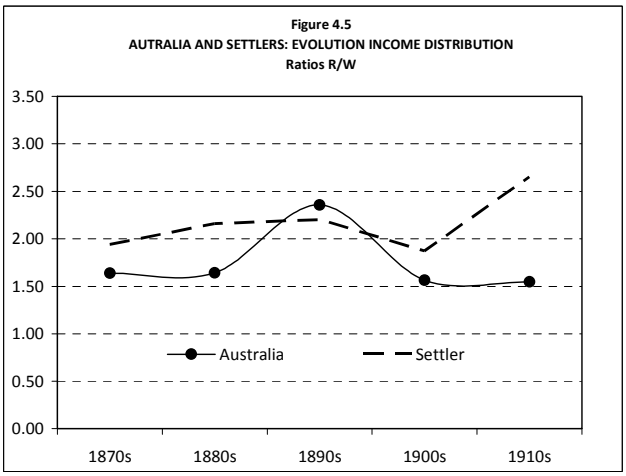
[87] Arroyo (2008) discusses a similar non-uniform evolution of the land rental/wage ratio when she extends the analysis to the decades prior to 1870.

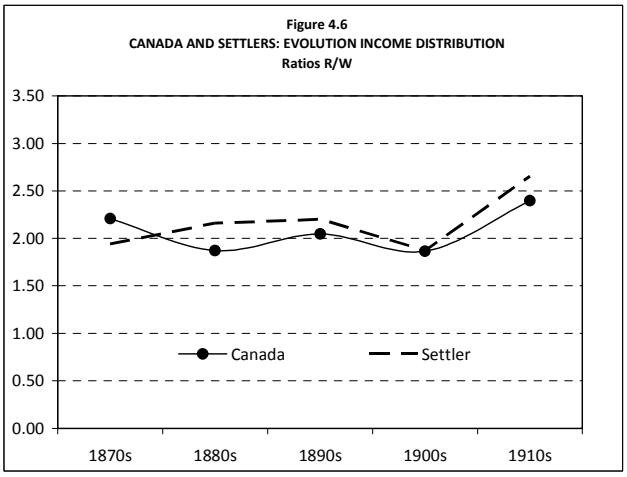
[88] The average ratio for the 1870s was 1.94, for the 1880s it was 2.16, and for the 1890s it was 2.10.

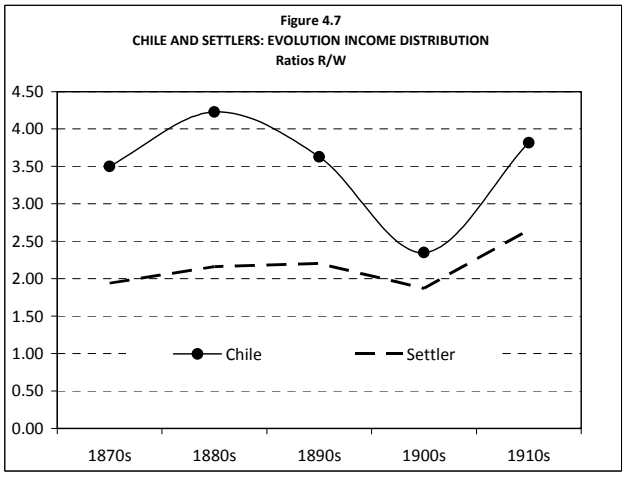
was persistent, but it started from very low levels and did not reach the ratios of the River Plate on the eve of WWI. This process of worsening moderated at the beginning of the 20th century, a fact that is consistent with the intensification and subdivision of estates in that period (see Chapter 5).

In Argentina, the impact of the price boom on inequality raised the indicator to 3.3 (Figure 4.4) and in Uruguay to 3.2 (Figure 4.9). Income distribution in Chile improved during the closing decades of the 19th century but this trend was reversed in the first decade of 20th. Chile began the 1900s with the highest levels and the previous improvement was associated with changes outside agriculture. Frontier expansion in the 1880s and 1890s was led by mining (in the North), and the competitive effects on the labour market made for upward pressure in other sectors.[89]





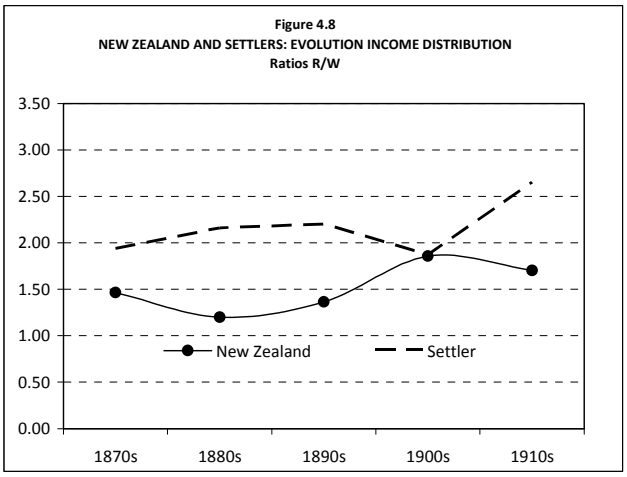


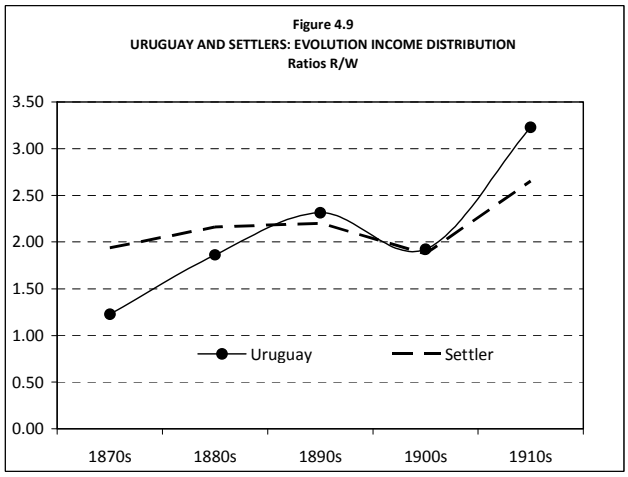


These trajectories are correlated with our findings about land frontier expansion in Chapter 3. In Argentina, Uruguay and New Zealand income distribution clearly worsened (from different levels) and they are precisely the economies that extended their frontiers to the "best" aptitude lands. At the same time, Chile's income distribution evolution was not homogenous with a strong worsening in

[89] See Rodríguez Weber (2009) and Bértola and Rodríguez Weber (2009) for an extensive analysis of the evolution of income distribution in Chile from the mid-19th century to 1930. See Rodríguez Weber and Willebald (2010) for an analysis of the evolution of agrarian functional income distribution in Chile during the First Globalization.

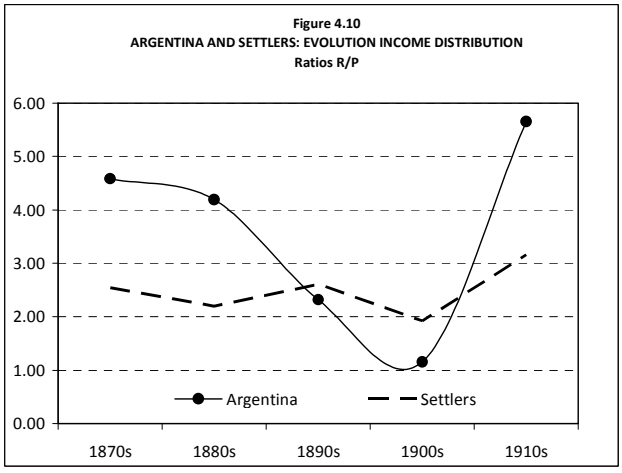
the end of the period, which is consistent with the irregular trajectory of its land frontier expansion that affected several sectors (mining and agriculture). Finally, the relatively moderate frontier expansion in Canada and Australia, with high contributions of medium and low quality lands, seems coherent with a steady movement in income evolution.

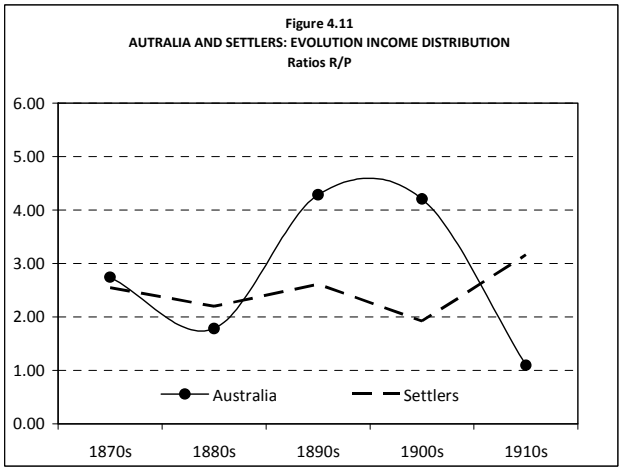




Source: see Appendix 2 to Chapter 4.

Until the 1880s, the difference between total land rentals and profits was greater than the difference between total land rents and wages (by a factor of 2.3[90]) in the "club" and income distribution worsened to an equivalent extent (the ratio increased to 3.1 in the 1910s). The First Globalization had huge impacts in terms of the accumulation of land and capital and their returns, and the general rule was for pressure to make income distribution worse. However, unlike in the previous case, the representativeness of the average is lower and the differences between each economy and the mean of the "club" were marked, especially in the cases of Argentina (Figure 4.10), Australia (Figure 4.11) and Uruguay (Figure 4.15).

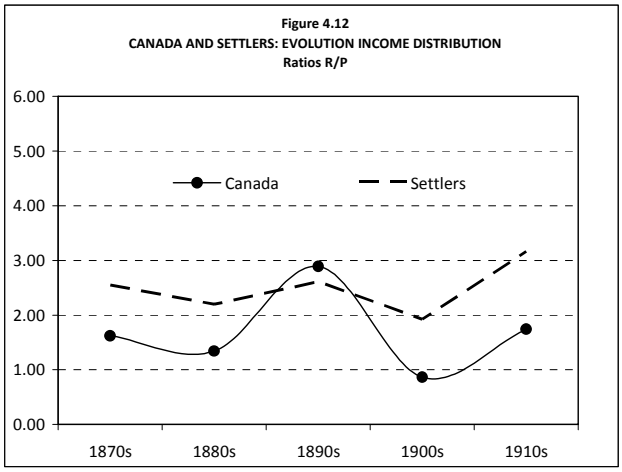


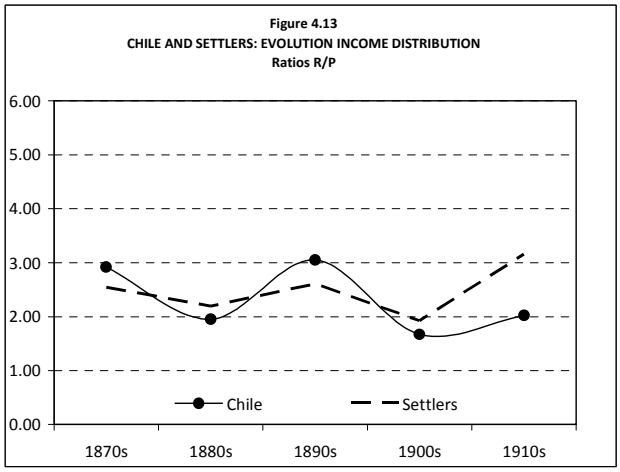


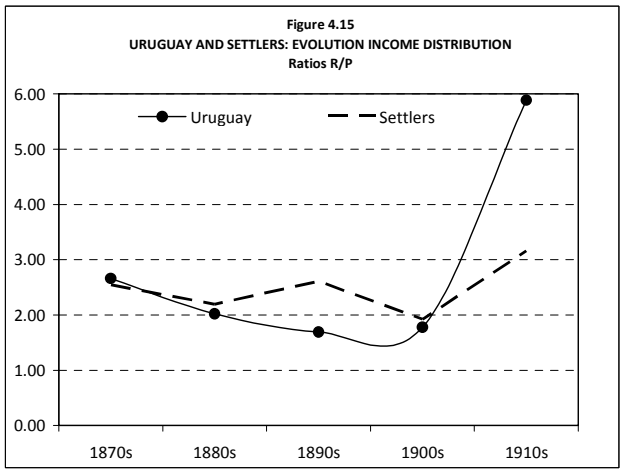
In the River Plate the pattern was similar. In a process that might be a result of the increasing capitalization of agrarian activity (wire fences, buildings, irrigation channels), both indicators fell

[90] The average ratio for the 1870s was 2.55 and for the 1880s it was 2.20.

up to the end of the 19th century. The impact of the price boom and land frontier expansion made for a significant rise in the index until it reached levels where rents almost 6 times profit shares. However, Australia showed an inverse evolution, and starting in the 1890s with values between 4 and 5, the share of rents on profits decreased until similar values were reached (the ratio in the 1910s was almost 1). The capitalization of Australian agriculture and the "desire to change the environment" (Williams, 1975:87), which became very noticeable in the closing decades of the 19th century, were led by the mechanization of production, the construction of irrigation systems and the progressively increasing use of fertilizers and special varieties of cereals that made for increasing profits. The evolution in Canada (Figure 4.12) and New Zealand (Figure 4.14) was predominantly below the settler average, which denotes an income structure where rents exceed profits with a narrower gap. In other words, they were less "rentist" and more "capitalist" economies than the others. Finally, Chile (Figure 4.13) had a similar trajectory to the mean of the club, which confirms that the main component in the inequality was the difference between landowners and workers (Figure 4.7). The capitalization in the agriculture only became important in the 20th century, and its effect would be very marked in the subsequent decades (see Rodriguez Weber & Willebald, 2010).







Source: see Appendix 2 to Chapter 4.

It is important to consider that in our methodological approach total profits are estimated by difference. Therefore, strictly speaking, it is a variable that reflects not only total profits but estimation errors as well. We believe that the directions of the trends are correct, but it is possible that changes may have exaggerated the processes. This point is very important and we will enlarge upon it next stages of our research about settler economies and economic development. In particular, the debate as to whether economic growth is profit-led or wage-led [91] seems an attractive question to analyze and has a bearing on the long-run performance of the "club" and the creation of "(post) staples economies" in the second half of the 20th century (Wellstead, 2007).

3. Final remarks

Our analysis makes three main contributions, one of them in the empirical field and the others in analytical matters. In empirical terms, we present original estimates of functional income distribution in the agrarian sector of settler economies and we do comparative exercises with them. Calculation methodology, sources and assumptions are presented in the Appendix 2 to this Chapter.

We make two contributions to advance in analytical fields. First, the impact of the First Globalization on natural resource abundant (land-abundant) economies in terms of inequality was that income distribution worsened, and in this finding we are consistent with the more extended evidence (although we are working with a different framework). Our estimates for the agrarian sector in the club show that wages and profits trended to lose share in sector income while land rentals gained (in a process that we call "rental drifts"). This evolution was clearer in the River Plate economies and Chile than in Australasia and Canada, where the evidence is mixed and the distribution among proprietors of productive factors varied. Second, it is interesting to distinguish between two distributive patterns. In one, the former British colonies, capitalist relations (related to profits) and broader markets (related to wages) were relatively predominant, but in the other, the ex-colonies of Spain, economic relations were based on agrarian rental incomes. However, the trajectories of the club members were not uniform and they were affected in numerous ways, and our aim is to determine how the dynamics of land frontier expansion was probably one of the main factors in these different influences.

The availability of land resources was the main comparative advantage that enabled these economies to participate in world commodity markets and was the basis for their export-led growth strategy. But at the same time the First Globalization created pressure to increase inequality. This pressure was expressed as a wider gap between land rentals and other income modalities (wages and profits), a process that combined rising rental rates and the expansion of the productive factor

[91] See Bhaduri (2008) for a recent discussion of this concept.

more intensively used to produce food and raw materials (land reacts endogenously to improvements in the terms of trade). However, the natural endowments of the settler economies in the "club" were not homogenous throughout their respective territories, and this made for differing results. In our theoretical framework, moving the land frontier onto the "best" land would foster the adverse effects on inequality because it would enable a reduced segment of the population (landowners) to capture increasing rents. The more intensive worsening in income distribution in the agrarian sector in the River Plate was associated with the different timing of land frontier expansion onto land that was better as regards agricultural aptitude and distance. However, the effects of an abundance of natural resources on economic development are not determined by resource endowments alone; we must consider institutional factors so as to make the explanation more complete. The prevailing conditions contributed to the creation of a "*rentist*" pattern in Spain's ex-colonies, where land ownership ensured the elite received incomes without having to make large investments in production, and because land concentration was high due to the colonial heritage (Bértola et al, 2010). In other words, land frontier expansion occurred at the same time that the institutional arrangements that created a new land ownership rights system were set up. This will be our central theme in Chapter 5.

Willebald & Bértola (2011) analyze the impact of income and land distribution on the economic performance of settler economies, and they say that "…the fact that the distribution of land ownership has little explanatory power would suggest, as a first approach, that it is the generation of income flows, acting together with the incorporation of capital –in its various modalities– that creates the dynamics of demand that impacts on trade and productive specialization." Like in that article, we find that in the "club" of settler economies there are clear differences in the evolution of inequality when we evaluate incomes, but the differences are less marked when we consider land ownership. These authors argue that it is also possible that, even in countries where competitiveness was highly dependent on natural resources, other forms of capital ownership might be more significant for wealth distribution, such as financial assets, urban property or industries processing primary products. Our analysis sheds new light on this question.

The literature has concentrated on land ownership and not paid enough attention to the quality of land factor. We introduce this aspect into the discussion and consider agrarian aptitude, and the interaction with institutional quality. The appropriability problem arises when it is possible to capture huge rental differentials in the process of land frontier expansion. If institutions give legitimacy to this trajectory, income distribution will worsen more intensively. This was what happened in the settler economies in the South American Southern Cone. The evolution was more related to the generation of incomes than to the ownership of land, it was a process that involved all

agents regardless of whether or not they were proprietors, and the generation of wealth involved the participation of assets other than land, such as railways, ports, financial support and agrarian machinery. We deal with this subject in greater depth in Chapter 5.

Appendix 1 to Chapter 4
Inequality measures

1. Gini Index

The Gini Index is the average difference between all possible pairs of incomes in the population, expressed as a proportion of total income.[92] Considering the population size as *n*, the income (from other assets) of person *i* as y_i –with *i = 1, ..., n*–, and $\bar{y}$ as the average income,[93] we define Gini Index (*G*) in the following terms (Cowell, 2008:147):

$$G = \frac{1}{2n^2\bar{y}}\sum_{i=1}^{n}\sum_{j=1}^{n}\left|y_i - y_j\right|$$

With $0<G<\frac{n-1}{n}$, and where higher values of *G* represent increasing inequality.

2. Generalized Entropy indexes

Generalized Entropy indexes are a family of indicators derived from the Information Theory that simultaneously satisfies the properties of the weak principle of transfers, decomposability, scale independence and the population principle (Cowell, 2008: 50-63). It may be expressed as follows:

$$E_\theta = \frac{1}{\theta^2-\theta}\left[\frac{1}{n}\sum_{i=1}^{n}\left[\frac{y_i}{\bar{y}}\right]^\theta - 1\right]$$

Where θ is a real parameter that may be given any value, positive, zero or negative, and higher values of E_θ represent increasing inequality. The maximum value of E_θ is ∞ if $\theta \leq 0$ and $\frac{n^{\theta-1}-1}{\theta^2-\theta}$ in other cases.

[92] The Gini Index is usually defined from consideration of proportions of areas in the Lorenz Curve.
[93] In our exercises we use the hectares of land that a person posses as y_i (and the average) in the following formulation.

Appendix 2 to Chapter 4
Functional income distribution: estimation methodology, sources and assumptions

1. Introduction

We estimate the functional income distribution of the agrarian sector during the First Globalization –from 1870 to the WWI– in selected settler economies (Argentina, Australia, Canada, Chile, New Zealand and Uruguay), and we take one year from each decade as a benchmark. We choose years that represent points in time prior to the strong expansion (the 1870s and 1880s), the "initial boom" (during the 1890s) and the period before WWI. The available information on the settler economies varies, both in quantity and quality, and we need to make several assumptions and specific calculations to obtain compatible estimates. Our aim in this Appendix is to describe the estimation method and the different decisions we made. We survey and estimate the agrarian product, wages and total land rents in the agrarian sector. Profits were obtained as a residual in all the cases. In general, the evolution of the variables at current prices is irregular. As far as possible we smooth out the series by calculating 3-year averages to reduce the risk of taking an abnormal year as a benchmark, and we take the middle year of the three to name out mark. We usually use reverse chronological order starting with a benchmark year for the 1910s. Our decision to take some year close to WWI as a reference is based on the availability of data about the diverse components of the aggregated variables. Information from the previous decades is scarce and it is usually necessary to use indirect indicators. We select a year in each decade as a benchmark on the basis of information availability criteria and we explain this point separately for each country.

In this introduction we outline the general themes and aspects that are common to all our economies and we organize our material by country (in sections) and by variable and period (in subsections). Each section includes details of (i) agrarian product, (ii) rents, and (iii) wages, although the ordering within each subsection differs depending on what is most suitable for the explanation. At the end of Appendix there are bibliographical references classify by section.

1.1 Agrarian income

To measure agrarian income we consider the gross domestic product (GDP) of the activity according to official data and the best available estimates. We have annual estimates at current prices for Australia, Canada and Uruguay, at constant prices for Argentina and Chile, and estimates of other variables for New Zealand that we associate with agrarian GDP. We have estimates of agrarian income for Uruguay and Chile. We use these data to calculate some components of the total distribution, but as we have agrarian GDP for the other countries we work with GDP to maintain homogeneity within the sample. We will refer to agrarian income as agrarian product.

1.2 Land income

In a previous study (Álvarez & Willebald, 2009), to measure land income we followed Dwyer (2003) and Gaffney (1970). In general, when the value of land is stable, land income is the annual rental for the land. However, when land value increases, the future rentals for land are expected to be higher. As a result, land has two types of yields or returns, one directly associated with the productive activity and the other with land value appreciation (like in the case of an investment). (see Carmona & Rosés, 2009, for a discussion). There is little reliable historical data available about this so researchers usually adopt a conservative 5 per cent fixed rental yield and add a percentage to represent the accrual of future rentals. However, this method introduces too many assumptions and as far as possible we have used a different approach to estimating land income.

Our aim is to calculate rents in terms of the earnings remuneration of land as a productive factor regardless of whether or not the land has been rented. Therefore we consider the total of land used for agricultural production (cultivated land and pasture) and measures of the rental rate per surface unit (hectares or acres). In order to consider the differences as regards the quality and relative remoteness of land we include in our estimation the geographical differential value of the land and its rental rates. This is especially important when dealing with large economies such as Argentina, Australia and Canada. In this sense, we follow the Ricardian concept of land rent.

> "Rent is that portion of the produce of the earth which is paid to the landlord for the use of the original and indestructible powers of the soil. It is often, however, confounded with the interest and profit of capital, and in popular language the term is applied to whatever is annually paid by a farmer to his landlord. If, of two adjoining farms of the same extension and of the same natural fertility, one had all the convenience of farm buildings, and was properly drained and manured, and advantageously divided by hedges, fences and walls, while the other had none of these advantages, more remuneration would naturally be paid for the use of one than for the use of the other; yet in both cases this remuneration would be called rent. But it is evident, that only a portion of the money paid annually for the improved farm would be given for the original and indestructible powers of the soil; the other portion would be paid for the use of the capital which had been employed to ameliorate the quality of the land and to erect such buildings as were necessary to secure and preserve the produce." [Ricardo (1821 [2010]), Ch.2:5].

However, it is usually very difficult to distinguish between land and land improvements, and sometimes our data include some components that exceed the strict concept "of the original and indestructible powers of the soil".

It is common in the literature to use the evolution of the price of land to gauge the movement of

rental rates (Austin, 2007; Bértola, et al., 1999; Bohlin & Larsson, 2007; Emery, et al., 2007; Greasley & Oxley, 2005; Shanahan & Wilson, 2007; Williamson, 2000 and 2002) and we employ a similar definition. However, it is not enough to apply land price movements to estimate the rental rate because the evolution has to be corrected by the interest rate.

In our conceptual framework (see Chapter 2) the key relation –as a decision rule– is the following: $\frac{pa'(n)}{\phi'(N)} = \Lambda = \rho$ *(1)*

In the long run, the rate of return on clearing land (Λ) –the relation between the marginal income [$pa'(n)$] and the marginal cost [$\phi'(N)$] of clearing land– must be equal to the interest rate ρ (which represents the opportunity cost). The marginal income on clearing land is the value (considering the relative price of land output or agricultural good, p) of the marginal physical productivity of the land ($a'(n)$), and this relation equals the land rent (q) in the equilibrium. The marginal cost of clearing –that is, the cost for one unit of (new) land– is the land price (p_N). Therefore, we can rewrite the relation *(1)* as: $q = p_N . \rho$ *(2)*

Therefore, if we want to deduce the evolution of the rental rate (the rent for one unit of land) in the long run we need to consider the movement of land prices and the interest rate. Williamson (2007):204 gives the same warning when analyzing the recent literature about this question and Arroyo Abad (2008) proposes this empirical correction for four Latin American countries in the 19th century.[94] Data about interest rates is scarce but some partial information indicates a downward but not continuous trend during the period (see Willebald, 2010, for a survey). A proxy for the local interest rate is the yield of government bonds, a homogenous measure that quantifies the financing opportunity cost in those economies. We use data from Obstfeld & Taylor (2003) and we work with triennial averages centred in the mid-year. Usually we refer to the coefficient "price-interest rate" as the index to adjust rental rates in the long run. The amount of land used for crops and livestock grazing is agricultural census data, and where this is not available we use technical coefficients of production to estimate areas by regions (this was our procedure for Argentina, Uruguay and New Zealand). We refer to land income as total land rents or rental mass.

1.3 Labour income

To measure labour income we consider the salary mass in agrarian activity including cattle production, crops and farming, and as a reference we take the income of an unskilled day labourer. During the period, specialized work usually involved seasonal tasks (harvests or the shearing season) and paid very high (abnormal) wages. Whenever possible we take into account three

[94] Their conceptual reference is Jorgenson (1963), who proposes a theoretical explanation of capital accumulation within the Neoclassical Theory framework.

components: the number of agrarian labourers (wage-earners), the wage rate (without board [95]) and the number of hours worked. Information availability varies among the six countries, and depending on the data we use official statistics, index numbers, other estimates or even data from particular labour-contracts (in which case we discuss how representative they are). In several cases we obtain different levels of wages that are not consistent with the result of applying the Nominal Wage Index to our benchmark. This is not strange because the index can cover other items and involve different weights, but we can presume that the indicator correctly follows the dynamics of the variable. We interpolate intermediate values between levels with the movement of the index and so re-scale the series. The method is as follows:

We have two values of our variable (w): w_0, wage rate in $t=0$, and w_j, wage rate in $t=j$.

We have an appropriate index to approach wage evolution:

NWI_t: Nominal wage index, with $t=0, \ldots, j$

Our objective is to join w_0 and w_j with the trajectory of NWI_t, maintaining the same "shape" of the evolution but re-scaling the index to splice the series and interpolate values for specific years.

We calculate the variations for the whole period from *0* to *j*.

$$w_j \Big/ w_0 = VarW_{j/0} \qquad (3)$$

$$NWI_j \Big/ NWI_0 = VarNWI_{j/0} \qquad (4)$$

The yearly correction coefficient (*YCC*) is calculated as the (annualized) relation between the two whole variations:

$$\left(VarNWI_{j/0} \Big/ VarW_{j/0} \right)^{(1/j)} = YCC \qquad (5)$$

We adjust each annual variation in the index with the *YCC* (as the ratio of the two factors) and re-calculate variations to apply to the extreme figures of our interest variable.[96]

We refer to labour income as total wages or salary mass.

2. Argentina

Our selection of benchmarks basically depends on the availability of census data, and we supplement this with additional information. We propose the following benchmarks: 1869, 1875, 1888, 1895 and 1914.

2.1 Agrarian product

The agrarian product at constant prices (1914 million *pesos*) comes from Cortes Conde

[95] Board is the provision of meals and lodging. Our series correspond to wages without board. If the labour contract was negotiated in terms of monetary payments, meals and lodging, we put a value on this payment-in-kind. Wages without board are higher than wages with board because wages, in our terms, are associated with monetary payments.

[96] Some similar operations are applied to land prices.

(1994):16 and covers the period 1875-1913. Previous years are estimated from Maddison (2001) considering the total GDP growth from 1870 to 1890.[97] Figures were inflated by a cost of living index presented in Williamson (1999) and commented on Williamson (1995):163. The deflator does not cover all GDP but as the share of consumption is very high we assume it is a good proxy.[98]

2.2 Rents

- ***Total land rents 1914***

The Third National Census in the Republic of Argentina (*Tercer Censo Nacional de la República Argentina*, henceforth *TCRA*) of 1914 has information about land rents (*precio del arrendamiento*) for farming and livestock establishments at the provincial level (24 provinces[99]), and it distinguishes leasing periods (less than 3 years, 3, 4 and 5 years, and more than 5 years) and monetary ranges (Argentine *pesos* per hectare).

For cattle establishments,[100] the ranges are as follows: less than 0.20 Argentine *pesos*, 0.21-0.5, 0.51-1, 1.1-2, 2.1-5, 5.1-10, 10.1-15, and more than 15 Argentine *pesos*. For farming activities, the ranges are: less than 5 Argentine *pesos*, 5-10, 11-20, 21-30, and more than 30 *pesos*.[101] In addition, the ranges are presented in accordance with percentages of crops (10%, 20%, 30% and more) but this information is not considered in our calculations. By considering the simple average for total rented establishments (105,899 in 306,603 estates) we obtain rental rates by types of production for each province. The census has information about the area of total exploitation in accordance with the main activity. Our estimate of total rents in 1914 is based on farming and livestock areas valued at rental rates and the value represents the 67% of total income (1,133 million Argentine *pesos*).

- ***Land areas 1869, 1875, 1888 and 1895***

Data about rents in different regions in previous periods are not available, so we need to gauge their evolution from indirect indicators. Total rents constitute a value with two factors –quantity and price components– and we estimate the changes in both over time by using appropriate proxies. We start by looking at the quantity component by considering the land used for pastoral production.

We assume that in our period of analysis pastoral land, by bovine unity, expanded at the same rate as total factor productivity (TFP) in the agrarian activity. Pastoral production in Argentina included cattle and sheep and the "bovine unity" is the equivalent number of animals considered as

[97] Maddison (2001) presents information corresponding to 1870 and 1890.
[98] In 1913-1915, the private consumption (included changes in stocks) amounted to 76 per cent of GDP (Ferrerés, 2005:171-172) and the composition of consumption included a high proportion of food, beverages and raw materials derived from agriculture.
[99] At the time of the census, the territory of Los Andes was surveyed as a separate administrative jurisdiction. However, in our estimates this region is included in Salta.
[100] We place available or non-used plots in this category.
[101] Such differences in the levels of rents between lands for livestock and for crops can be considered as differences in terms of land quality (or, equivalently, productivity). This evidence is our fundament to assume the higher rent of high quality land respect to low quality land ($q_H > q_L$ in Chapter 2).

if there was only cattle production. In this sense, the number of bovine unities per hectare is a measure of productivity, and we assume that this measure moved like TFP. As we know the number of animals per hectare in 1914 and the corresponding land that was used, we can calculate a technical coefficient for each province.

Considering that in terms of the use of the nutritive characteristics of grass, 8 sheep are equivalent to 1 cow (Cortes Conde, 1979:63[102]), we calculate the "equivalent cattle" per province and the ratio between this figure and land surface area in 1914.[103] These are measures of productivity and we reduce them in accordance with changes in the TFP (Newland & Poulson, 1998[104]) to estimate the corresponding ratios for 1895. As the *TCRA* has information about the numbers of rural animals in 1895, we can immediately estimate the extent of land per province used for pastoral production.[105] We repeat the method to estimate the 1888 (according to *TCRA*) and the 1875 values (in accordance with Vázquez-Presedo, 1971: 52[106]). We took data for 1869 from Cortes Conde (1979): 277. We do not have data for all the provinces, and we assume that provinces without figures did not have sheep or cattle (scarce information is probably associated with small numbers of animals).

As regards agricultural activity, we approach the changes in the amount of land used for crops by gauging the amount of land used to grow plants per province. Our data for 1914 are from the *TCRA* and include cereals, industrial plants, legumes and vegetables. The data for 1895 are from the Second Republic of Argentina census (*Segundo Censo de la República Argentina*, henceforth *SCRA*) of 1895 and include trees, cereals (wheat, corn, flax, barley), industrial plants (vines, peanuts, sugar cane, tobacco, cotton), legumes and vegetables, and fodder.[107] We apply the growth rates calculated to the agricultural land area of 1914 to obtain 1895 data for each province.

For 1888 it is not possible to replicate the same method at a provincial level. Therefore we use the data for the total cultivated area of four important crops (wheat, maize, sugar cane and potatoes) in 1875, 1888 and 1895, derived from Mitchell (2007), and apply the movements to the closer

[102] Cortes Conde (1979:63, Chart 2.8) uses this relation in accordance with census definitions (*Censo General de la Provincia de Buenos Aires, 1881*). In Uruguay, the relation extensively used for agrarian production is lower (1 cow = 5 sheep) (Astori et al., 1979; Moraes, 2001). Clearly the ratio changes over time –because of technological progress and changes in the regions to do with the natural conditions of the soils– although our results are no much affected by these changes. If we change the relation by 30 per cent and consider values of 5.6 instead of 8, we obtain a share of rents in total agrarian GDP of 42 per cent in 1895 instead of 41 per cent, and 50 per cent in 1888 instead of 48 per cent. The biggest difference occurs in 1869 when we obtain a share of 60 per cent instead of 54 per cent.

[103] Land intensity was greatest in Buenos Aires (0.60 equivalent cattle per hectare) and lowest in San Juan (0.02).

[104] The annual rates of change in the TFP were 0.5 per cent in 1865-1908 (2 per cent in 1825-1908). Newland & Poulson (1998): 341, Table 3.

[105] Our data for 1895 aggregate Buenos Aires province and the Federal Capital. The information about the latter is from the *Segundo Censo de la República Argentina*. Our estimates follow this criterion in all cases.

[106] The sum of provincial data differs from the total that the source reports. For total sheep, the difference is 1,000 out of 57,547,000 sheep, and was not considered. For total cattle, the difference is 502,000 out of 13,993,000 cattle, and it was proportionally distributed among the provinces that had data in 1888.

[107] Cultivated land increased by a factor of 3 in the period and almost 90 per cent of the expansion was in four provinces: Buenos Aires, Santa Fé, Córdoba and La Pampa.

figure maintaining the same provincial structure as for 1895. To estimate the land extension of agricultural activity in 1869, we maintain the rate of growth in the 1872-1888 period (1872 is the first available figure).

- ***Land prices 1869, 1875, 1888 and 1895***

Argentine Ministry of Agriculture (1926) provides information about land prices in the period 1904-1924 (annual data) and 1899-1903 (average, in Argentine pesos per hectare) for 15 provinces and for an aggregate category of 9 provinces. However, there is scant information about land prices in each province in the 19th century. Diaz Alejandro (1970):46 presents information for 1888 for 5 provinces (Buenos Aires, Santa Fé, Córdoba, Entre Ríos and La Pampa) that is compatible with the data mentioned above. The figures for 1895 were estimated by simple interpolation. We assume the evolution of land prices in the rest of the provinces to be the same as in the closer territories, and in some cases we take account of some specific characteristics of a province. We give a summary of our decisions in Table A4.1.

Table A4.1
PROVINCES ASSUMED AND REFERRED IN LAND PRICES
1895 interpolations

Province assumed		Provinces of reference
Tucumán	*Same movement as*	Buenos Aires
Corrientes and Misiones	*Same movement as*	Avg. Entre Ríos and Santa Fe
San Luis, Mendoza and San Juan	*Same movement as*	Avg. Córdoba and La Pampa
Santiago del Estero and Catamarca	*Same movement as*	Avg. Córdoba and Tucumán
La Rioja	*Same movement as*	Avg. Córdoba and San Luis
Salta and Jujuy	*Same movement as*	Avg. Tucumán and Catamarca
Chaco	*Same value as*	Avg. Santiago del Estero and Catamarca
Rest of the provinces	*Same value as*	Chaco

Mulhall & Mulhall (1869), (Sec. C, Ch. II, p. 16) present a sheep-farmer budget with information from Buenos Aires and consider a land price of £3,000 per half square league (equivalent to £3.35 per hectare). We convert this value to the currency at that time (pesos papel) (Mulhall & Mulhall, 1875, p. 412 and Global Financial Data) and then to the currency used in the previous sources (*pesos moneda nacional*) (Ferreres, 2005) to obtain compatible series. We interpolate the figure for 1875 from the prices in 1888 and 1869 and adopt the same province structure as in 1888.

- ***Total land rents 1869, 1875, 1888 and 1895***

We updated the rent rates (*pesos argentinos* per hectare) of 1914 by the movement in the land prices –corrected by the change in the interest rates– and multiply by the land occupied by crops and livestock (in hectares) obtained previously.

2.3 Wages

We estimate total wages from estimates of wage-earners in agrarian activities (workers) and wage rates for each benchmark.

- ***Wage rates 1914***

Information about wage rates by province is scarce and incomplete, and we assume that regional wage dispersion was low because we are mainly considering unskilled workers.

Cortes Conde (1979):226-228 presents annual data (incomplete) of agrarian wages (*porteros* and *peones*; by month) from 1882 to 1914. We assign the level of 1913-1914 –40 Argentine *pesos*– to 1914 as our initial benchmark. We compare with other source of 1912 (Boletín del Departamento Nacional de Trabajo, No. 25[108]) that provides data for two provinces and the levels are compatible. According with this source, wages per month without board were 40 and 37.50 Argentine *pesos* in Buenos Aires and Santa Fe, respectively (cattle production). We consider annual wages and therefore we multiply each figure by 12.

- ***Wage rates 1869, 1875, 1888 and 1895***

Williamson (1999) presents a Nominal Wage Index for 1864-1940 and quotes Williamson (1995) as the main reference for the data. He uses Cortes Conde (1979) to calculate the index from 1883 to 1903, so the figures are consistent with our initial benchmark. We project backwards the level of 1914 by the movement in the Williamson's Nominal Wage Index to estimate the 1895 and 1888 wage rates. For the previous period, he uses a different source that does not offer satisfactory results for our purposes, and we employ an alternative source.

Barsky et al. (2005):389 present rural wages data for 5-year periods from 1860 to 1895, and they coincide with Cortes Conde's figures for the respective years.[109] We interpolate those data to complete annual series, calculate an index, and retropolate our 1888 level (17.9 Argentine *pesos* per month) by its movement to calculate the wage rates for 1875 (14 Argentine *pesos*) and 1869 (12 Argentine *pesos*). As before, we multiply these values by 12 to obtain annual wages.

- ***Agrarian workers 1895 and 1914***

In the Fourth Republic of Argentina Census (*Cuarto Censo de la República Argentina*, henceforth *CCRA*) of 1947, there are estimates of agrarian occupation in 1895, 1914 and 1947 (552,114, 828,420 and 1,536,968, respectively). These data give us general trends but we must adjust the levels because these figures include occupiers with incomes other than wages, so we contrast them with alternative information.

[108] Data kindly provided by Prof. Esteban Nicolini.

[109] Barsky et al. (2005) quote the following source: SEGUÍ, Francisco (1898): *Investigación parlamentaria sobre agricultura, ganadería, industrias derivadas y colonización ordenada por la H. Cámara de Diputados en resolución de 19 de junio de 1896*. Anexo B. Provincia de Buenos Aires. Buenos Aires, Penintenciaría Nacional.

The *TCRA* presents data about the economically active population in agrarian activity in 1914. It classifies the population as "director's family" or "employees", and it distinguishes among male, female and children by province. We consider that employees are wage-earners, and from the director's family only males earn wages when they are non-owners (otherwise their remuneration would be profits or rents). We assume that each establishment has one owner. Hence we consider total wage-earners as the sum of employees and director's family males minus the total of land proprietors (estimated as total agrarian real estate units, from República Argentina, 1919: 3-6) and we obtain a figure of 732,632 workers (provincial distribution). We apply to this figure the growth of occupied population from the *CSRA* and so calculate the total of wage-earners in 1895 (488,275).

- ***Agrarian workers 1869, 1875 and 1888***

The First National Census in the Republic of Argentina (*Primer Censo Nacional de la República Argentina*, henceforth *PCRA*) of 1869 and the *SCRA* of 1895 have information about the occupied population by professions, and in the second of these sources these categories are grouped into broad productive activities. We use the "production of raw material" as a reference to reproduce the same group in 1869 because it is the activity best linked to agriculture. We adjust the two groups to include only agrarian professions[110] and assume that the 50 per cent of *jornaleros* work in agriculture.[111] We discount professions with earnings other than wages (*estancieros*, *hacendados* and *arrendatarios*) and obtain 481,000 persons in 1895 (very close to our previous estimate) and 229,640 for 1869; this amounts to an increase of 109.5 per cent over the period. With this growth rate we retropolate the 1895 estimate (488,275) to obtain a total of 233,117 wage-earners in 1869. The figures for 1875 and 1888 are obtained by interpolation.

- ***Total wages***

Wages for each benchmark were estimated as the product of wage rates and agrarian workers.

3. Australia

Our selection of benchmarks basically depends on the availability of census data and specific surveys. The information is more complete and systematic than for Argentina. We propose the following benchmarks: 1871, 1881, 1891, 1901 and 1911.

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[110] We include the following categories: *abastecederos, agricultores, arrieros, cazadores, estancieros, hacendados, horticultores, leñadores, mayordomos, obrajeros, pasteros, pastores, vaqueros, sericultores, reconocedores de frutos, vinicultores, alambradores, arzoneros, fusteros, arboricultores, arrendatarios, baqueanos, capataces, clasificadores de frutos, chacareros, caballerizos, chancheros, cañamoneros, cañeros, colmeneros, domadores, estereros, enfardadores, gallineros, hortelanos, hueveros, labradores, medianeros, montaraces, puesteros, podadores, quinteros, segadores, tamberos,* and *lecheros.*

[111] The occupation *jornalero* is a broad category that includes day labourers regardless of their type of economic activity. The conditions of this occupation varied across the country. In Buenos Aires it was very common to find *jornaleros* in port jobs but in provinces, with their greater agriculture specialization, they were mainly in the agrarian sector. We consider that our criterion is suitable because we obtain a total population occupied in agriculture that is close to the census data of 1895

3.1 Agrarian product

We use data calculated by Butlin (1962). Although his estimates have been widely criticized (see for example, Haig, 2001) they are still in general use as the main statistical reference.

3.2 Rents

- ***Total rents 1911***

To our knowledge, the only study that estimates land income from the beginning of the 20th century is Dwyer (2003), who follows two studies by Robert Scott (1969 and 1986).[112] To measure land income, he uses the same methodology as Gaffney (1970). In general, when land values are stable, land income is the annual rental for the land. However, when land values increase then future rentals for the land are expected to be higher. Therefore land has two types of yields or returns; one directly associated with the productive activity and the other with land value appreciation (like for any other asset). However, reliable historical data about these types of returns are usually not available so the author adopts a conservative 5 per cent fixed rental yield plus a representative percentage of the accrual from future rentals. He calculates the latter value by considering a 30-year period (1910-11 to 1939-40) and applying an iterative process that renders an "accrual yield" of 1.9679 per cent. For 1911/12, he estimates total land rents (smoothed land income) at AUD 63.7 million (£31.6m) and total land value at AUD 914 million (£453.6m) (exchange rates from Vamplew, 1987). The share of rents in the agrarian product for that year (£80.9m) is 39 per cent, and this will be our reference ratio as the initial benchmark.

Australia has a very large surface area and it is important to bring regional differences into our estimates. Therefore we calculate the value of agrarian land in each state, on the assumption that the structure of rents coincides with the land value structure.

- ***Land areas 1871, 1881, 1891 and 1901***

Since the second half of the 19th century data on land use has been published, with differing regularity, by all the states (Vamplew, 1987), depending on the availability of information, we interpolate figures or backwards project data in accordance with the evolution in other states to complete the series. The details are shown in Table A4.2.

Table A4.2
STATES ASSUMED AND REFERRED IN AGRARIAN LAND AREA

	Available data	Interpolation	Backward projection	With the movement of:
New South Wales	1875, 1880 1883-1913	1876-1879 1881-1882	1871-1874	Victoria
Victoria	1865-1913			
Queensland	1875, 1880-1913	1876-1879	1871-1874	South Australia
South Australia	1862-1913			

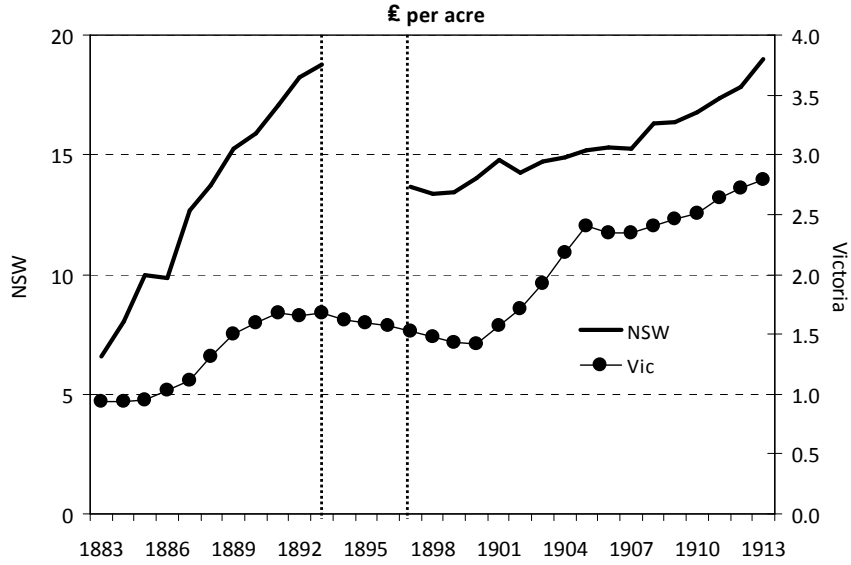
[112] We were unable to consult these studies but Dwyer (2003) presents the results, discusses them and explains clearly the differences from his own estimates.

Tasmania	1875, 1885...1910, 1915	1876-1879, 1886-1889, ..., 1911-1914	1871-1874	Victoria
Western Australia	1875, 1885...1910, 1915	1876-1879, 1886-1889, ..., 1911-1914.	1871-1874	South Australia
North Territory	1900, 1905...1915	1901-1904,...1911-1914		

- ***Land prices 1911***

The paper that is usually used as a basis for studying the evolution of Australian land prices during the First Globalization is Taylor (1992).[113] He presents figures for Victoria (1865-1913), New South Wales (1883-1893, 1897-1913), Queensland (1881-1913) and South Australia (1862-1913). He is cautious in his inter-state comparisons and especially so as regards New South Wales, whose data seems excessively high.[114] On the other hand, he is confident that his indicators adequately represent the trends. We agree with him in all cases with the exception of New South Wales. In Figure A4.1 we present land prices in New South Wales (on the left axis) and Victoria (right axis) and compare their evolutions. The lack of information for the years 1894-1896 seems to coincide with a change in the trend and this raises doubts as to whether our calculations are suitable. Victoria's evolution shows a decline in about the same period that New South Wales declines but the magnitude of the decrease is significantly less (9 and 27 per cent, respectively). Therefore, by level and evolution, we prefer to work with alternative information for New South Wales.

Figure A4.1
AUSTRALIA LAND PRICES: VICTORIA AND NEW SOUTH WALES
£ per acre



Source: Taylor (1992).

One of the most important innovations in New South Wales government land policy at the beginning of the 20th century was the Closer Settlement Acts 1904 to 1909, and the Closer Settlement Promotion Act 1910. Under this regime, land prices in New South Wales reached 52 per cent of the value in Victoria in 1910-1912 and this ratio remained relatively stable until the 1930s (see Australia Statistical Yearbooks for 1934, 1932,

[113] Taylor (1992) is the source of Williamson (2000, 2002).
[114] For instance, the land price of New South Wales in 1900 (£14) is almost ten times higher than Victoria's figure.

1922, 1913, 1912 and 1911).[115] Therefore we use the prices from Taylor (1992) for Victoria, Queensland and South Australia, and apply the relative prices derived from closer settlement transactions to calculate the New South Wales values. We employ similar criteria for Western Australia and Tasmania. North Territory was the last region in Australia to be occupied and we would have to consider the price was close to zero. Therefore, we use the lowest price (which was the price in Queensland) to give a value for occupied land in this territory. When we consider occupied land and prices by state, the exercise yields a total land value of £484m for 1911, which exceeds Dwyer's (2003) calculation by just 10 per cent. The resulting state structure of land value is applied to total rents in 1911 (strictly, the average 1910/11-1911/12).

- ***Land rent rates 1871, 1881, 1891 and 1901***

We use the Taylor (1992) series for Victoria, Queensland and South Australia, and we assume that the movement of land prices in Western Australia and the Northern Territory was similar to Queensland's evolution, and movements in Tasmania were similar to those in Victoria. As to New South Wales in 1911, we maintain our reference of 52 per cent of Victoria's price for 1901, and in the absence of better options, we consider Victoria's land prices as a reference for the 19th century.

- ***Total land rents 1871, 1881, 1891 and 1901***

We update total rents by state in 1911 by the movement in land prices –corrected by the change in interest rates– and multiply by the area of farm holdings.

3.3 Wages

- ***Agrarian workers 1871, 1881, 1891, 1901 and 1911***

Vamplew (Ed.) (1987) provides data on employment in rural industries classified by colonies, states and territories for the years 1871, 1881, 1891, 1901 and 1911. These data represent the economically active population and include non wage earners, casual and permanent employees, and proprietors and their families, but it excludes aborigines. The lack of 1891 and 1901 data for the Northern Territory means that Australia's total is slightly underestimated. However, the share of this territory in total rural employment is very low (0.12 per cent at the beginning of the 1910s) and we interpolate the figures in accordance with the data for 1881 and 1911. Butlin & Dowie (1969) propose a division of the agricultural workforce in Australia in accordance with their grade and occupation classes (data for the whole country). They distinguish employees, the self employed, people providing assistance (unpaid) and wage-earners (receiving wages or a salary) by gender for 1891, 1901, and 1911. The total workforce differs from the total employment figures in Vamplew (Ed.) (1987) by an average of 8 per cent. We consider the wage earners in Butlin & Dowie (1969)

[115] 1921 (57%). 1931-1933 (47%).

as farm workers and we apply Vamplew's (Ed.) (1987) state structure to obtain data for 1891, 1901 and 1911.[116] We calculate data for 1881 and 1871 using the evolution of employment by colony in Vamplew (Ed.) (1987) and apply this to the figures above.

- ***Wage rate 1914***

The Commonwealth Bureau of Census and Statistics (1914) (*CBCS*) provides information on wage rates (minimums) for agriculture and livestock activities by state. There are three classes with various categories including farming (general labourers, harvesters, milkers, ploughmen), gardening –gardeners, nurserymen–, and pastoral workers –cooks, shearers (per 100), shed hands and wool pressers. We consider the simple average of all the categories except shearers because they were employed on a piecework system. There is information available for New South Wales, Victoria, Queensland, South Australia, Western Australia and Tasmania, and calculating the weighted average (in accordance with the weights presented in *CBCS*, 1914: 45) we obtain a wage for all Australia of £2.65 in 1914. This figure is consistent with Withers et al. (1985) (£2.45), who presents series of minimum weekly wage rates by industry groups (adult male), in annual data for 1891, 1896, 1901, 1906-1914. The source is the same (Labour Reports up to 1938) and we think that the difference (8 per cent) can be explained by the use of other weights or by gender differentiation.

- ***Wage rates 1871, 1881, 1891, 1901 and 1911***

We apply the structure of state wages (compared to the mean) in 1914 to the wage level that Withers et al. (1985):140 presents, and we consider the 1910-1912 average as the figure for 1911 and express the data in annual terms.[117] Then we project these figures back in time with the changes in minimum agriculture weekly wage rates by states (adult males) presented in Withers et al. (1985):144 corresponding to the years 1901 and 1891, and with the evolution of the weekly money wage indexes presented in Butlin (1962):158 and surveyed in Withers et al. (1985):154. Indexes are not available for Western Australia and Tasmania so we apply the same movements as in the New South Wales series. For North Territory we use the same wage level as Western Australia.

- ***Total Wages***

Total wages for each benchmark were estimated as the product of wage rates and agrarian workers classified by colony and state.

4. Canada

The information available for Canada is similar to what is available for Australia except that, for some series, the coverage is better and the concepts more precise. Our selection of benchmarks is governed by census data and we propose the following years: 1871, 1881, 1891, 1901 and 1911.

[116] We include the Australian Capital Territory (ACT) in New South Wales.
[117] Huberman (2004) and Huberman and Minns (2007) estimate 49.6 annual weeks worked in this period.

4.1 Agrarian product

Urquhart (1986) gives estimates of gross domestic product by industry –at current prices in Canadian dollars– for the years 1870-1926. His estimates are commonly used in the literature and they are methodologically compatible with another source, (McInnis, 1986), who proposes agrarian value-added (constant prices and deflator) for the same period.

4.2 Rents

- ***Total land rents 1911***

Bertram (1973) discusses previous calculations of land rents for the period 1901-1921 (especially Chambers & Gordon, 1966) and proposes new estimates for the prairie regions: Manitoba, Saskatchewan and Alberta. He obtains the estimated value of farm rents by multiplying farm values by the rate of interest corresponding to the first mortgage on farm property.

We work with 1911 as our reference year and replicate Bertram's exercise. We obtain land area (in acres) from Statistics Canada (1983) (census data) and land prices from Statistics Canada (1917). Land prices –by province– correspond to the average values per acre of occupied farm land for 1908-1910 and 1914-1916 (in Canadian dollars-CAD)[118] and we obtain the figures for 1911 by interpolation. Our results exceed Bertram's estimates in 16, 8, and 17 per cent in Manitoba, Saskatchewan, and Alberta respectively, so we extend the calculations to the other provinces and correct down land values by 10 per cent, assuming that the differences between our figures and Bertram's will remain.[119] The interest rates on the first mortgage on farm property are published in Statistics Canada (1915), and they contain different numbers of observations: Prince Edward Island (5), Nova Scotia (9), New Brunswick (4), Quebec (6), Ontario (43) and British Columbia (6).

We calculate total rents for Canada for 1911 by aggregating the data from the provinces (CAD 226 million, which is equivalent to 50 per cent of agrarian GDP).

- ***Land areas 1871, 1881, 1891 and 1901***

The area of land in farm holdings (census data) by province for 1871, 1881, 1891 and 1901 are from Statistics Canada (1983).

- ***Land prices 1871, 1881, 1891 and 1901***

Emery et al. (2007) were the first to try to bring regional aspects into the recent discussion about the evolution of relative factor prices in Canada during the global expansion of the late 19th and early 20th centuries. They report land prices for three locations in Ontario (Augusta-Elizabethtown, Medonte, and Wellington) to represent the "east region" and three provinces in western Canada:

[118] Prices are estimated by correspondents.

[119] If our assumption is correct, our estimates would be the maximum values of land rents. It is a conservative assumption that biases the results against our hypothesis because we would be working with a country with levels of land rent above those we could expect considering factor endowments quality.

Manitoba, Saskatchewan, and Alberta. We correlate these places to their provinces in accordance with Table A4.3.

Table A4.3
LOCATION LAND PRICE REFERENCES TO PROVINCES OF CANADA

Province	*Referred to*	*Location*
Prince Edward Island		Augusta–Elizabethtown
Nova Scotia		Augusta–Elizabethtown
New Brunswick		Augusta–Elizabethtown
Quebec		Augusta–Elizabethtown
Ontario		Medonte-Wellington
Manitoba		Manitoba
Saskatchewan		Saskatchewan
Alberta		Alberta
British Columbia		Alberta

- ***Total land rents 1871, 1881, 1891 and 1901***

We updated total rents by province for 1911 by the movement in land prices –corrected by the movement in interest rates– and multiplied by the land area devoted to agrarian activities.

4.3 Wages

- ***Agrarian workers 1871, 1881, 1891, 1901 and 1911***

McInnis (1986) presents census data (1871, 1881, 1891, 1901, 1911 and 1921) with information about the agricultural workforce by status in terms of farmers (proprietors of farm units of 10 acres or more), family workers and paid labourers. We consider the latter two as wage-earners. No classification by provinces is available, but Statistics Canada (1983) provides data on male workers classified by province for 1891, 1901, 1911 and 1921.[120] The two series differ by an average of just 4 per cent over the period (the former exceeds the latter) and this gap can probably be explained by the presence of female workers. We project the total of male workers from Statistics Canada (1983) back in time (for 1881 and 1871) with the movement of the total agriculture workforce in McInnis (1986), and we distribute workers by province in accordance with the 1891 structure. This may be a reasonable assumption because women in agriculture in Canada worked only at peak periods of labour demand (McInnis, 1986:753). As the wheat boom started in the 1890s, and this period coincided with strong land frontier expansion, the error is not very serious in this case. Total wage-earners (family and paid labourers; McInnis, 1986) are distributed by province and gender in accordance with workforce structure (Statistics Canada, 1983). For Alberta, the number of agrarian workers is marginal from 1901 back in time, so it is considered equal to zero in benchmarks corresponding to 19th century.

[120] According to the source, figures for the 20th century are adjusted to a 1931 classification of occupations, and the 1891 figures are unadjusted data.

- ***Wage rates 1911***

Statistics Canada (1917) provides wage information by province and gender for 1909, 1910, 1914, 1915 and 1916. These are wages per year including board, per month in the summer season including board, and the average value of board per month. We consider the first concept above and interpolate figures to obtain the data for 1911.[121] The denomination "including board" used in the source may cause confusion. We contrast this with another source (Statistics Canada, 1983, Series M78-88) and confirm that they are wages without board.

- ***Wage rates 1901***

Statistics Canada (1906) provides information on the cost of labour with board by provinces and by territories (a denomination that includes Saskatchewan and Alberta) in 1901. We assign the figure of the territories to Saskatchewan because we have no data about the number of agrarian workers in Alberta. According to our estimates, the ratio between wages "without" and "with" board was 1.9 in 1910-1914. In other ex-British colonies like New Zealand the ratio was 1.98 in 1900-1902. We assume a value of 2 and adjust the previous figures to calculate total wages.

- ***Wage rates 1871, 1881 and 1891***

We calculate the wage rates for 1871, 1881 and 1891 in accordance with the movement of regional wages presented in Emery et al. (2007). These data register daily wages in Toronto and Winnipeg according to two sources: salaries on the Canadian Pacific Railway and wage statistics published by the Department of Labour. We construct a triennial average index (1913=100) for the two regions from the annual average of both series. We use the Toronto index to update wages for Prince Edward Island, Nova Scotia, New Brunswick, Quebec and Ontario ("East") and the index of Winnipeg to adjust wages for Manitoba, Saskatchewan, Alberta and British Columbia ("West").

- ***Total Wages***

Total wages for 1911 were estimated as the product of wages and agrarian workers classified by province and gender (CAD 94 million, equivalent to 21 per cent of agrarian GDP). The total wages with board for 1901 classified by province were obtained directly from a source and they were adjusted to obtain "without board" figures. We calculate the data for 1891, 1881 and 1871 projecting backwards the previous estimates according to the movement of the total agrarian workers and the index of daily wages.

5. Chile

Our selection of benchmarks basically depends on the availability of census information and population data. We had to consult many additional sources and propose specific assumptions to

[121] We interpolate 1910 and 1914 data in all the provinces with the exception of British Columbia, for which we use 1909 and 1914 because no figures are available for 1910.

complete the picture and determine the best statistics in each case. The benchmarks are 1875, 1885, 1895, 1907 and 1915.[122]

5.1 Agrarian product

To measure agrarian income we consider the gross output or gross domestic product (GDP) of agrarian activity, as given in official data and the best available estimates.

The main recent contribution in this field was Rodriguez Weber (2009), who gives an estimate of income distribution in Chile for the period 1860-1930.[123] He estimates the generation of income by industry and occupational category and considers four benchmarks (1875, 1885, 1907 and 1930) and annual income indicators (for the period 1860-1930). Thus he obtains estimates of total and sector (agrarian, industrial and services) income. However, to avoid dealing with inter-sector and international income transfers (which are associated with different sector price evolutions and with the external ownership of assets, respectively) we focus our analysis on income generated within the sector (with the productive factors employed in economic activity). Therefore we work with the agrarian product. Information at current prices is available from 1900 onwards (Haindl, 2008) and we spliced this series with figures from Díaz, Lüders & Wagner (1998) (1908-1910 constant prices) which we inflated using the Agrarian Price Index presented in Wagner (1992).[124]

5.2 Rents

- ***Land prices 1917-1921 and 1875***

Information about land prices in Chile in the 19th century is scant and incomplete. Even in the 20th century there are few systematic studies of the whole country and they do not cover long periods. Hurtado, Bustos and Galmez (1979) are an exception to this, but the information they present is just for the second half of the 1910s and only covers two specific regions.

For Coquimbo and Curicó (Regions IV and VII, north and central zones, respectively) and Talca and Bío Bío (Regions VII and VIII, central and south zones, respectively), they register land prices for agricultural land with irrigation (either with fruit trees and vineyards or without them) and dry land. The figures are in constant December 1978 dollars and they are 5-year averages (beginning in 1917-1921). We convert the data to Chilean currency (using the exchange rate) and inflate them using the Consumer Price Index (from Braun et al., 2000) to obtain land prices in "new" Chilean pesos. Our estimates are expressed in "old" Chilean pesos so we convert the figures at the rate of 1 "new" peso = 1,000,000 "old" pesos.[125] We use the symbol $ to denote "old" *pesos*.

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[122] Our estimates were presented in Rodriguez Weber & Willebald (2010).
[123] A previous advance had been presented in Bértola & Rodríguez Weber (2009).
[124] The Agrarian Price Index is called "*Índice de Precios Agrícolas Latorre Extendido*" (*IPALS*) from Wagner (1992).
[125] From the 19th century up to today Chile has had three legal currencies: (i) 1830-Dec/1959: *peso chileno* or *"peso antiguo"*; (ii) 1960-Sep/1975: *escudo*; (iii) Oct/1975 to the present: *peso chileno* or *"peso nuevo"*. The relation is: 1 *peso nuevo* = 1,000 *escudos* = 1,000,000 *pesos antiguos*. See Braun et al. (2000): 88-89 for an explanation.

As fruit trees and vineyards are improvements closer to the idea of physical capital (which yields profits) we calculate an average land price that excludes them, so we consider the price of irrigated land without trees or vineyards and the price of dry land, and the two types of land are weighted by their share in the total agrarian area in 1936. The *Segundo Censo Agropecuario de Chile* (1935-1936) (henceforth *SCACh1936*) has information about agrarian area with irrigated and dry land and considers four zones: north, central, south and austral (extreme south). For our calculations, the south and austral zones are considered as the south region. As we have land prices for two regions –Coquimbo and Curicó; and Talca and Bío-Bío– we rearrange the data from the census into two large regions, the North-central and South-central zones, by dividing the central region in half and adding the areas to North and South, respectively. We have the weights for land prices: North-central with irrigation (3%) and dry land (29%); South-central with irrigation (2%) and dry land (66%). We assign the average price in 1917-1921 to each year in the period ($ 109 per hectare).

Correa (1938) comments on a document written in the 19th century called "Studies of the economic state of agriculture in Chile" (*Ensayos sobre el estado económico de la agricultura de Chile)* that has various kinds of information about the situation in 1875. The value of the total land, including arable land with irrigation, dry land, pasture and woodland, was equivalent to $ 233.3 million for a total area of 11.4 million hectares and with an average price $ 20 per hectare.[126] However, at that time irrigation meant a considerable investment, and like trees and vineyards in the 20th century this was closer to the generation of profits than rents. Therefore we exclude this kind of land and consider 11 million hectares at an average price of $ 11 per ha.

- ***Land prices 1885, 1895 and 1907***

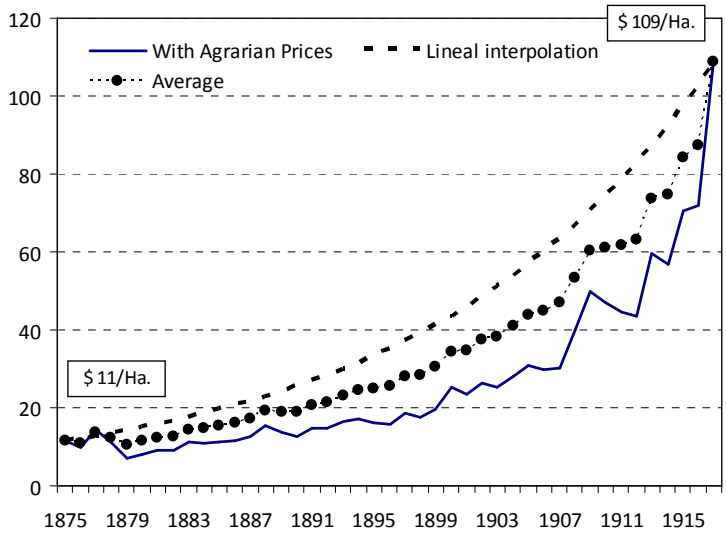
In other instances we complete several series of land prices using lineal interpolations. However, this case is different because the period (1875-1917) is extremely long and our underestimation of the fluctuations would be excessive. Moreover, Chile had high inflation at the beginning of the 20th century and this would distort the estimation considerably (see Millar Carvacho, 1994). Agrarian prices may be conceptualized as a weighted average of the return on the productive factors that participate in agrarian production, and this can give us some clues as to how to proceed.[127] Theoretically, rentals would have increased in real terms during the First Globalization (see the literature based on the H-O-S approach or Chapter 1 and 2) and risen higher than prices in the sector (even when corrected by interest rates it is reasonable to assume $\Delta q > \Delta p_A$). Estimating the

[126] Figures are presented in *pesos de 6 peniques,* and from the text we deduce that the relation is 1 *peso antiguo* = 4 *pesos de 6 peniques*.

[127] Considering Y as the gross domestic product of agrarian activity, we can express it as the sum of the total yield of the productive factors: $Y \equiv w\,L + \rho\,K + q\,N$. Where L, K and N represent the volume of labour, capital and land used in the production and w, ρ and q the respective earn-rates (wage, profit and land rents) (see a similar representation for the whole economy in Chapter 2). As $Y=y.p_A$ –the product of the volume produced in the agrarian activity and the prices of the sector– p_A may be interpreted as a "weighted" average of w, ρ and q.

evolution of land prices –i.e. land rents– by lineal interpolation would exaggerate the intermediate points (when they were not yet affected by inflation), but doing this with agrarian prices would cause the opposite effect (land prices would have exceeded the evolution of agrarian prices). We have no criteria to prefer one approach to land prices to the other so we opt to take an average of the two series. Figure A4.2 illustrates our three scenarios. Land prices in 1885, 1895 and 1907 are estimated as the average evolution.

Figure A4.2
LAND PRICES EVOLUTION: ASSUMPTIONS AND SCENARIOS
$/Ha



Source: Braun, Braun, Briones & Díaz (2000); Correa (1938); Dirección General de Estadística - Chile (1938). Hurtado, Bustos & Galmez (1979); Wagner, (1992).

- ***Land areas 1875, 1885, 1895, 1907 and 1917***

According to the *SCACh1936*, the total land used for agricultural activities in 1919 was 18.2 million hectares, and we assign this area to the period referred to in the price sub-section (1917-1922). When we check this value against the number of rural properties we find that the average size of a farming establishment was 188 hectares. We consider that in 1907 this number was 69,988 (Salazar, 1985), so we estimate the total area at 13.2 million hectares (we assume that the average size of establishments did not change significantly). The area for 1875 was taken from Correa (1938) (see previous sub-section) and the figures for 1885 and 1895 were obtained by interpolation.

- ***Total rents 1907***

To calculate total rents for 1907 we follow the methodology of Dwyer (2003). Reliable historical data about land rent rates are not available and it is usual to adopt a conservative 5 per cent fixed rental yield plus a representative percentage of the accrual of future rentals. In the case of Chile, that rental rate is a reasonable percentage. Bengoa (1990):38 comments that a conservative calculation for that time is a rental ratio of 5 per cent on capital. Correa (1938):252 presents data about rents for 1834, 1854 and 1875 –probably derived from fiscal information– that, for the last year, amount to almost 5 per cent of the land value (considering the total value of the land, including investments). We calculate the accrual yield by computing the internal rate of return on an investment equivalent to the land value in 1875 (the same value used to estimate the price) which was recovered in 1907. The resulting accrual factor for this period is 5.1 per cent. Therefore we

calculate total rents as 10.1% of land value in 1907, a figure equivalent to the 49 per cent of the total agrarian product.

- ***Total rents 1875, 1885, 1895 and 1915***

We update the total rents estimated for 1907 by the movement in land prices –corrected by the change in interest rates– and multiply by the area of farm holdings.

5.3 Wages

- ***Wage rates 1907***

Rodríguez Weber (2009) presents information on wage rates for each benchmark (1875, 1885, 1907 and 1930) but we make some changes to 1907 to consider regional differences. Bengoa (1990) presents daily wages[128] for several provinces around 1911, and we classify these by regions[129] and update to 1907 with an Agrarian Wage Nominal Index (Matus, 2009).

Rodriguez Weber (2009) discusses the number of days agrarian workers worked per year and assumes that the number increases from 200 days in 1875 to 260 in 1930.[130] We adjust our daily wages to transform them into the annual income from 227 working days in 1907. In Table A4.4 we present our assumptions and the data.

Table A4.4
WAGE RATES BY PROVINCE IN 1907
$ by day and $ by year

Year	Province	Region	$/day	$/year	1907, $/year
1910	Santiago	Central	1.0	227	204
1910	Curicó	Central	0.7	159	143
1910	Parral	Central	0.6	136	122
1910	Macul	Central	1.4	318	285
1911	San Javier	Central	1.0	227	174
1911	Malloco	Central	2.0	454	349
1912	Rancagua	Central	1.5	341	244
1912	Chillán	Central	1.2	272	195
1912	San Felipe	Central	1.5	341	244
1913	Maule	Central	0.8	182	125
		Average			***208***
1911	Copiapó	North	2	454	349
		Average			***349***
1907	Osorno	South	1.5	341	341
1910	Temuco	South	1.3	295	265
		Average			***303***

Sources: Bengoa (1990):18 and 196. Rodriguez Weber (2009).

- ***Agrarian workers 1875, 1885, 1907 and 1930***

We consider agrarian wage-earners as the income category identified with the *"gañanes"* (peasant) in Rodríguez Weber (2009). He provides information about the number of earners for each benchmark (1875, 1885, 1907 and 1930) and we use these data as a reference.

- ***Total wages in 1875, 1885, 1895, 1907 and 1915***

Based on the agrarian workers and wages rates, we calculate the total wages of 1907, which come to 21 per cent of the total agrarian product (triennial average centred in 1907) and we estimate

[128] We use *"forastero/día"* because it is the category similar to *"gañán"*, the unskilled worker in agrarian activity.
[129] Rodríguez Weber (2009):44 and Willebald (2009) discuss proposals to regionalize Chile to facilitate the analysis. Here, we apply the same criterion as in Chapter 4.
[130] See Rodríguez Weber (2009), pp. 42, 45, 54 and 231.

the proportions of the other benchmarks taking this year as a reference.[131] We project the total wages for 1875 and 1885 by the movement of wage rates and the number of workers from Rodríguez Weber (2009). Neither of these years distinguishes between regions so we consider the same wage for the whole country. Finally, we project total wages for 1907 backwards to 1895 and forwards to 1915 by the movement of wage rates in the Wage Nominal Index of Matus (2009) and the annual series of *"gañanes"* of Rodríguez Weber (2009).

6. New Zealand

As with the other ex-British colonies there is more information available, with periodic census data and many adequate secondary sources. We propose the following benchmarks: 1874, 1881, 1891, 1901, and 1911. The recent attempts to introduce these categories empirically into a historical perspective are Álvarez (2008), Álvarez, et al. (2011) and Álvarez & Willebald (2009), but our estimates consider a longer period and have more accurate information. Furthermore, the second article of the three mentioned above does not distinguish between land rentals and profits. Now we can improve the estimates with more sources and make our assumptions more precise.

6.1 Agrarian product

We do not have data about sector product in New Zealand before WWI. Linehman (1968) presents annual data by industry and total GDP at current prices from 1918 to 1939. There are other estimates of total GDP at current prices made with other methodologies. We use the series published in Briggs [2003 (2007)] –based on Rankin (1991)– and Easton (2004) and contrast them with Linehman's estimates.

The ratio between the Linehman and Briggs estimates of total GDP for the whole period (1918-1939) is 0.97 (average), although for some years the differences are greater. For instance, during the first 5-year period the ratio is just 0.8 and this difference is important in our study because these values are our splicing period. When we compare the sector structure with Easton's series, the compatibility with Lineham's data is marked. According to this source, the shares of nominal agriculture GDP in total GDP were 29.8, 26.2 and 23.2 per cent in 1920, 1930 and 1939, respectively, while the shares in the Lineham's series were 31, 26.3 and 23.1 per cent.

Information about agriculture for the period prior to 1918 is available for the gross value of agricultural production (GVP) for the years 1900/01, 1905/06, 1910/11, 1915/16 and 1920/21, and we assign the values to 1901, 1906, 1911, 1916 and 1921, respectively. We estimated the agrarian product (value-added) for 1916 by applying the movement in the GVP from 1916 to 1921 to the average value added of 1920-1922. The other figures are backward estimates –for 1901, 1906 and 1911– in accordance with the same criterion. The engine of the agrarian activity was the

[131] We repeat our estimates with the 1907 day-wage of the agrarian worker of Matus (2009) and the result is the same.

international market so export dynamism may be a good indicator of the evolution of the sector. However, the domestic market was developing at the same time and the result was a combination of the two processes. We expect that the share of agrarian exports –from livestock and agriculture; Bloomfield, 1984[132]– in agrarian GDP increased during the period and our methodology confirms it. When we consider triennial averages the figures are as follows: 0.84 (1901), 0.85 (1906), 0.92 (1911), 0.95 (1916), 1.08 (1921), 1.08 (1926), 1.04 (1931), 1.23 (1936).[133] We propose an exercise of lineal regression to extrapolate the shares in 1891 and 1881 and we obtain shares of 0.71 and 0.61, respectively. We applied both ratios to agrarian exports (triennial average centred in those years) to estimate the agrarian product. For 1874 we assume the same ratio as for 1881.

6.2 Rents

- ***Land areas 1874, 1881, 1891, 1901 and 1911***

Bloomfield (1984) presents series of land occupied from 1867 onwards with varying periodicity. New Zealand has a small surface area but land values are not homogenous and the differences between different establishments depend on geographic and institutional conditions. It was not possible to find different prices and rents by regions, but some institutional arrangements governing land make it possible to bring in these differences.

Gould (1969) publishes almost the same series as Bloomfield (1984) and provides a useful classification for our approach. He distinguishes between Crown land for pastoral purposes only –that is Crown Pastoral Leases (CPL), and from 1886 onwards Small Grazing Runs– and other agrarian land that is not under CPL. CPL land was especially suited to extensive pastoral farming, it was relatively infertile and/or inaccessible and it was subject to specific tenure conditions.

In addition, farm intensity differed on non-CPL land, depending on the type of production. This difference became increasingly important as agriculture and the dairy industry (associated with refrigeration) extended their influence in the agrarian economy. Therefore we differentiate kinds of land in accordance with its productive uses (livestock and crops). Bloomfield (1984) presents data about cultivated land and we include in this category grain crops, greens, root crops, orchards and other cultivated land from 1890 to 1911. We make estimates for years prior to 1890 using the evolution of the area of major crops (wheat, oats and barley).

Therefore we consider three types of land: CPL, non-CPL specialized in crops, and the rest of the non-CPL. Each type is related to different returns and prices; the lowest values for the first type, the highest values for the second and intermediate values for the third.

[132] Pastoral includes meat (preserved and frozen), butter, cheese, hides and skins, tallow and wool. Agriculture includes grain, flour, meal, potatoes and seed.
[133] We take 5-year data to maintain the periodicity pre-WWI. Shares higher than 100 per cent are possible considering stock variations.

- ***Rental rates and land prices 1874, 1881, 1891, 1901 and 1911***

Data about rents is scarce and scattered. CPL rents are calculated as the ratio between the yearly rental (or instalment payable) and the total area held from the Crown in 1913 and 1906 including deferred payments, occupation with the right of purchase, leases in perpetuity, renewable leases, small grazing-runs and pastoral runs. The calculation covered 11.4 and 15.6 million acres, respectively, for the two years. The 1896 source does not distinguish rental categories and we consider the total amount (New Zealand Yearbook, 1897, 1907 and 1914). Non-CPL non-crop rents are calculated from the annual rental paid by selectors under the closer settlement land policy, which was actively promoted by the government from the beginning of the 20th century. The calculations cover 105,239 acres in 1906 and 1.5 million acres in 1913. Finally, Greasley & Oxley (2008) propose an estimate of per capita rental values for cultivated land that enables us to calculate an implicit rental rate for 1890, 1914, 1919 and 1929 (population data from Briggs, 2003 (2007)).[134] Therefore we have land rental rates for different types of land and periods (see Table A4.5).

Table A4.5
LAND RENTAL RATES BY LAND CATEGORY AND YEAR

Land category	*Reference year*	*Rental rate (£/acre)*
CPL	1896	0.008
	1906	0.014
	1913	0.035
Non-CPL Crops	1890	0.98
	1914	2.27
	1919	3.81
	1929	3.10
Non-CPL Non-crops	1906	0.21
	1913	0.24

We calculate agrarian rental rates for each type of land and update by the coefficient "price-interest rate".[135] The only exception is non-CPL land specialized in agriculture for 1901, for which the land rent rate was interpolated between the 1890 and 1914 figures because the evolution turned out to be more reliable. We obtained land prices from Greasley & Oxley (2005). They present a real land price index that we inflated with the price index implicit in the relation between the nominal and the real wage (Greasley & Oxley, 2005, Data Appendix, p. 43-44). With that index we obtain the series of land prices in pounds, and update the value they give for 1915 (p. 28) (£7.4 per acre).

[134] The calculation of total land rents in this article exceeds the GDP of the agrarian sector, and this is an important conceptual error. However, the problem derives from considering that all cultivated land yields the same (high) rents. The implicit rental rate is derived from applying a mortgage interest rate to the price (per acre) of this type of land. We use this rental rate for our estimates.

[135] The source of interest rate does not present data for 1915-1924. We assume the same movement as Australia's interest rate.

- ***Total land rents 1874, 1881, 1891, 1901 and 1911***

We update total rents by land category for 1911 by the movement in the estimated land rentals and multiply by the area of farm holdings.

6.3 Wages

- ***Agrarian workers***

Hawke (1979) proposes a disaggregation of the New Zealand labour force for the years 1871-1936. He corrects the census data (such as those presented in Bloomfield (1984); agricultural and pastoral occupation) in line with a modern classification of economic activities and the reallocation of residual census categories like "others" and "indefinite occupations". He presents 5-year data from 1881 onwards (1886, 1891, 1901, 1906 and 1911). For years previous to this period, when the changes are more accelerated and the labour force increased very quickly, he presents figures for shorter periods. We smooth the figures in a similar way as for GDP data. We average 1871-1874 and 1878-1881 to calculate the total labour force in 1874 and 1881, respectively. The agrarian labour force includes non wage-earners (land proprietors and family workers) so it is necessary to adjust our series. Considering that many landowners may have been registered as labour force, one way to correct our figures is to take these people out by assuming that each establishment has one owner. Bloomfield (1984) presents the number of farm holdings for the period.

- ***Wage rates***

Arnold (1982) provides information about remuneration by industry for the period 1873-1911 and considers wages paid in shillings per week. For farm or agrarian labourers the data are presented with and without board, and we use the latter category. We calculate the annual wage with the same ratio as that used for Australia (Huberman, 2004 and Huberman and Mins, 2007). Arnold (1982) does not include information about farm wages without board in 1873-1877 because his source (Statistics of New Zealand) does not report it. Greasley & Oxley (2004) propose nominal wage indexes by industry for 1873-1913 in a way that is compatible with Arnold's data. We complete Arnold's series with the evolution of their nominal farming wages index presented.

- ***Total Wages***

We calculate the total wages by multiplying the number of wage-earners and the wage rates.

7. Uruguay

We selected our benchmarks in function of the information available about land rents. Unlike for the other countries, we have land rental series (4- or 5-year periods) and we use these data in the estimation. The first estimate of land used for agrarian activities was in 1872 and this year will be our starting point. We propose the following benchmarks: 1874, 1883, 1893, 1903 and 1912.

As in the case of New Zealand, the recent attempts to introduce these categories empirically into the historical perspective are Álvarez (2008), Álvarez et al. (2011), and Álvarez & Willebald (2009). The same comments apply to the Uruguay data; our estimates are based on broader information and we work with a longer period.

7.1 Agrarian product

Bértola (2005) proposes an estimation of income distribution in Uruguay –by productive sector and occupation classes (annual data)– from 1908 to 1966, and this is one of our starting points. However, to maintain consistency in our estimates in the sample of countries, we work with agrarian product (livestock and crops value-added) at current prices. Bértola (1998) presents these series (annual data) for 1870-1936. During the period when the two series coincide (1908-1936), the lineal correlation is close to 0.9 although agrarian income exceeds agrarian product by more than 50 per cent (an average of 54 per cent for the whole period).

7.2 Wages

- ***Total wages 1912***

Bértola (2005) presents various occupational categories: unskilled labourers (*"peon"*), foremen (*"capataz"*), servants, landowners, lessees and lessors, and considers numbers of persons and income rates. We use the three first categories as wage-earners. Total wages for the years 1911-1913 amounted to 21 per cent of total income, and we apply this proportion to agrarian GDP in the same period. We project this value back in time in accordance with movements in the wage rate and the number of farm or agrarian workers.

- ***Wages rates 1874, 1893, 1883 and 1903***

The information used to calculate total wages in 1912 may be disaggregated in terms of amount (number of workers) and price (wage rates) to estimate a weighted average wage. The result is $ 363, as the average of $ 300 (unskilled worker), $ 720 (foremen) and $ 351 (servants) (triennial averages centred in 1912). Analogously, we have data for 1909-1911 ($334).

There is scant data for agrarian wage rates in previous periods and we have to rely on partial information and indirect indicators. An initial possibility was to work with Williamson's (1999) Nominal Wage Index for 1870-1940, based on Bértola et al. (1999a, b), to update the figures, but there are some problems that make this option unsuitable. This index was constructed in accordance with the following occupational classes: unskilled public building workers (1870-1886); unskilled building workers in a particular firm (1886-1900); building sector labor cost (1900-1907); and unskilled building workers (1907-1926). Therefore the series have an urban profile that makes it difficult to apply them to our figures as we move back in the 19th century. We do not have evidence about the composition of the labour market in Uruguay but it is reasonable to suppose that

integration was high on the eve of WWI. However, this assumption is doubtful for previous decades, so we look for alternatives and wage levels in accordance with agrarian payments.

Barran & Nahum (1971) analyze the agrarian profitability of a cattle and sheep establishment in 1891. For each peso ($) paid in wages (for contract and also piecework), $ 0.81 was paid for board and lodging. Therefore, by considering this ratio and the number of contracted workers, we calculate an annual wage of $ 196 ($88 with board).[136] This annual wage was applied for 1893 (the Nominal Wage Index for 1891-1893 has the same value, which denotes salary stability).

These authors also present calculations for the returns on a sheep and cattle farm in 1868-1869,[137] and in addition they obtain information for 1871 from a specialized journal.[138] In the case of the sheep and cattle farm, we consider an annual wage of £37 that converted into pesos –Millot & Bertino (1996), Officer (2011)– and adjusted by board and lodging (in accordance with the estimates for 1891) yields a wage of $ 320. In the second case, monthly wages between $12 and $15 are reported for cattle farming wage-earners and between $15 and $17 for sheep farming wage-earners. By considering averages, annual wages and board and lodging, we get a very similar level to the previous one ($ 321), which is consistent with the high stable values in the period.

As a result we have wage levels for 1871, 1893, 1909 and 1912, and we need to estimate figures for 1874, 1883, 1893 and 1903. We rescale Williamson's (1999) Nominal Index Wage to make our data compatible with this evolution and obtain our reference values (see subsection 3.3).

- ***Agrarian workers 1874, 1883, 1893 and 1903***

We estimate the number of workers in crop and cattle farming.

The Ministry of Livestock and Agriculture's series data (Ministerio de Ganadería y Agricultura - Dirección de Agronomía, 1950) on the crop farming workforce distinguishes land proprietors, family workers and wage-earners for 1925, and Bertino & Bucheli (2000) extend the series of the total workforce of the activity to cover 1913-1924 and 1908. We project the total wage-earners from the first source with the movement in total workforce in the second source. Barran & Nahum (1967) estimate the crop farming workforce in 1892-1894 and get values compatible with those of Bertino and Bucheli (2000),[139] and we use the same above-mentioned methodology to calculate wage-earners in 1893. Before the 1890s, crop farming was not an important sector, it was related to subsistence occupations, and we do not consider wage-earners in that activity.

In addition, we follow an exercise by Rial (1982): 119 to estimate the number of labourers

[136] The ratio between wages without and with board is 2.2. It is close to the New Zealand value for the same year and considers official data (2.1; average 1890-1892).
[137] Barran & Nahum (1971):265 quote an English book edited by J.H. Murray in 1871.
[138] Barran & Nahum (1971):266 quote the journal of the organization representative of agrarian interests (*Revista de la Asociación Rural*) published in January, 1873. The article is a letter that answers some questions from a Portuguese citizen about the costs and returns of agrarian activity in Uruguay.
[139] 44,023 (1892), 43,409 (1894) and 41,631 (1908), respectively. They are farming workforce and not wage-earners.

employed in the livestock sector in accordance with technical coefficients. According to the testimony of agrarian producers, during the 1860s one worker was employed per 300 cattle and per 1,500 sheep, and from the first decade of the 20th century one worker was employed per 580 and 1,000 animals, respectively (Barrán & Nahum, 1967, 1977). Therefore, considering the number of cattle and sheep and these technical coefficients (we assume that the coefficients changed lineally between 1860 and 1900, and maintain the last ratio in the 20th century) it is possible to estimate the number of workers.

We have data on the number of animals from Dirección General de Estadísticas (1937) (livestock census) for 1900 and 1908, and from Barrán & Nahum (1971a, b) for 1883 and 1874. We obtain the figures for 1893 and 1903 by lineal interpolation (between 1885 and 1900, and between 1900 and 1908, respectively) and the values for 1883 and 1874 are the simple averages of two estimates by these authors.[140] We use the sum of our estimates of crop cultivation and cattle farming labourers for 1908 (43,667), 1903 (37,095) and 1893 (33,409) to project Bértola's (2005) 1908 figure (47,082) back in time. For 1874 and 1883 we use our estimates of cattle farm workers (28,256 and 23,394, respectively).

7.3 Rents

Balbis (2005) presents information about land rents (Uruguayan *pesos*/hectare) by province[141] for five-year periods (with the exception for one three-year period) from 1886 to 1924. Thanks to the detailed data available we can carry out a different exercise that is more precise than for the other countries. We estimate total land rents in 1912 by considering rent rates and cattle and crop farming area by province, and we classify the provinces in accordance with their agrarian aptitude. The CONEAT index is an indicator of agrarian productivity that classifies regions in accordance with their agrarian aptitude (MAP-CONEAT, 1979) and we use it as reference. Depending on the availability of information, we apply land rents and land prices (adjusted by the interest rate) to estimate land rents for each benchmark and area devoted to cattle or crops.

Balbis (2005) presents a breakdown of the country in four zones: South (Canelones, San José, Flores), Littoral (Paysandú, Río Negro, Soriano and Colonia), North (Salto, Artigas, Rivera, Tacuarembó, Treinta y Tres and Cerro Largo), and Centre (Lavalleja, Durazno, Maldonado, Florida and Rocha). For our purposes it is more suitable to rearrange the regions so as to incorporate differing land quality and to "homogenize" the zones. We place Florida in the South region and Paysandú in the North.

[140] Barrán & Nahum (1971b) present two data items by category for 1874 –4.75 and 6.33 million (cattle) and 9.75 and 13 million (sheep)– and for 1883 –6 and 8 million (cattle) and 14.56 million (sheep)– derived from different sources. We do not have any criterion to prefer one or other figure so we opt to work with the average.

[141] Uruguay has 19 administrative jurisdictions called *departamentos.*, which are equivalent to the "provinces" or "states" in other settler economies.

- ***Land areas 1874, 1883, 1893, 1903 and 1912***

The information sources for the total cattle farming area in each year is as follows: 1872 (Jacob, 1969:11), 1900, 1908 and 1916 (Moraes, 2001:55), the crop area for 1872 (Jacob, 1969:11), 1900 and 1908 (Bertino et al., 2005:158-159). We obtained the crop area for 1912 and 1916 by considering a total agrarian area of 16.6 million hectares and taking the difference. We calculated the benchmarks by lineal interpolation. The cattle farming area was distributed proportionally among the provinces in accordance with province areas because all the land is suitable for raising cattle and sheep (see Chapter 4). We distributed the crop farming area proportionally among provinces with a CONEAT index higher than 100 as these areas were more suitable for intensive agrarian activities. These provinces or *"departamentos"* are the following: Canelones, Colonia, Flores, Florida, Río Negro, San José and Soriano.

- ***Land rent rates 1874, 1883, 1893, 1903 and 1912***

Balbis (2005) provides data for 1911-1913 and 1891-1895 and we assign these to 1912 and 1893, respectively, but we do not consider the information for 1901-1905 because it is so scant.

There is no information for 1912 for three provinces –Treinta y Tres, Maldonado and Rocha– therefore we estimate these figures by taking the changes in Cerro Largo (for the first case) and Lavalleja (for the two latter cases), from the period 1906-1910 to the eve of WWI (average of 1911-1913). There is no information for 1893 for six provinces –Colonia, Salto, Rivera, Treinta y Tres, Maldonado and Rocha– and we estimate them using a variety of criteria. We estimate Colonia, Salto and Treinta y Tres in line with the average movement in Río Negro and Soriano, Paysandú, and Cerro Largo, respectively, from 1891-1895 to 1896-1900. We assume Rivera had the same land rate as Artigas. Lastly, we estimate Maldonado and Rocha using the average growth in land rents in Lavalleja and Durazno from 1891-1895 to 1906-1910. There is no information available for the province of Montevideo so we consider the same land rent as Canelones. They are next to each other and they share similar agrarian characteristics.

We calculate the rest of the benchmark land rent rates (1903, 1883 and 1874) in accordance with movements in land prices and interest rates. For 1903 we have prices per province from Balbis (1995). The series are complete with the exception of figures for Durazno and Maldonado in 1911-1913, and we calculate these in accordance with the movement in Lavalleja. We estimate land rents by moving the 1912 figures in accordance with the evolution from 1903 to 1912. We applied the same methodology to estimate the figures for 1883 and 1874, using averages by zones (not by *departamentos*) and moving the figures from 1893 and 1883, respectively. Data by province begin in 1886-1890 and therefore we compare the average of our regional analysis in 1893 with the Balbis's (2005) regional average for the same year. The differences will not be very important and we confirm that our methodology is satisfactory.

- ***Total land rents***

We multiply our calculations of the area and the land rent rates to obtain our estimates of total land rents.

8. Our estimates

We present our agrarian GDP component estimates (current currency) in Table A4.6.

Table A4.6
AGRARIAN SECTOR: FUNCTIONAL INCOME DISTRIBUTION
Agrarian GDP components in current currency

	ARGENTINA (000s pesos)				AUSTRALIA (000s pounds)		
	Wage	Rent	Profit		Wage	Rent	Profit
1869	33,718	54,038	11,782	**1871**	6,716	11,007	4,010
1875	46,371	100,192	23,899	**1881**	9,940	16,327	9,167
1888	85,856	129,327	55,726	**1891**	11,661	27,490	6,415
1895	163,802	272,953	236,296	**1901**	12,153	19,024	4,523
1914	351,663	1,132,937	200,433	**1911**	21,239	32,863	29,997
	CANADA (000s Canadian dollars)				**CHILE (000s "old" pesos)**		
	Wage	Rent	Profit		Wage	Rent	Profit
1871	31,839	70,268	43,379	**1875**	10,669	37,355	12,802
1881	43,857	82,062	61,165	**1885**	10,097	42,701	21,855
1891	50,000	102,349	35,405	**1895**	20,297	73,619	24,140
1901	48,457	90,394	104,934	**1907**	60,559	142,285	85,156
1911	94,265	225,923	129,792	**1915**	98,908	377,697	186,395
	NEW ZEALAND (000s pounds)				**URUGUAY (000s pesos)**		
	Wage	Rent	Profit		Wage	Rent	Profit
1874	1,289	1,887	2,505	**1874**	4,390	5,385	2,022
1881	2,617	3,140	1,664	**1883**	4,338	8,080	3,997
1891	3,099	4,223	2,969	**1893**	4,700	10,879	6,424
1901	3,038	5,639	3,028	**1903**	7,132	13,724	7,716
1911	5,526	9,414	3,671	**1912**	12,137	39,196	6,656

Source: see Text.

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9.1 Introduction

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Chapter 5

Natural resources and institutional quality: the hypothesis of appropriability revisited from an historical perspective

A new literature has developed, inspired by the work of Sachs & Warner (1995), which focuses on the so-called "resource curse hypothesis", a puzzling paradox whereby resource-rich countries seem to tend to grow more slowly than resource-poor ones. However, natural resources –essentially coal and iron– played a key role in the emergence of "modern economic growth" since the 18th century, with Great Britain as the leader and Belgium, Germany, France and the US as followers. Besides this, during the 19th century other regions were brought into the expanding Atlantic economy and participated successfully in international trade, which suggests that other resources apart from minerals might be important for economic growth. In other words, these economies showed that there were other *blessings* apart from mineral resources. The Second Industrial Revolution had important repercussions in extensive regions of the world periphery –parts of South America, Australasia and the north and south of Africa– as it brought technological progress (railways, refrigeration, a reduction in the cost of inter-oceanic transport) to these areas where a temperate climate and fertile soils were particularly suitable for producing a range of commodities like wool, meat and cereals.

Therefore, rather than considering the curse as a general pattern we can see it as being subject to the influence of supply and demand conditions, technological progress and institutional structures, in a process with strong historical specificity. Settler economies, which are regions with abundant natural resources, are an interesting "natural experiment" in this sense. We select six economies –Argentina, Australia, Canada, Chile, New Zealand and Uruguay– and evaluate a period of strong economic expansion based on their dynamic participation in primary international trade, namely the First Globalization (1870-1913), to shed new light on the subject.

One of the main analytical branches of the curse of natural resources hypothesis has to do with the role institutions play in economic relationships. In this sense, we use the appropriability hypothesis to consider the idea that different types of natural resources interact with institutional quality to render dissimilar economic results. The literature usually refers to the curse (or the blessing) considering the evolution of GDP per capita, but we want to go beyond this (restricted) concept and consider an idea closer to a broad definition of development. Then we evaluate the curse in terms of sector economic growth and income distribution. While the intensity of the First Globalization and its consequences for settler economies followed a common pattern, the countries reacted in different ways, and this probably determined their economic performance in the

subsequent decades. These economies based their production on primary activities but in spite of this, around the time of WWI, they achieved levels of development close to the "core". However, income per capita was higher and inequality was worsening less in ex-British possessions (Australia, New Zealand, Canada) than in the South American Southern Cone (Argentina, Chile and Uruguay), and in the former group economic specialization was relatively less concentrated on primary activities. In terms of the curse/blessing of natural resources, the ex-British colonies were more blessed and less damned by their abundance of natural resources than the other ex-colonies.

According to the more extended literature, settler economies would have similar natural resources. However, it is important to consider the idea of "quality" to identify differing "types" of natural resources. In this Chapter, we introduce the consideration of different types of land –depending on agrarian aptitude– to incorporate a gradient of appropriability possibilities that ranges from land of high quality (more likely to yield differential rentals) to low quality. Our conclusion is that the productive application of the abundance of natural resources (as initial endowments) was a blessing for settler economies in terms of economic growth, but they suffered the curse of increasing inequality in the agrarian activity. These processes were not homogenous in the countries of the "club", and this can be explained by differences in productive application by type of land. Economies that expanded their frontiers into high agrarian aptitude lands welcomed the blessing of economic growth in the agrarian sector, but they were cursed with the concentration of agrarian rents in the hands of small and privileged classes.

Nevertheless, natural resources did not perform alone; they interacted with various different institutional arrangements such as different kinds of government actions, in particular the establishment of the land ownership rights. We propose two methodological approaches to tackle this subject, and they depend on our operationalization of the concept of institutional quality. This concept is approached in terms of (i) constraints on the executive and the enforcement of property rights (which we call the "macro level"; the concept that is used more in the literature), and (ii) the formation of the land ownership system, which we understand as the main institution in the agrarian activity (it considers agents' behaviour and is closer to the "micro level").

The first approach is based on estimating the statistical relationship between economic development in the agrarian activity, natural resources (land) and institutions. For this analysis we use panel data estimation and include the interaction between the two latter variables, and we study six economies and consider data for each decade from 1860 to 1913. These exercises are not conclusive but they help to identify some of the main features of the process and offer clues as to how to proceed with the second approach. This is based on a historical description of the distribution of land rights –from the beginning of the 19th century to WWI– and the institutional

arrangements governing land ownership in the River Plate (Argentina and Uruguay) and Australasia (Australia and New Zealand). Our discussion is focalized on the role of national authorities (state) and the definition and enforcement of land rights, and we attempt to identify two "models" –the "British" and the "Hispanic" models– that determine different distributive patterns (considering land and income related to the activity).

After this introduction, this Chapter is structured as follows. First, we review the concept of the curse of natural resources and present the appropriability hypothesis (Section 1). Next we present our statistical results (Section 2), and to cater to the main shortcomings of the analysis we use the notion of appropriability to guide the depiction of the historical formation of the land ownership system (Section 3). This analysis enables us to identify two models of distribution and the creation of institutional arrangements governing land ownership that generate different distributive patterns of assets (land) and incomes (in the agrarian sector).

1. Institutional quality and the appropriability hypothesis

In Chapter 2 we review theories that offer interesting predictions about why different resource-rich economies may be affected differently by their natural wealth. Countries with extensive plantation crops (sugar, bananas) or very valuable minerals (oil, diamonds) are more likely to obtain unfavourable results than countries with wheat, rice or livestock. But why is it that in our club of settler economies some seem to gain relatively more from their endowments when they all have comparable natural resources?

Boschini, et al. (2005) propose a framework that provides arguments to answer this question. They show that the effect of natural resources on economic development is not determined by resource endowments alone, but rather by the interaction between the type of resources and the quality of the country's institutions. This combination of factors represents the so-called "appropriability" of a resource, a concept that alludes to the environmental factors that control the innovator's ability to obtain returns generated by an innovation. In the case of natural resources, this concept captures the probability that these resources will lead to rent-seeking, corruption, anti-competitive strategies or conflicts over the rents from natural capital, which in turn hamper economic development. In economies where resources are highly appropriable their abundance may hinder economic performance, while in countries where resources are less appropriable their abundance may contribute to economic development in the long run. The appropriability hypothesis may be conceived in terms of the institutional and the technical dimension. On the one hand, natural resources abundance affects the economic development under weak institutions and, on the other hand, the impact of the institutional quality and abundant natural resources is more pronounced when the natural resources are technically more appropriable.

In a similar way, Mehlum et al. (2006) develop a model in which entrepreneurs choose between becoming "producers" or "grabbers". The relative payoff from each strategy depends on how "grabber friendly" the country's institutions are, and this also determines the effect of natural resources on the economy. More natural resources raise national income if institutions are "production friendly" but reduce it if they are "grabber friendly". Robinson et al. (2002) develop a model with similar predictions but in which political incentives generated by the resources are the key factor. In countries with good institutions resources are positive because the perverse political incentives are mitigated, but in countries with bad institutions resources remain a curse.

In a recent working paper, Camilo García-Jimeno and James Robinson show a renewed interest in land frontier expansion, and this is interesting for us empirically and analytically. This concept is associated with the incorporation of land (a natural resource) into production, a process that is accompanied by the establishment of a new system of land ownership rights (institutional arrangements), so there is an immediate connection with our area of study. The interesting point in their specification is that if we reinterpret the analytical relation the model is equivalent to that used in Boschini, et al. (2005) (see our conceptual framework in Chapter 2, Section 4).

1.1 Our model

Settler economies had an abundance of land and excellent conditions for the competitive production of primary commodities. Some of them also had considerable mineral deposits, which had important effects on the social-economic context and population dynamics. However, we focus our analysis on land abundance as we want to emphasize land as a productive factor in the generation of agricultural products (foods and raw materials).[142] In Chapter 3, we estimated the land frontier expansion of the settler economies taking into account agrarian aptitude as a proxy for "land quality", and we examine the role of distance from "markets" or "centres of gravity" as a possible other component of this concept. Therefore we can bring these indicators into our model as our proxy for natural resource wealth (land wealth), and we then control for the effect of institutional quality on the natural resources.[143] In this sense we differ from Boschini et al. (2005) as we understand the technical dimension in terms of its potential productivity instead of "point" and "diffuse" natural resources. In addition, we apply the García-Jimeno & Robinson (2009) formulation but we differ from their approach in that we work with a more accurate concept of

[142] Even in the case of Chile, the evolution prior to the incorporation of mineral wealth –from the mid-19th century to the 1880s– had several features common to economies that produce food and raw materials, which makes it a comparable case. Denoon (1983) argues that Chile and South Africa constitute "limit cases" of settler economies.

[143] García-Jimeno & Robinson (2009):18 admit that "…[t]here are many caveats with these findings. For example, we did not control for variation in the 'quality' of the frontier. For instance there may be a big difference between Oklahoma in the United States and the Atacama Desert in northern Chile, both of which were frontiers in 1850."

frontier[144] and we consider several benchmarks. This captures the dynamism that characterized the process, an element that was lacking in their analysis. We use panel data to estimate the equation:

$$y_{it}=\beta_0+\beta_1 NR_{i,\,t-1}+\beta_2 Inst_{i,\,t-1}+\beta_3 (NR_{i,\,t-1}\,x\,Inst_{i,\,t-1})+\varepsilon_i \qquad (1)$$

where y_{it} is the dependent variable of interest for country i (six settler economies) in the period t (with t representing decades from the 1870s to the WWI) considering the economic performance –annual GDP growth rate (*GDPAG*) and the index level (*GDPA*); 10-year average– and the income distribution within the agrarian activity, which constituted the more important economic sector of the period.[145] Our indicator of inequality is the relation between income components (functional income distribution in the agrarian sector); specifically, the ratio of the total mass of land rents to wages (*RW*), which higher values correspond to increasing inequality (as the Gini Index) and a "rentist" profile of the agrarian production.[146]

1.1.1 Explanatory variables: institutional quality

Like García-Jimeno & Robinson (2009), we consider $Inst_{i,t-1}$ as the constraints on the executive (*C*) from *Polity IV* in period *t-1* but, unlike in their approach, we admit changes in the time of the index. This measure of historical political institutions is defined as the extent of institutional restrictions on the decision making powers of the chief executive, whether individual or collective. In a democracy, constraints would come from the legislative or judicial branches of government. In a dictatorship constraints may come from the ruling party in a one-party system, a council of nobles or powerful advisors in monarchies, or perhaps the military in polities which are subject to the threat of military coups. The extent of constraints on the executive are coded as being between 1, meaning "unlimited executive authority" and 7 for "executive parity or subordination". A country would be in the first category if "constitutional restrictions on executive action are ignored" or if "there is no legislative assembly, or there is one but it is called or dismissed at the executive's pleasure". A country would be in the upper category if "a legislature, ruling party or council of nobles initiates much or most important legislation" or "the executive is chosen by the accountability group and is dependent on its continued support too remain in office" (Marshall & Jaggers, 2009: 23-24). (See specifications in Appendix 1 to Chapter 5). These indicators are systematic subjective ratings generated by specialists to provide different agents (typically politicians and investors) with measures of political and institutional risks, governance and democracy. However, considering that they are the results of value judgments and entail evolutions

[144] Instead of using the area of the current national territory as reference, our indicators consider the area suitable for grassland and different kinds of land (see our discussion in Chapter 3).
[145] Boyce & Emery (2006) and Bravo-Ortega & De Gregorio (2005) propose and test models with the growth rate and level of income per capita as dependent variables, and our exercises follow a similar line.
[146] The data were presented in Chapter 4.

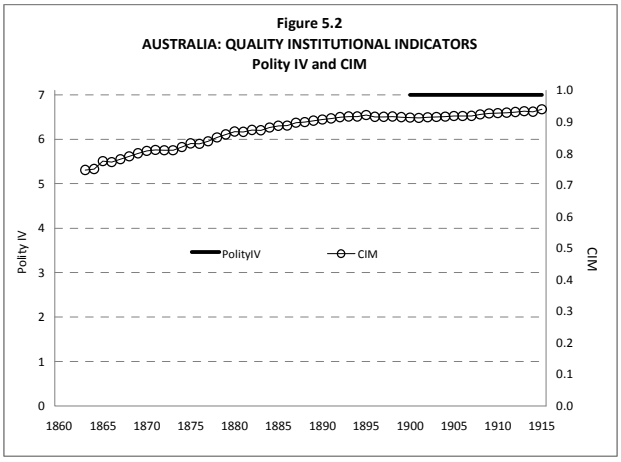
in which periods of absolutely stability are interrupted by sudden jumps (the discrete evolution of the index), their application to statistical long-run studies has disadvantages. We introduce alternative indicators in order to obtain robust estimations.

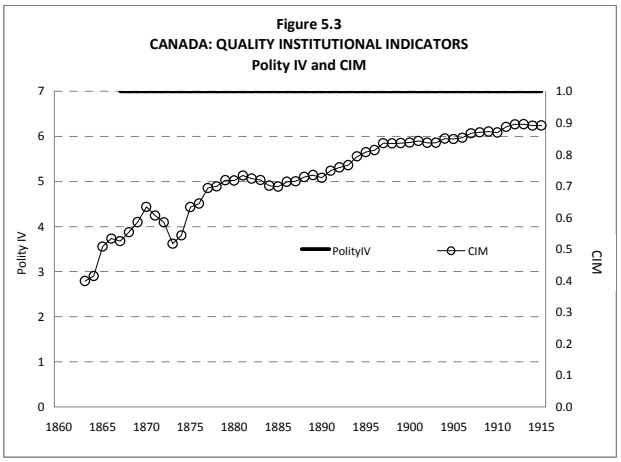
Clague et al. (1999):187 say that the government has four crucial roles to play in contract enforcement and the protection of property rights: (i) It provides third-party enforcement when no self-enforcing mechanism exists; (ii) It may be the entity that connects the branches of the contract; (iii) It may enforce the arrangement that private agents use to constitute themselves as a formal group; and (iv) the government ensures peace. These characteristics are applicable to the creation and distribution of landowner rights and the enforcement of the property system. Therefore these concepts are interesting as a guide in our approach to this question. The argument is that to capture the potential gains of activities intensive in contract enforcement and property rights it is possible to employ the relative use of currency, by applying the concept of "contract-intensive money". Contract-intensive money (*CIM*) is defined as the ratio of non-currency money to the total money supply, or $CIM=(M_2-Curr)/M_2$, where M_2 is a broad definition of the money supply and *Curr* is currency held by people (outside banks). In other terms, to capture the effectiveness of contract enforcement through time, it is possible to use the societies' reliance on non-currency money, since such "means of payment" and "reserves of value" would not be chosen by agents that are skeptic about the government's willingness or capacity to enforce contracts.

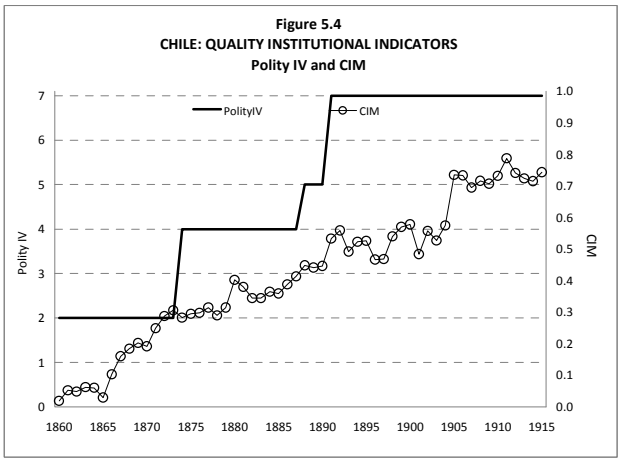
The application of these ideas to settler economies is not new. Prados de la Escosura & Sanz-Villarroya (2006, 2009) use the same concept to evaluate the role of institutional arrangements in the long-run decline of Argentina by comparing the evolution of the *CIM* with the cases of Australia and Canada. Both Clague et al. (1999) and Prados de la Escosura & Sanz-Villarroya (2009) argue about how well these indicators fit, and the evidence is convincing. "CIM is a reflection or measure of the type of governance that improves economic performance rather than a cause of that performance" (Clague et al., 1999: 189). Hence this can operate as an instrumental variable in the historical analysis. To justify our decision we compare the evolution of the two indicators for each country. The association between indicators by country is evident in Australia (Figure 5.2), New Zealand (Figure 5.5) and Chile (Figure 5.4) and increasingly congruent in Canada (Figure 5.3). In Argentina (Figure 5.1) and Uruguay (Figure 5.6) the evolution of *CIM* is highly irregular and this is related to the low values of *Polity IV* indicators.[147] We repeat our statistical analysis of executive constraints (*C*) with *CIM* indicators to estimate equation *(1)*. We have doubts about the differences in levels among economies because the comparability of the

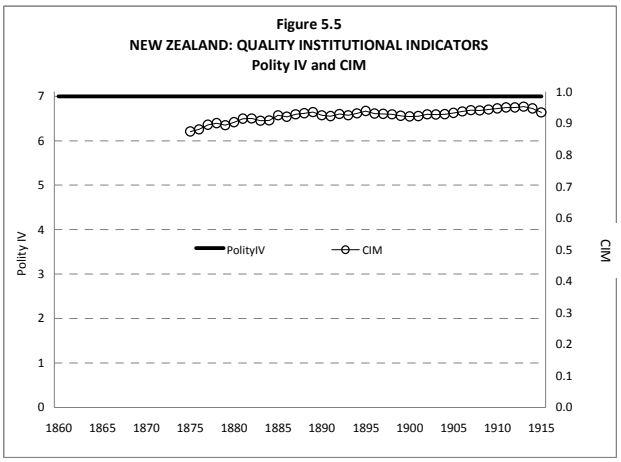
[147] See the calculations in Appendix 1 to Chapter 5.

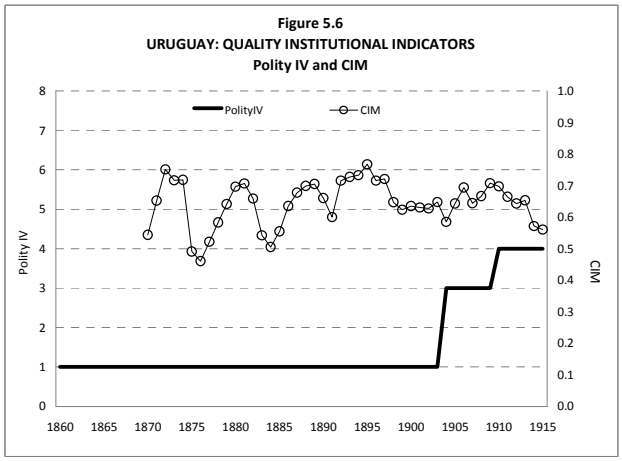
indicators is not yet satisfactory. To overcome this deficiency we include an index of *CIMs* (1860s=100; *CIMI*) to rule out levels and just consider evolutions.











Source: see Appendix 1 to Chapter 5.

In all our estimates we consider indicators for each country *i* in time *t-1* to control for possible effects of endogeneity in the model.

1.1.2 Explanatory variables: natural resources

"Natural resources" is a more restricted category of analysis than "natural capital" because they are just one function of natural wealth and, in consequence, they do not consider its systemic

character (Ayres, et al., 1997). However, as category, they acquire precision in the historical analysis of economies where the constitution of markets and others institutions were determined at the same time as natural resources were first exploited.

To discuss the impact of natural resources on economic development it is useful to distinguish among resource abundance (a stock measure of resource wealth), resource rents (the 'windfall' flow of earnings derived from the natural resources at some point in time) and resource dependence (the degree to which economies have access to alternative sources of income other than resource extraction; usually related to export specialization). Obviously these concepts may be inter-connected because economies with large natural capital may get high incomes from extraction, specialize in primary exports and become dependent on resources. But some resource-rich countries are not dependent on resources and some relatively resource-poor economies are. Besides, there is much confusion about the exact meaning of the concept "resource abundance". The sense may vary from one science to another and even among different areas of Economics. In the natural sciences or Environmental Economics, resource abundance usually refers to the amount of potentially exploitable natural resources. But when we study the Dutch disease, resource abundance refers to the amount of already exploited natural resources and reserves.

The share of potential resources that eventually becomes economically exploitable depends on many factors such as economic and political conditions and technological progress, which adds historical specificity to the explanation of economic processes. The literature initially proposed the "curse" as an empirical fact almost undoubtedly and based mainly on the analysis of an index –GDP shares of primary exports– more suitable to measure *dependence on* rather than *abundance of* natural resources. In these terms, the focus of the analysis concentrated on the channels that connect the two processes –rich natural resources and economic growth– in accordance with the typical factors that affect economic performance: the accumulation of productive factors (investment, human capital) and technological progress. However, the literature about the curse has actively incorporated institutional arrangements into the analysis because: (i) institutional aspects have increasingly become part of recent mainstream economic thought; (ii) a central point of the natural resources question is ownership –of the assets and the rents associated with their productive application–; and (iii) the interest groups and the state are key agents in the formation of the property system. Results have been mixed, but there is a general consensus in the literature that some kind of conditionality is operating. This is the idea that the quality of institutions plays a key role in the curse or blessing of natural resources and, even when natural resources are abundant, economies can have promising economic performance when institutions are "good" (these countries would show some kind of curse reversal). There has been a reaction to this line of thought and

several authors put the emphasis in to distinguish between natural resource dependence and natural resource endowment or abundance, taking into account alternative indicators such as the stock of natural capital[148] or total natural resource assets. In this analytical line, there is empirical work that challenges the traditional view inverting the relationship –resource abundance positively affects growth and institutional quality (Ding & Field, 2004; Brunnschweiler, 2008)– and claiming the curse is "a red herring" (Brunnschweiler & Bulte, 2006). In accordance with these considerations, our measure of abundance of natural resources in settler economies needs some further explanation to precise its implications. In our proposal, *NR* corresponds to natural resource wealth expressed in terms of the land that is not occupied or not incorporated into production, and in this sense it is closer to an *abundance* than a *dependence* concept. We propose several measures of *NR*, which was one of the main "potential" productive factors that the colonizers encountered when they arrived in these new territories. We work initially with an indicator similar to the index *F* of García-Jimeno & Robinson (2009). However, our *F* differs because it measures the proportion of non-occupied land to the land suitable for grassland and to raise animals, instead of the whole national territory.[149]

Then: $NR_{i,t-1} = 1 - \frac{OA_{i,t-1}}{PVG_{i,t-1}}$ *(2)*

Where:

$OA_{i\ t\text{-}1}$: is the occupied area (in km^2) of country *i* in period *t*, with *t=1870, 1880, 1890, 1900* and *1910.* . We classify territories with more than 2 people per square mile (0.7722 people per square kilometre) as occupied land (closed frontier) as it is standard in the literature.

PVG_i: is the "potential vegetation grassland" area (in km^2) of country *i.*

An important point in our definition is that our indicator *F* shows a decreasing trajectory –with some breaks of reversal expansion– that denotes the progressive and sometimes intermittent advance of the population across the territory. Therefore, in fact, our economies became less land-rich during the period, and if we assume the standard hypothesis they would be "escaping" from the curse. In other words, natural endowments become relatively scarcer with the expansion of the population on the "open" frontier, and they become limited as more land is incorporated into production. Seen in this way, natural abundance is not a static concept but changes in the long run. As in the previous case, we consider measures for each country *i* in time *t-1* to control for possible effects of endogeneity.

How can we represent the gradient of different appropriability conditions of natural resources? In Chapter 3 we present indicators corresponding to different types of land in accordance with its

[148] See, for example, World Bank (2006).
[149] For details and extensive discussion of the indicator see Chapter 3.

aptitude to allocate as grassland. We classify land as having high, medium or low aptitude, and we analyze the evolution of each frontier depending on the total grassland ("extensive indicators"), for each type of endowment ("intensive indicators") and by the contribution of each type of land to the total expansion of the frontier ("contribution indexes"). Specifically, (i) with "extensive indicators" we compare the expansion by each type of land in relation to total grassland; (ii) with "intensive indicators" we compare the expansion by each kind of land in relation to the total land of this type available; and (iii) with "contribution indexes" we measure the contribution of each type of land to the total expansion of the frontier. Our graphical analysis –from Figure 3.27 to 3.52– showed dissimilar trajectories by indicators and countries which, combined with our findings in Chapter 4, led us to propose an overall pattern and the following conjecture. The economies that during the First Globalization expanded their frontier by incorporating high aptitude land would have enjoyed stronger agrarian sectors, but at the same time there would have been a more intensive worsening in income distribution. This conjecture may be evaluated in terms of an appropriability problem that emerges from the different land quality notion, and our analysis contrasts the impact of each type of frontier on economic development (in terms of growth and distribution). Therefore we need to work with several indicators that provide an appropriability gradient to represent different capabilities of capturing rents.

We include *F* as a reference and to facilitate comparisons with other studies (especially with García-Jimeno & Robinson, 2009), but it does not offer useful results for our analysis. We consider our contribution indexes for high (*HI*) and medium (*MI*) land aptitude to represent the appropriability gradient (from more to less appropriability) and compare coefficients to test our hypothesis. In addition, we build relative indicators to contrast the evolution of the last indexes with those of low land aptitude (*LI*): *HI/LI=HL* and *MI/LI=ML*. Finally, we consider the "extensive indicators" *FEH*, *FEM* and *FEL* of land as another way to test our hypothesis (as before, considering from more to less appropriability). The "sense" of the appropriability is given by the technical conditions of the different land, understanding "technical" as the intrinsic features of the natural resources. Better land –the most productive land– makes it possible to generate and appropriate rents in a more intensive way. In other words, higher appropriability would be related to cursed results. However, natural resources do not perform alone but interact with institutions. This interaction is at the core of our third explanatory variable.

1.1.3 Explanatory variables: interaction between natural resources and institutions

For economic and technical reasons, some land qualities are more likely than others to cause problems like rent-seeking, conflicts and the crowding-out effects. However, this problem could be countered by "good" institutions, and whether natural resources are good or bad for a country's

development can depend on the interaction between the prevailing institutional arrangements and the types of resources the country has. We consider the joint action of natural resources and institutional quality indicators to test this question, and we introduce the multiplication of the two indicators as an additional variable.

1.1.4 Our empirical model

We can not estimate the general formulation of equation *(1)* because we have multicollinearity problems. By the nature of their construction, the indicators of institutional quality are highly correlated to the respective interaction components and this would distort the results. Therefore, we work with two models:

$$y_{it}=\beta_0+\beta_1 NR_{i,\,t-1}+\beta_2 Inst_{i,\,t-1}+\varepsilon_i \qquad (3)$$

$$y_{it}=\beta_0+\beta_1 NR_{i,\,t-1}+\beta_2 (NR_{i,\,t-1}\,.\,Inst_{i,\,t-1})+\varepsilon_i \qquad (4)$$

Where we consider, alternatively:

y: GDPAG, GDPA and *RW.*

NR: F, HI, MI, HL, ML, FEH, FEM, and *FEL.*

Inst: C, CIM and *CIMI*

NR x $Inst_{i,t-1}$*: FC, HIC, MIC, HLC, MLC, FEHC, FEMC, FELC, FCIM, HICIM, MICIM, HLCIM, MLCIM, FEHCIM, FEMCIM, FELCIM, FCIMI, HICIMI, MICIMI, HLCIMI, MLCIMI, FEHCIMI, FEMCIMI* and *FELCIMI.*

1.1.5 Hypotheses

What do we expect? A reasonable assumption is to identify economic development with richer economies (faster economic growth and higher incomes) and more egalitarian societies. During the First Globalization, the settler economies expanded strongly led by agrarian sectors but also suffered worsening income distribution. Both processes were the result of incorporating abundant land into production, and in this sense long run economic performance was the outcome of decreasing natural wealth. We test two hypotheses: (i) "good" institutions, and especially when they interact with natural resources, bring about a reversion of the curse (or they reinforce the blessing); (ii) the different degree of appropriability conditions the magnitude of the impact on economic development.

First, we work with model *(3)*. On the one hand, in the case of *GDPA* (growth rate and level) β_1 should be negative in accordance with the standard hypothesis of the curse of natural resource abundance, and β_2 should be positive because the standard results are that good institutional quality

is beneficial for growth. On the other hand, we would expect a positive effect of resources (β_1) on inequality (worsening in income distribution as the curse) and a negative effect of institutions (β_2), which would indicate improving equality derived from good institutions. Second, we estimate equation *(4)*, and we propose similar arguments as in the previous model, although we work with the interaction component instead of institutional quality indicators. Both formulations are suitable for evaluating the different impact of natural resources depending on their appropriability conditions. We compare the coefficients β_1 derived from the successive estimations of equation *(3)* and *(4)* to test our hypothesis of appropriability in accordance with the technical dimension. We compare the coefficients β_2 derived from the successive estimations of equation *(3)* with the corresponding of estimations of equation *(4)* to evaluate the institutional dimension of the appropriability problem. Evidence in favour of this hypothesis would require us to find more intensive effects of institutions when we estimate equation with an interaction variable.

1.2 Results

We work using panel data and we consider the most suitable model for each case among fixed effects (MFE), random effects (MRE) and ordinary least square (OLS). As is usual in the literature, we initially tested the correlation between the individual effects and the other regressors with the Hausman test to see if the results allow us to reject the null hypothesis of no correlation and to use fixed effects model, or do not reject it, and estimate the model of random effects. In addition, we tested the significance of the individual effects computing the Breush-Pagan for random effects, and the F test statistic for fixed effects. For cases in which individual effects were not significant, we use OLS. To control for heteroscedasticity we always use robust standard errors. We select the models that provide important insights for our objective (essentially to do with natural resources) and exclude the non-significant relations (see database in Appendix to Chapter 5). [150]

1.2.1 Estimates that include institutional quality

We present our estimates of equation *(3)* using institutional quality as an explanatory variable of economic growth, level of production and income distribution in the agrarian sector. Only in the first case we also include the results of equation *(4)* because it is suitable for the presentation.

- ***Economic growth in the agriculture***

Our first exercises have economic expansion as the dependent variable; we consider growth rates (10-year periods) of income in agrarian activity (Table 5.1). We introduce the lagged value of *GDPA* to allow for the presence of convergence effects (we obtain the usual negative and significant coefficients). It turns out that an abundance of natural resources is significant in few

[150] All estimates may be obtained by request from the author.

cases, and as expected the signs are negative (*MI* and *ML*) so we do not reject the curse hypothesis. In other words, extensive "open" territories (large natural endowments) in the last 10-year period would have adverse consequences on economic growth in subsequent decades. However, the results are far from conclusive. One of our indicators, low quality land (*FEL*), has a positive and significant sign. This outcome is interesting because it shows that differences in terms of land quality may explain differences among economies.

Table 5.1
ECONOMETRIC EXCERCISES: GROWTH OF AGRICULTURE GDP AND INSTITUTIONAL QUALITY

Dependent variable: **Growth Agriculture GDP (GDPAG)**

	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Constant	**9.8**	**9.2**	**10.4**	**17.2**	**0.0**	**-1.9**	**9.7**	**9.2**	**10.4**	**17.5**	**0.1**
	0.03	*0.03*	*0.02*	*0.06*	*0.97*	*0.13*	*0.03*	*0.03*	*0.02*	*0.06*	*0.94*
lnGDP(-1)	**-0.51**	**-0.50**	**-0.48**	**-0.51**	**-0.46**	**-0.46**	**-0.51**	**-0.50**	**-0.48**	**-0.51**	**-0.46**
	0.01	*0.02*	*0.01*	*0.01*	*0.02*	*0.02*	*0.01*	*0.02*	*0.01*	*0.01*	*0.02*
MI	**-7.42**	**-6.92**					**-7.33**	**-6.90**			
	0.08	*0.08*					*0.08*	*0.08*			
ML			**-8.15**	**-15.07**					**-8.17**	**-15.29**	
			0.06	*0.09*					*0.05*	*0.09*	
FEM											
FEL					**2.23**	**4.17**					**2.18**
					0.01	*0.01*					*0.01*
C	**-0.01**		**0.00**		**0.01**						
	0.62		*0.92*		*0.71*						
CIMI		**-0.02**		**0.11**		**0.10**					
		0.63		*0.16*		*0.06*					
Interac_C							**-0.01**		**0.00**		**0.01**
							0.64		*0.90*		*0.73*
Interac_CIMI								**-0.02**		**0.11**	
								0.63		*0.15*	
Rsq	0.57	0.48	0.58	0.60	0.48	0.59	0.57	0.48	0.58	0.46	0.48
F stat	3.83	3.93	5.49	5.44	8.71	6.60	3.87	3.93	5.54	6.65	8.35
(Prob)	*0.02*	*0.02*	*0.00*	*0.00*	*0.00*	*0.00*	*0.02*	*0.02*	*0.00*	*0.00*	*0.00*
Observations	30	30	30	30	30	30	30	30	30	30	30

All coefficients were estimated with robust standard error. p-value in italic.
Interac_C, and _CIMI mean interaction between the corresponding land abundance index and, respectively, C and CIMI.

The signs of institutional quality (*C* and *CIMI*) are predominantly positive in accordance with our hypothesis, although a few of them are significant coefficients. The fact that good institutions do not affect income expansion may be evidence in two different directions. On the one side, institutional quality was not so important to economic growth in the case of agrarian activities during the First Globalization. In other words, economic growth would have been based on bringing into productive use idle resources to fuel economic growth rather than the creation of institutions to promote expansion. On the other hand, these results may be warning us about the shortcomings of our institutional indicators. Similar considerations correspond to interaction variables.

- ***Economic growth: GDP in agriculture production***

Our second set of exercises (Table 5.2) have to do with the volume of agriculture production index as a dependent variable (10-year averages, expressed in logarithms) and land frontier

indicators and institutional quality as explicative variables. The negative and significant effect of the abundance of natural resources on agrarian income level does not allow us to reject the curse hypothesis. In other words, large "open" territories (huge natural endowments) in the last 10 years would affect agricultural production. The institutional arrangements have positive signs, a result consistent with the standard hypothesis and which, unlike the previous outcome, does not present contradictions between models. Therefore the quality of institutions would be important to explain higher levels of agrarian production, although only some coefficients are significant. In particular, the most convincing models are those that include "relative intensive" indicators (*HL* and *ML*), which is an encouraging result because they are the more suitable ratios to test our hypothesis.

Table 5.2
ECONOMETRIC EXCERCISES: AGRICULTURE GDP AND INSTITUTIONAL QUALITY

Dependent variable: **Agriculture GDP (GDPA)**

	OLS	OLS	OLS	OLS	OLS	MRE	MRE	OLS	OLS	OLS	MFE	MFE	MRE	OLS	OLS	MEF	OLS
Constant	**5.8**	**5.5**	**5.5**	**7.3**	**6.1**	**35.2**	**32.4**	**7.2**	**5.7**	**7.4**	**62.4**	**50.1**	**22.8**	**6.7**	**5.1**	**49.6**	**8.7**
	0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.01*	*0.02*	*0.00*	*0.00*	*0.00*	*0.01*	*0.02*	*0.00*	*0.00*	*0.00*	*0.09*	*0.00*
F	**-2.9**	**-3.4**	**-2.0**														
	0.02	*0.00*	*0.07*														
HI				**-4.1**	**-2.9**												
				0.01	*0.01*												
MI						**-31.9**	**-29.5**										
						0.02	*0.04*										
HL								**-4.0**	**-2.5**	**-4.0**							
								0.01	*0.01*	*0.01*							
ML											**-61.0**	**-48.9**	**-19.5**				
											0.01	*0.02*	*0.01*				
FEH														**-3.8**	**-2.1**		
														0.01	*0.01*		
FEM																**-48.6**	
																0.10	
FEL																	**-6.3**
																	0.05
C	**0.1**			**0.1**		**0.0**		**0.1**			**0.5**			**0.1**			
	0.11			*0.12*		*0.61*		*0.11*			*0.00*			*0.07*			
CIM		**1.8**			**0.8**		**1.0**		**0.9**			**3.9**			**1.0**	**1.4**	**1.9**
		0.01			*0.17*		*0.26*		*0.14*			*0.01*			*0.09*	*0.18*	*0.02*
CIMI			**0.0**							**0.2**			**0.3**				
			0.24							*0.01*			*0.02*				
Rsq	0.20	0.72	0.80	0.77	0.15			0.16	0.12	0.19				0.19	0.14		0.21
Within						0.59	0.62				0.68	0.70	0.56			0.64	
Between						0.21	0.14				0.07	0.09	0.23			0.02	
Overall						0.59	0.08				0.02	0.03	0.12			0.02	
F stat	3.20	5.24	3.67	4.90	5.38			4.38	4.50	5.00	17.46	12.87		4.09	5.21	7.98	3.05
(Prob)	*0.06*	*0.01*	*0.04*	*0.02*	*0.01*			*0.02*	*0.02*	*0.01*	*0.01*	*0.01*		*0.03*	*0.01*	*0.03*	*0.06*
F all u_i=0											14.59	14.83				11.02	
(Prob)											*0.00*	*0.00*				*0.00*	
Wald chi2						6.44	5.41						6.83				
(Prob)						*0.04*	*0.07*						*0.03*				
BP chi2						5.00	5.09						9.34				
(Prob)						*0.03*	*0.00*						*0.00*				
Observations	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30

All coefficients were estimated with robust standard error. p-value in italic.

What happens to our appropriability hypothesis? We compare three sets of coefficients to evaluate our hypothesis; first, contribution indicators (*HI* and *MI*), second, relative intensive indicators (*HL* and *ML*), and third, "extensive indicators" (*FEH*, *FEM* and *FEL*), and in all cases we contrast coefficients derived from the same group of control variables.

In the first appropriability gradient we obtain coefficients around -3 for *HI* and -30 for *MI*. Therefore negative coefficients are significantly lower when we estimate the model with medium land aptitude contribution. In other words, an abundance of an open frontier with land of high aptitude is relatively better (less bad) for economic performance than medium aptitude and we therefore reject the appropriability hypothesis. According to our evidence, countries that moved their frontier onto high aptitude land faced lower adverse effects in terms of economic growth, technically speaking. When we estimate models comparing the movement onto high and medium aptitude land as against low aptitude (*HL* and *ML*) the sign and the direction of the differences are alike. The same happens when we compare *FEH* and *FEM*. The "curse was more cursed" when land frontier expansion presented a more intensive presence of medium than high quality land.

- ***Income distribution: total rents in relation to total wages***

The exercises for income distribution show how the different specifications of abundant resources have negative and significant coefficients that enable us to reject the curse hypothesis.

Table 5.3
ECONOMETRIC EXCERCISES: INCOME DISTRIBUTION AND INSTITUTIONAL QUALITY

Dependent variable: **Rents/Wages ratio (RW)**

	MRE	OLS	MFE	MFE	MRE	MFE	MFE	MFE	MFE	MRE	MFE	OLS	OLS	OLS	OLS
Constant	**5.66**	**5.63**	**7.19**	**6.51**	**5.97**	**6.87**	**7.03**	**27.92**	**34.62**	**5.88**	**6.87**	**14.39**	**11.70**	**13.27**	**9.69**
	0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.01*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
F	**-3.94**	**-2.86**													
	0.00	*0.01*													
HI			**-4.82**	**-4.54**											
			0.00	*0.00*											
MI															
HL					**-3.79**	**-5.03**	**-5.08**								
					0.00	*0.00*	*0.01*								
ML								**-26.58**	**-32.87**						
								0.00	*0.01*						
FEH										**-3.89**	**-5.14**				
										0.00	*0.00*				
FEM												**-12.44**	**-8.98**		
												0.00	*0.03*		
FEL														**-10.93**	**-6.95**
														0.00	*0.03*
C	**-0.05**		**-0.09**		**-0.04**					**-0.03**		**-0.06**		**-0.14**	
	0.53		*0.03*		*0.62*					*0.70*		*0.24*		*0.00*	
CIM		**-1.63**		**-0.04**		**0.17**		**1.13**			**-0.02**		**-1.38**		**-1.33**
		0.00		*0.94*		*0.71*		*0.22*			*0.98*		*0.01*		*0.01*
CIMI							**0.00**		**0.20**						
							0.98		*0.02*						
Rsq		0.47										0.40	0.46	0.57	0.49
Within	0.22		0.26	0.24	0.29	0.28	0.28	0.28	0.31	0.25	0.24				
Between	0.39		0.01	0.08	0.07	0.23	0.16	0.92	0.31	0.00	0.01				
Overall	0.32		0.01	0.00	0.00	0.00	0.00	0.24	0.00	0.01	0.01				
F stat		12.53	16.34	22.66		37.74	38.33	50.35	13.31		18.77	8.12	13.09	16.21	15.43
(Prob)		*0.00*	*0.01*	*0.00*		*0.00*	*0.00*	*0.00*	*0.01*		*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
F all u_i=0			9.80	4.96		57.30	5.11	5.50	5.44		5.18				
(Prob)			*0.00*	*0.00*		*0.00*	*0.00*	*0.00*	*0.00*		*0.00*				
Wald chi2	8.82				65.76					5.18					
(Prob)	*0.01*				*0.00*					*0.08*					
BP chi2	9.67				10.34					13.45					
(Prob)	*0.00*				*0.00*					*0.00*					
Observations	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30

All coefficients were estimated with robust standard error. p-value in italic.

An abundance of land was associated with lower rentals/wages ratios and so we identify the blessing of natural resources in terms of equality (Table 5.3). We obtain mainly negative coefficients for the institutional quality indicators, which show that institutions contributed to the blessing (they would be associated with low levels of *R/W*), although few of them are significant.

As in the previous analysis, we compare sets of coefficients to evaluate our appropriability hypothesis. We cannot compare contribution indicators (*HI* and *MI*) because medium land does not turn out to be significant. However, when we estimate the models with relative indexes (*HL* and *ML*) it is clear that "the blessing was more blessed" when economies moved their land frontier onto medium aptitude land. The indicator of abundant high aptitude land exceeds that for medium aptitude land, both in relation to low aptitude land (they are lower in absolute values), and therefore the movement onto high aptitude land would contribute less intensively to an improvement in income distribution. Similar relations show the comparison for the extensive indicators.

1.2.2 Estimates that include the interaction between land abundance and institutional quality

We present our estimates of equation *(4)* using the interaction between the indicator for land-abundance and institutional quality as the explanatory variable. In general the results show a pattern similar to previous exercises.

- ***Economic growth: GDP level in agricultural production***

As in the previous exercises, our estimates show a negative and significant relationship between the abundance of natural resources indicators and agricultural production so we cannot reject the curse hypothesis. In other words, large "open" territories (huge natural endowments) in the last 10-years affected agrarian production in subsequent decades.

Some models are not strictly comparable but they reveal some interesting insights. The coefficients corresponding to medium aptitude land show that economies with more natural resources of this type undergo more intense curses. In other words, economies that in the last 10 years had greater medium aptitude land wealth (as against low aptitude) registered lower levels of agricultural GDP. These results are apparent when we compare the coefficients of *HI* with *MI*, *HL* with *ML*, and lastly *FEH* with *FEM* and *FEL*. We therefore reject the hypothesis of appropriability in technical terms, a result coherent with the historical evidence. Settler economies used their high aptitude land to produce commodities and raw materials and achieved a sustained trajectory of export-led growth.[151] In other words, an abundance of high aptitude natural resources was a less

[151] More than half the land suitable for grassland was of high aptitude. The average in the club was 52 percent, with a maximum of 98 per cent in Uruguay and a minimum of 2 per cent in Canada.

intensive curse –a blessing in comparative terms– for settler economies, and economies that moved their frontiers onto comparatively worse land suffered a "more damning curse". In spite of the high appropriability of high aptitude land, economic growth in agriculture was possible and encouraged –in relative terms– by this type of natural resource.

Table 5.4
ECONOMETRIC EXCERCISES: AGRICULTURE GDP AND INTERACTION NNRR-INSTITUTIONAL QUALITY

Dependent variable: Agriculture GDP (GDPA)

	OLS	OLS	OLS	OLS	MRE	MRE	OLS	OLS	OLS	MFE	MFE	MRE	OLS	OLS	MFE	MEF	OLS
Constant	**6.4**	**6.9**	**7.7**	**6.7**	**35.6**	**33.3**	**7.6**	**6.3**	**7.6**	**64.3**	**52.7**	**23.1**	**7.3**	**5.8**	**54.1**	**50.3**	**9.7**
	0.00	*0.00*	*0.00*	*0.00*	*0.01*	*0.02*	*0.00*	*0.00*	*0.00*	*0.00*	*0.02*	*0.00*	*0.00*	*0.00*	*0.05*	*0.08*	*0.00*
F	**-3.8**	**-5.3**															
	0.02	*0.00*															
HI			**-4.5**	**-3.5**													
			0.01	*0.00*													
MI					**-32.2**	**-30.4**											
					0.02	*0.04*											
HL							**-4.4**	**-3.0**	**-4.2**								
							0.01	*0.01*	*0.01*								
ML										**-62.9**	**-51.5**	**-19.7**					
										0.01	*0.02*	*0.01*					
FEH													**-4.5**	**-2.9**			
													0.01	*0.00*			
FEM															**-52.9**	**-49.4**	
															0.06	*0.09*	
FEL																	**-7.5**
																	0.04
Interac_C	**0.2**		**0.1**		**0.0**		**0.1**			**0.5**			**0.2**		**0.1**		
	0.10		*0.12*		*0.59*		*0.11*			*0.00*			*0.06*		*0.16*		
Interac_CIM		**2.6**		**0.8**		**1.0**		**0.8**			**3.9**			**1.1**		**1.6**	**2.1**
		0.01		*0.17*		*0.25*		*0.16*			*0.01*			*0.09*		*0.15*	*0.02*
Interac_CIMI									**0.2**			**0.3**					
									0.01			*0.02*					
Rsq	0.22	0.34	0.19	0.15			0.17	0.12	0.19				0.21	0.14			0.22
Within					0.60	0.62				0.68	0.70	0.56			0.62	0.65	
Between					0.20	0.14				0.08	0.09	0.23			0.02	0.02	
Overall					0.06	0.08				0.02	0.03	0.12			0.01	0.07	
F stat	3.39	5.41	4.90	5.34			4.39	4.47	4.99	17.53	12.73		4.19	5.26	7.66	8.92	3.11
(Prob)	*0.05*	*0.01*	*0.02*	*0.00*			*0.02*	*0.02*	*0.01*	*0.01*	*0.01*		*0.03*	*0.01*	*0.03*	*0.02*	*0.06*
F all u_i=0										14.57	14.89				11.75	11.16	
(Prob)										*0.00*	*0.00*				*0.00*	*0.00*	
Wald chi2					14.72	16.89						6.82					
(Prob)					*0.00*	*0.00*						*0.33*					
BP					50.50	5.16						9.28					
(Prob)					*0.02*	*0.02*						*0.00*					
Observations	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30

All coefficients were estimated with robust standard error. p-value in italic.
Interac_C, _CIM and _CIMI mean interaction between the corresponding land abundance index and, respectively, C, CIM and CIMI.

Coefficients of the interaction variable are positive and significant in many cases and, as before, the models than include *HL* and *ML* are the most convincing. This is very important because we have proved that good institutions interacting with natural resources can mean favourable consequences and strengthen high levels of welfare. However, the evidence in favour of the institutional dimension of the appropriability question is not clear. We would not reject this hypothesis if the results of our estimation were significantly higher than previous estimates, but the differences between β_2-coefficients in Table 5.2 and Table 5.4 are not so great.

- ***Income distribution: total rents in relation to total wages***

As in the previous analysis the different specifications of land frontier expansion indicators have negative and significant coefficients that allow us to reject the curse hypothesis. In other words, an

abundance of land was associated with lower rentals/wages ratios, and therefore we would identify the blessing of natural resources in terms of equality. However, in this context the key question is about appropriability. What do our results suggest about it?

When we compare the coefficients of the different specifications of land frontier expansion we find evidence in favour of the appropriability hypothesis (we compare *HL* with *ML*, and *FEH* with *FEM* and *FEL*). Economies that expanded their frontiers onto high aptitude land had the least blessing from their abundance of natural resources. To advance onto the land in the high aptitude regions opened up possibilities to appropriate higher rents, and this worsened income distribution more intensively.

Table 5.5
ECONOMETRIC EXCERCISES: INCOME DISTRIBUTION AND INTERACTION NNRR-INSTITUTIONAL QUALITY

Dependent variable: **Rents/Wages ratio (RW)**

	MRE	MFE	MFE	MFE	MRE	MFE	MFE	MFE	MFE	MRE	MFE	OLS	OLS	OLS	OLS
Constant	**5.43**	**6.87**	**6.46**	**6.53**	**5.89**	**6.97**	**7.04**	**28.68**	**34.62**	**5.75**	**6.83**	**14.11**	**10.98**	**12.60**	**9.01**
	0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.01*	*0.00*	*0.00*	*0.00*	*0.01*	*0.00*	*0.00*
F	**-3.78**														
	0.01														
HI		**-4.53**	**-4.52**	**-4.53**											
		0.01	*0.00*	*0.00*											
HL					**-3.72**	**-5.16**	**-5.08**								
					0.00	*0.00*	*0.01*								
ML								**-27.36**	**-32.87**						
								0.00	*0.01*						
FEH										**-3.76**	**-5.14**				
										0.00	*0.00*				
FEM												**-12.16**	**-8.21**		
												0.00	*0.06*		
FEL														**-10.24**	**-6.22**
														0.00	*0.06*
Interac_C	**-0.03**	**-0.09**			**-0.03**					**-0.03**		**-0.06**		**-0.14**	
	0.76	*0.07*			*0.61*					*0.70*		*0.25*		*0.00*	
Interac_CIM			**0.01**			**0.23**		**1.15**			**0.05**		**-1.45**		**-1.41**
			0.98			*0.61*		*0.22*			*0.93*		*0.01*		*0.01*
Interac_CIMI				**-0.04**			**0.00**		**0.19**						
				0.04			*1.00*		*0.02*						
Rsq												0.40	0.46	0.54	0.49
Within	0.21	0.26	0.24	0.24	0.29	0.28	0.28	0.28	0.31	0.25	0.24				
Between	0.40	0.01	0.10	0.18	0.08	0.26	0.17	0.92	0.31	0.01	0.01				
Overall	0.32	0.01	0.00	0.00	0.00	0.01	0.00	0.24	0.00	0.01	0.01				
F stat		11.63	20.67	25.97		32.08	38.08	50.59	13.31		17.44	7.95	12.46	15.33	14.79
(Prob)		*0.01*	*0.00*	*0.00*		*0.00*	*0.00*	*0.00*	*0.01*		*0.01*	*0.00*	*0.00*	*0.00*	*0.00*
F all u_i=0		9.80	5.02	4.78		5.71	5.13	5.48	5.44		5.26				
(Prob)		*0.00*	*0.00*	*0.00*		*0.00*	*0.00*	*0.00*	*0.00*		*0.00*				
Wald chi2	12.72				68.07					44.59					
(Prob)	*0.00*				*0.00*					*0.00*					
BP	9.56				10.71					13.32					
(Prob)	*0.00*				*0.00*					*0.00*					
Observations	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30

p-value in parenthesis (Robust Standard Errors).
Interac_C, _CIM and _CIMI mean interaction between the corresponding land abundance index and, respectively, C, CIM and CIMI.

We obtain mostly negative coefficients for the institutional quality indicators and several of them are significant (significance level of 0.1), but their influence seems inferior to that we perceived in agrarian production. The signs of the coefficients show that the combination of natural resources and institutions yielded favourable results, which led income distribution to improve in these

economies. However, institutions would not be such important to explain distribution as in the case of the product of agriculture. As in the previous exercises, evidence in terms of the institutional dimension of the appropriability problem is not convincing (compare β_2-coefficients in Tables 5.5 and 5.3). At a conjectural level, the fact that good institutions interacting with natural resources do not present differential consequences in terms of distribution (and production) may constitute evidence in two directions. On the one hand, it may be that the interaction was not an important component in the economic performance of settler economies and, on the other hand, these results may be a warning about the shortcomings of our institutional indicators. We probably need a more accurate indicator of institutional quality, and our description of the formation of the ownership land system embodies this warning.

1.3 Highlights and shortcomings

Our exercises are far from conclusive, basically because our data base is small, but they provide interesting insights. We do not reject the curse of the natural resources hypothesis in terms of economic expansion (growth and level of agrarian production). But, if we admit that the curse can be represented in terms of inequality, it is possible to reject the natural resources curse hypothesis considering the relationship between rents and wages in the agrarian activity.

Institutional quality, acting alone or in combination with the natural resources, was able to induce positive effects because it moderated the curse or strengthened the blessing of the natural resources. However, our evidence suggests that the incidence of institutional quality would be more relevant to explain production than distribution. It is not enough to state categorically this assertion but the evidence shows interesting trends.

In addition, we find evidence in favour of the appropriability hypothesis in terms of inequality, but we reject it in terms of agricultural production. The expansion of the land frontier onto relatively higher aptitude land meant a more moderate curse on the production side of the economy, but it meant a "blessing less blessed" in distributive terms. These considerations are valid for the technical dimension of the appropriability question, but we do not find evidence in favour of the institutional dimension.

What were the consequences of these conditions in the long run? As the abundance of natural resources (land) decreases with the occupation of territory, economies that incorporated "new" land into production "escaped from the curse" of natural resources and sustained a trajectory of expansion until they reached levels of income close to the core of the world economy. However, in this process, our economies left the blessing, in terms of income distribution, of an extensive open territory behind them, to shape a persistently non-egalitarian environment.

The most important shortcomings of the previous analysis derive from the analytical treatment of institutions. It is possible to identify at least three clear limitations in our approach.

First, we reduce the complexity of institutional arrangements (as regards structure and change) to "one number". It is clearly questionable whether we can add up all kinds of different institutions into a composite concept and measure its quality. This may be useful to study some economic relationships, but it minimizes the analytical and explicative power of institutions in economic development. [152] Second, in our analysis, we consider institutions as an exogenous component of the economic system, but there is extensive literature that emphasizes the endogeneity of institutions (see Alston & Mueller, 2005, 2003, for a literature review). A classical discussion in the study of the settler economies is about the *latifundia* and the huge damage to economic growth this property structure caused (see CIDE, 1965, for Uruguay; and Heaton, 1925, for Australia). However, several authors argue that these large estates are not given structures but the results of economic and technological forces (see Williams, 1975, for Australia). This analysis is perfectly compatible with the notion of institutional endogenenity and we will deal with it in depth in future stages of our research. Finally, the statistical exercise based on a "macroeconomic" level does not deal with the decision behaviour of the agents. It is true that in settler economies agrarian interests were in early contact with the political power and induced decisions or participated directly in government. In this sense, our previous approach would capture the expressions of the relationships among agents at a macro level. However, with this approach we are unlikely to understand the specific actions of the different groups or the dynamics of the process in particular sectors.

The way to overcome, at least partially, the deficiencies in our method is to change the approach to complement –and not to replace– the previous analysis. A first step in this direction is to identify the specific institutional arrangements that regulate –formally or informally– the appropriability conditions of the land (and, as consequence, of rents); i.e. the conditions that determine the agent's capabilities for capturing rents. We describe the process of the distribution of land ownership rights and the characteristics of land tenure systems in a historical and comparative perspective and consider as illustration four economies in the "club": Argentina, Australia, New Zealand and Uruguay. We will try to remedy the previous shortcomings by working in three different directions. First, it is possible to give additional dimensions to the "constraints on the executive" (*C*) and the evolution of the *CIM* (and *CIMI*) to make both types of indicators more representative. Second, we can introduce into the analysis elements that characterize the endogenous formation of institutions in the society such as the political confrontations, the influence of different power groups or the impact of technology. Finally, when we describe the process of distribution of land ownership

[152] For a critical overview, see Chang (2010).

rights we propose our approach to the agents' decisions. This option does not completely remedy the shortcomings of our previous macro level analysis, but it is a first step in this direction.

2. Appropriability and the formation of the land ownership system

In the 19th century one of the main social and economic processes in the settler economies was frontier expansion and the creation of the institutions (formal and informal) that determined wealth distribution and the general conditions of inequality. Initially we discuss two key components of the process: the characterization of the land tenure system and the role of the state in this institutional configuration. Afterwards we present the features of both components in the particular cases of Argentina, Australia, New Zealand and Uruguay, and we identify two models.[153] One of them – which is closer to the "British model"– is characterized by an active state with developmental features that promotes a pattern of greater equality. The other –which is the "Hispanic model"– is dominated by a state pressured by financial difficulties, recurring disorder in the administration of public land, and a high degree of intervention by the agrarian oligarchy in political power, all of which promote income (and asset) concentration.

2.1 Land tenure systems: characteristics and conditions

Land tenure refers to the collection of rights and obligations under which land is held, used, transferred and inherited. The meaning of the concept varies with the social and historical context. It is used to allude to land tenure prescribed by statutory or common law, to customary land tenure, and to practices or routines (Alston & Mueller, 2005; Moyo, 1995; Shivji et al., 1998). The specification (definition and interpretation) and the enforcement of land ownership rights constitute two fundamental dimensions in the process of the appropriability of natural resources because they affect the timing of settlement and the use of the land. Therefore, and from a conceptual point of view, the formation of the land ownership system is as important as the role of the state in establishing land ownership rights. We consider the relation between the two dimensions to make our concept of appropriability more precise.

2.1.1 Land ownership system

Arrangements vary enormously between rural and urban areas because land is used for agriculture in the former and for residential and business purposes in the latter. Land ownership systems can be categorized in line with three essential dimensions: (i) the presence or absence of formal land deeds, defined as the registration of land ownership rights with a government authority; (ii) the extent of landowner and landholder rights to contract voluntarily for use of the land; and (iii) the spectrum of private-communal ownership rights to the land, and in this there are two extremes,

[153] A first approach to the question was presented previously in Álvarez & Willebald (2009). For New Zealand and Uruguay also see Álvarez (2008).

one is the independent farmer owning land with freehold (or fee-simple) deeds, and the other is bound labourers working on plots of land temporarily assigned to them by the authorities in a communal land system. Freehold ownership is perpetual, it can be inherited by a freely-designated successor, it is freely alienable, it is often registered with a central authority that has undertaken a survey of the land (sometimes called a cadastral survey), and it is characterized by fixed annual obligations (La Croix, 2002). Leasehold land is based on a system of rentals for long periods. Land belonging to one entity –either the state or an individual– is leased by contractual agreement to another entity. These leases may be long or short. In practice, 99-year leases are considered to be as secure as a freehold tenure system. The lease agreement is then registered with the ownership of that land to create land rights that are enforceable (Economic Commission for Africa, 2004: 20-21).

2.1.2 Role of the state

The arrangements governing land ownership rights vary depending on who specifies them and who enforces them. In these two dimensions the possible actors range from the first person that claimed ownership of the land in question (the claimant) –or a group of claimants who act collectively– to the state, if it is interested in the "agrarian question" and acts on the matter.

Usually it is the state that defines, interprets and enforces land ownership rights. The definition of these rights is a legislative function of the state, the interpretation is a judicial function and enforcement is a police function. These functions entail costs and in consequence the state may leave some rights as open access. Many assets have numerous components and it is costly to define land ownership rights for all the dimensions of value. Some attributes may be either *de jure* or *de facto* left as open access. There are incentives for individuals or groups to expropriate the right to use land exploiting attributes that the state leaves as open access. In many situations, individuals or groups use violence as a strategy to capture land ownership rights. By individual enforcement we mean the efforts that individuals make to maintain their rights (putting a fence around the land, posting "no trespassing" signs in strategic places, etc.). Governments enforce land ownership rights through the police and the courts (Alston & Muller, 2003, 2005).

In the economies of recent European settlement, the colonizer state (usually represented by the Crown) had an additional function. The doctrine underlying the traditional view of settlement was that in the age of discovery the "new" areas were *"terra nullis"*, that is to say land belonging to no one. European rulers adopted the position that territories without political organization, systems of authority or legal codes could legitimately be annexed. This view, with slight differences, embodied the idea that Europeans were superior to native peoples because they were civilized and Christian, and this superiority was clearly expressed in the art of war (Reynolds, 1987). By definition, the focus of the debate was the "new" territories owned by the Crown, which then transferred land from

the public to the private sphere. For decades there was debate about land ownership, tenure systems, prices, conditions of tenure and land taxes, and the authorities in different places established a variety of different frameworks and instruments, which yielded differing results.

As regards the typology of political states, some authors (Auty & Gelb, 2001; Lal, 1995; Leftwich, 1995) differentiate between "developmental" states and "predatory" states. Developmental states act in an autonomous manner and pay attention to long run welfare maximization, while predatory states have factions and act in the service of section interests. The participation of the state in the distribution of land ownership rights and the creation of a land ownership system provides interesting ways in which states can be characterized. It is not our aim in this study to find evidence about this, but our description will shed some light on the matter.

2.2 Australasia: the definition of ownership rights and the intensification of settlement

It has been emphasized in Australasian historiography that the process of land distribution in Australia and New Zealand was highly idiosyncratic, and this contributed to the emergence of an agrarian society with high welfare levels and democratic values. The distribution of land constituted a political and economic resource that the state used widely in the 19th century to promote efficient land use and to intensify settlement.

2.2.1 Australia

The development of agriculture depended on the application of capital and labour to abundant land, like in the other recent settlement economies, but in Australia two other factors were important as well: (i) government activity to provide the legal framework for land settlement, to encourage immigration and to install the social capital needed for economic growth; (ii) the development of agricultural technologies appropriate to the conditions of the environment (Clarkson, 1971:90). We attempt to identify the main features of the first dimension –"the vital and living issue in public affairs" (Reeves, 1902 [1968]: 193)– and we work only tangentially on the second one (we will consider this issue in detail in new steps in our research).

In the early days of colonization, land was alienated by grants and orders from the Crown. The first Crown instructions (1787-1788) authorized the governor to make grants only to liberated prisoners, but in subsequent instructions issued by the Secretary of State in 1789 the privilege of obtaining grants was extended to free immigrants and men belonging to the detachment of marines serving in New South Wales. The maximum grant did not exceed 100 acres and was subject to a quit-rent of one shilling per annum for every 50 acres, to be paid within five years of the date of issue. In many cases these grants were made conditional upon a certain proportion of the land being cultivated or upon certain services, but these conditions do not seem to have been enforced.

In 1811 the governor started to grant town allotments on lease for periods of 14 or 21 years, and the rents varied significantly from time to time depending on the governor. In the 1820s further regulations relating to grants to immigrants were issued. In 1825 the principle of alienation of land by sale to free settlers was introduced, and in 1829 leases were entirely abolished and grants of freehold estates were established. However, in 1834 leases were re-introduced. Land was allowed to be sold to private agents at a minimum price of 5 shillings an acre, but no individual was allowed to buy more than 4,000 acres and no family more than 5,000 acres.

In the 1820s grants were usually tied to the applicants' capital resources, and the policy of land grants was continued until 1831. In the same decade sheep and cattle farmers were taking their flocks into outlying areas without any formal land grant. The governor of New South Wales sanctioned this by issuing tickets of occupation, but in 1826 the British government imposed settlement limits (this was adjusted in 1829) beyond which no land could be occupied before it was surveyed, and within which the title to land had to be obtained by grant or purchase.

In 1831 the government issued an order that no Crown lands could be disposed of in the future except by public auction.[154] The minimum price for country land was fixed at 5 shillings an acre, and in 1839 this was raised to 12 shillings, and the applicant had the power to select land at the upset price,[155] for which there was no bid at the auction, or upon which the deposit paid at the time of sale had been forfeited. This was the time the selection principle was introduced into Australia's land laws, and it was then applied to land which was put up for sale by auction.

The British government now regarded Australia not as a prison but as a place with economic activity and an outlet for Britain's poor. As a result, New South Wales was settled by a significant number of farmers with the resources to buy their land, and they provided employment for landless labourers shipped to Australia on the proceeds of revenues from the sale of land. However, the effective action of colonial sheep farmers was in a way more effective. These farmers simply occupied land beyond the limits of settlement and produced wool for the British textile industry. This squatting was a spectacular manifestation of the desire to use what was unused. [156] Enormous areas were occupied in a short time, practical-minded pioneer farmers learned about the potential uses of Australia's environment and transformed the country into a place that could be lived in (Williams, 1975). In the 1830s, the New South Wales government was forced to recognize the squatters and it granted annual grazing licenses to sheep farmers upon payment of a quit-rent of 20 shillings per 100 acres and with the proviso that if the conditions were not fulfilled the land would

[154] The introduction of the principle of land sales in place of grants is, usually, referred to as the "Rippon Regulations".
[155] The upset price is the lowest price acceptable for something that is for sale by auction.
[156] The movement of the people on the territory is consistent with our findings referred to the land frontier expansion; this was a process that preceded the price boom of the last decades of the 19th century.

have to be vacated six months after notification.[157] In 1839, a border police force was set up to preserve law and order in these districts and it was financed by a tax on the number of head of livestock held by the squatter (Robertson, 1924: 176-180). As their wealth increased the squatters acquired political power and during the 1840s these sheep farmers forced changes in land legislation (Clarkson, 1971; Williams, 1975).

In 1842, new regulations from an Imperial Act of Parliament came into force. The principle of sale by auction was maintained, land was surveyed before being put up for sale, and the upset price was fixed at 20 shillings per acre. It was established that, after deducting an initial charge for the survey, half the proceeds from land sales would be used to finance immigration into the colony in which the revenue was acquired.

In 1846, a new land classification system was established in the Waste Lands Act. The land was divided into "settled districts", "intermediate districts" and "unsettled districts" (Robertson, 1924: 186-188). The principles of sale by auction or by private contract were maintained, but a system was introduced whereby leases were granted for various terms and for pastoral purposes only. While the lease was valid the leaseholder could purchase the freehold at the upset price of £1 per acre, and when the term expired he had a pre-emptive right to purchase all or any part of the land at the same price. An entirely new system for the occupation of pastoral land was introduced whereby fixity of tenure of the lease was granted and the fee was paid on the stock carrying capacity. In unsettled districts the term of the lease was fixed at 14 years, in the intermediate districts it was for 8 years and in the settled districts the yearly tenure system was retained.

The 1846 legislation remained in force in New South Wales until 1861 and in the colonies of Victoria, Tasmania, and Queensland (which were separated from the mother colony in 1851, 1856 and 1859, respectively) until repealed by acts of the colony parliaments. Gold was discovered in 1851 and the subsequent gold rush greatly changed the conditions of colonization. States of the Commonwealth have found it to their advantage to adopt different systems for securing the settlement of an industrial and agricultural population (Yearbook, Australia, 1911).

Western Australia and South Australia did not feel the influence of the New South Wales legislation because in these states new conditions prevailed. Under a different set of circumstances and origins (very different from the original convict base of the other colonies) settlement was affected by legislation of a special and novel nature, and it was not until a later date that the land laws in these territories were brought more into line with those of the eastern states. During the 1860s, 1870s and 1880s all the colonies tried to make land available to small farmers who would

[157] Previously land had been maintained for grazing purposes under "tickets of occupation".

grow food for the expanding population, and they did this by allowing cultivators to select holdings from among the livestock grazing leases. Except in South Australia these efforts to "unlock the land" were not very successful.[158] The advantages of the country favoured sheep and cattle rather than crops, and where the land was suited to crops, as in South Australia, farms were large rather than small. The stock-rearers were firmly in control of the situation and policies for the disposal of Crown land could not successfully run counter to economic realities (Clarkson, 1971:93).

In New South Wales, the passing of the Crown Lands Act and the Occupation Act in 1861 promoted the interests of small farmers. The aim of these Acts was to facilitate the establishment of an agrarian population side by side with stock-rearing tenants. Men with limited capital found it difficult to establish themselves with any chance of success, but under the new principle of free selection before survey, land was sold in limited plots of from 40 to 320 acres at a price of £1 per acre, partly payable by deposit (one quarter of the purchase price), and carrying an interest rate of 5 per cent per year. The colony was divided into first- and second-class settled districts and unsettled districts, and all the pastoral leases were left open to the operations of free selectors. The system of unconditional sales was still continued and remained in force until its abolition in 1884. This Act represented benefits, but the way it operated also caused considerable mischief, mainly because the fact that land was held under pastoral leases meant it was not exempt from free selection and could be the target of speculators who had no *bona fide* intention to settle on it. The Crown Lands Act of 1884 and the supplementary Act of 1889 were aimed at bringing this situation under control. These regulations maintained the principle of free selection before survey and were designed to give fixity of tenure to pastoral leaseholders, but at the same time they tended to restrict the land area sold without conditions. Pastoral leases were required to be surrendered to the Crown and divided into two equal parts. One of them was returned to the lessee under a lease with fixity of tenure for a certain period, and the other half ("the resumed area"), the lessee was allowed to hold under an annual occupation license, but it was always open to selection.

Further Acts in 1884 and 1889 did not succeed in their objectives. Settlement proceeded very slowly and the accumulation of land into large estates continued. Parliament introduced new principles into agrarian legislation in the state, embodied in the Crown Lands Acts of 1895 to 1909, the Labour Settlements Act of 1902, the Closer Settlement Acts of 1904 to 1909 and the Closer Settlement Promotion Act of 1910. These measures still gave fixity of tenure to pastoral leaseholders, retained the principle of free selection before survey and offered *bona fide* settlers special inducements by the introduction of new forms of tenure on easy terms and conditions (Yearbook, Australia, 1911).

[158] Remember our analysis about land distribution in Chapter 4.

The early history of land settlement in Victoria was closely connected to that of New South Wales. For the first fifteen years of its existence,[159] the regulation of the alienation of Crown lands was governed by the Orders in Council of the mother state and was in accordance with the general regulations. The Orders in Council were established under the Imperial Acts of 1842 and 1846 and remained in force until 1860, when an Act was passed by the Victoria state government that divided all Crown lands into country and special classes. The former were available after survey for selection in allotments (from 40 to 60 acres), while special lands, situated near towns, railways, rivers, etc., were sold quarterly by auction at an upset price of £1 per acre.

Free selection before survey was introduced in 1862, it provided for large agricultural areas to be set apart and in these areas land could be selected at a uniform price of £1 per acre. This regulation imposed alternative conditions, such as the effect of certain improvements or cultivating part of the land, and the mode of payment was changed. As regards pastoral lands, license fees and assessments of stock were abolished, and provision was made for the payment of rent for runs in accordance with their value, based on their stock-carrying capacity. There was more legislation in 1869 that consolidated and amended all previous regulations. The system of free selection before survey was retained in the Land Act and the Pastoral Act, and it applied to all unoccupied Crown land, but the selected area was limited to 320 acres and was held under license for a term of 3 years. During the first two and a half years the selector had to reside on the land, fence it, and cultivate a certain proportion of it. At the end of the license period the selector could either purchase the land outright or obtain a further lease of 7 years, with the right to purchase at any time during this term. The regulations governing the occupation of land for pastoral purposes comprised two systems: runs under license or lease, or grazing rights. After this there were repeated changes in land legislation until WWI that covered special forms of tenure and small-improved holdings.[160]

Like in Victoria, the initial history of land settlement in Queensland is closely related to that of New South Wales.[161] Queensland separated from its mother colony in 1859, and the first Parliament of the new colony passed three acts dealing with Crown lands that involved pastoral leases and general settlement. In the subsequent decades the regulations were more an expansion of existing laws than the adoption of a new land policy. Several situations were defined and amended in terms of conditional purchases, the government had the power to repurchase land to promote closer settlement, and cooperative land settlement communities were set up.

[159] The region was known as the District of Port Phillip.
[160] In addition, the alienation and occupation of the territory know as the "Malle", which was an area of about 11,000,000 acres in the north-west of the state, had its own special regulations.
[161] The region was known as the District of Moreton Bay.

In a similar way, the early settlement of Tasmania was carried out under the regulations framed for the disposal of Crown lands in New South Wales, because it was a part of this colony until its constitution as a separate administration in 1825. In 1828 the first land sales on the island took place, and in 1831 the system of issuing free grants of land was abolished. In 1855-56, the government of the island colony became more autonomous and took responsibility for a land settlement policy.[162] The Waste Lands Act of 1858 introduced the principle of free selection before survey. During the 1860s several Land Acts were passed and the Waste Lands Act of 1870 embodied and consolidated many of the salient features of previous enactments. It gave the governor the power to reserve such land as might be considered necessary for public purposes, and the rest was divided into "town", "agricultural" and "pastoral" land. The upset price for agricultural land was £1 an acre and that for pastoral lands was a sum equivalent to 12 years of rents, but not under any circumstances more than 5 shillings an acre. Numerous amendments to the 1870 Act were passed, and in 1890 the various Acts then in force were consolidated. The 1890 Act was itself amended from time to time and subsequently included Crown lands and closer settlement Acts.

In 1834, the British Government approved the colonization of South Australia, and under an administrative Act the colony was founded. The members of a special commission executed the plan and declared all the land in the colony, except what was reserved for roads and footpaths, to be open to purchase by British people. The commission made regulations for the survey and sale of this land at an appropriate price for letting unsold land for periods of not less than three years. They might sell the land by auction or otherwise, but only for cash, at a uniform price, and at not less than 20 shillings per acre.[163] This system ran into problems due to the financial crisis of the early 1840s and had to be modified, but it was not until 1872 that the authorities approved regulations that conformed more to the legislation in the neighbouring colonies. The new legislation gave settlers with only a small amount of capital an opportunity to settle on Crown land under fair conditions and with a reasonable chance of success. The Act of 1872 was amended from time to time, and in 1888 it was repealed and its provisions consolidated by the Crown Lands Act. The principles of closer settlement were introduced by the Closer Settlement Act of 1897, which was repeatedly amended in subsequent years.[164]

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[162] In 1856 the colony was granted responsible self-government with its own representative parliament, and the name of the island and colony was changed from Van Diemen's Land to Tasmania.

[163] The principles on which the colony was established were created by Mr. Edward Wakefield. The main idea in Wakefield's scheme was to sell waste land at a high price and to use the revenue to bring in immigrants, so as to secure a constant supply of hired labour for agricultural work and to develop the settlement. Other leading features of the scheme were that no convicts should be sent there, that no State Church should be established, and that the new colony should be financially independent and not be a burden on Britain (see Robertson, 1924, and Williams, 1975).

[164] An interesting aspect of the institutional development of the region was the proposal of the "Torrens Act". This was a Real Property Act originally proposed in 1858 in South Australia by Sir R. R. Torrens, and it was adopted in all the States of the Commonwealth, New Zealand and South Africa. The aim of this Act was to give security and simplicity to all land dealings by providing for registration of ownership that protected all involved interests. By this system

The colonization of Western Australia started in 1829. The first settlers received large grants of land proportional to the amount of capital they brought in, at a rate of 40 acres for every sum of £3, and of 200 acres for every labourer brought into the colony. However, the grants were subject to various conditions about land improvements. In 1832, free grants were abolished and land was sold at a minimum price 5 shillings per acre. In 1837 the price of allotments in Perth, Fremantle, and Albany was fixed at a minimum of £5 per acre. New land regulations were formulated by the Colonial Office in the subsequent decades. In 1890, the colony was granted constitutional government and from time to time the land laws were changed until a Land Act was passed in 1898 amending and consolidating previous legislation. The colony was divided into six divisions; sale by auction was permitted in all of them but the occupation conditions differed. This Act was repeatedly amended, and the Agricultural Lands Purchase Acts 1896 to 1904 introduced the principle of the administration being able to repurchase Crown land for the purposes of closer settlement (Year Book Australia, 1911).

In 1863, part of New South Wales that lay in the north (latitude 26° S., and between longitude 129° and 138° E.) was annexed to South Australia. However, the regulations governing the sale and occupation of land differed in this state and they were regulated by the Northern Territory Crown Lands Act 1890, the Northern Territory Lands Act 1899 and the Northern Territory Tropical Products Act 1904.

The review of this complex field, with its formidable array of Acts, varying attitudes, different regional realities and a persistent strategy of trial and error make it difficult to identify a clear settlement pattern. However, "it is suggested that the single theme of intensification, the idea that more and smaller holdings was a desirable aim, unites much of the complexity" (Williams, 1975: 62). The vigorous (and belligerent) squatter movement transformed the livestock-rearing settlers of the first half of the 19th century into a strong social class that was active in politics and spread its economic influence throughout the territory. Nevertheless, if there was a turning point in Australian history it was the Gold Rush of 1851 (Williams, 1975: 74-75). This altered the basic economic profile of the country and the composition of the population as around 750,000 new inhabitants arrived over the next ten years. One expression of these changes at the administrative level was the creation of colonial legislatures in New South Wales, Victoria, South Australia and Tasmania. Gold became increasing difficulty to get in the second half of the 1850s and it was natural to advance on the land which, in fact, was sparsely settled. This was in line with the progressive and predominant view which, explicitly or implicitly, was held by politicians and theorists, about that the Australian

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everyone who acquired land or an interest in land obtained a title deed that if not absolutely was at least practically secure against anyone whose claim did not appear in the registry. This effectively established the two elements of simplicity and security in land acquisition.

society evolved from one stage to another. But many people believed that this vision did not fit in with the "squattocracy" that held the land. What was the reaction of society to the pretensions of this quasi-aristocracy? According to Rosecrance (1964):286, "the pastoral way of life could not support a full-blown aristocracy. Despite the peculiar nature of the Australian frontier, the squattocracy provided no more than rudimentary insight into the nature of traditional European conservatism".

In the latter half of the 19th century, Australia emerged as a truncated version of a European socio-economic environment. In political terms, Australia was the "radical" fragment of British society. "A certain admixture of 'philosophical radicalism' mitigated the working-class ethos of convicts, gold diggers, Chartists, and trade-unions. At the same time, Australian's political bias was already skeptical of the liberal position" (Rosecrance, 1964:285). The colonial social hierarchy did not seem to be fixed or permanent, and it was relatively common for people to change status. This social homogeneity made for powerful unity in political questions. The grazers maintained a privileged political position into the 1850s and land control into the 1860s, but in the 1890s they fell very far from their high status due to the consolidation of militant radicalism of society.

In general, the authorities' strategy to tackle land concentration and open the frontier consisted of four connected elements: survey, price, residence, and improvement, and was supported by a combination of supervision, progressive taxation and repurchase. The results were not always successful. There were many limitations on surveys and supervision, and the average size of estates increased progressively, which indicates a certain relationship between expansion (to land of lower quality) and land productivity. Price exigencies were subject to the better organization of credit channels, and in the absence of suitable financial conditions, certain requirements meant that in fact the rich had privileges. Conditions of residence and improvement were dominated by evasion and corruption. Estate subdivision (often more fictitious than real), closer settlement (associated with the state purchase and new sale of lands), "[s]ettlement and cultivation advanced at snail's pace … Alienation of land in small holdings went on apace, but under some strange adaptation of Gresham's Law the big holdings drove out the small ones" (Heaton, 1925: 415).

In consequence, the pattern of occupation established by the squatters well over fifty years before endured. They maintained their economic primacy but did not retain political power (Rosecrance, 1964; Williams, 1975) which was disputed with "small farmers [that] increasingly resorted to the creation of political associations to do their bidding in the colonial legislatures" (Denoon, 1983: 102). This balance echoes the idea we commented on above, in Chapter 4, about the incomplete picture that an analysis of the land ownership distribution indicators offer when it comes to understanding inequality in settler economies (Willebald & Bértola, 2011). Income

distribution in general and particularly functional income distribution are key elements in the explanation of economic performance in our club. Nevertheless, an analysis of institutional achievement must not obscure the fact that the intensification of settlement was equally a matter of environmental factors like quality of the soil, rainfall, vegetation and distance, all of which contributed to the final outcome and make our analysis pertinent.

2.2.2 New Zealand

Land distribution among the colonizers followed the British custom of the Crown being the ultimate owner of the land. Colonizers could not negotiate directly with the natives but required the intermediation of the Crown (in this first stage of colonization, the Crown's right of pre-emption was only suspended in the period 1844-1845). The Colonial authorities and the representatives of the autonomous government created a legal framework that regulated the expropriation of land from the Maoris and the granting of ownership to European colonizers. These conditions were formally expressed in the Treaty of Waitangi in 1840, which established that only the government could buy land from the natives. Once land was acquired, the government wanted to get it into productive use as soon as possible and aimed at distributing it among individuals (Hawke, 1979).

The government resold part of this land in order to finance immigration, disposed of some of it as grants to individuals in return for services, and retained some on a perpetual leasehold basis (Keall, 2000). In Article II of the Waitangi Treaty, the UK acknowledged the individual and collective rights of the native Maoris to their territories. The Waitangi Treaty was a turning point in New Zealand economic history as it was when the Maoris ceded sovereignty of their territory in exchange for autonomy and land ownership rights. For the most part the Treaty was systematically disregarded and land was transferred to European colonizers on a massive scale (Hawke 1985; Prichard Lloyd, 1970). In 1852 the Constitution Act empowered the General Assembly to make laws regulating the sale, disposal, and occupation of Crown land and authorized the division of New Zealand into provinces. The governor approved the regulations in the provinces, which ensured that there was a degree of consistency in their settlement policies even though there were different systems in operation (sales with deferred payments, ballot systems, sales by auction, etc.).

A lot of land was held by speculators who were asking excessive prices for it, and new settlers looked to the Crown for low-priced land. This increasing demand coincided with the rise of Maori nationalism and there was more resistance to the sale the land, which exacerbated existing conflicts and led to serious fighting between government forces and the native inhabitants.[165] In 1862, the Crown's right to pre-empt Maori land was abolished and it was not re-established until 1892. This

[165] The New Zealand Wars or Maori Wars were a series of armed conflicts that took place in New Zealand between 1845 and 1872, and in them the main point of contention was the ownership and sale of land.

meant there was a thirty-year period of uncontrolled dealing, and together with Crown purchases and confiscations it made for the take-over of large swathes of Maori land. In 1891, a Royal Commission commented that these alienations of land were against the public interest, and in most of the leases and purchases land was obtained on a large scale by capitalists (McLintock, 1966).

The provincial governments were abolished in 1876 and the "labyrinth" of local legislation was replaced by the Land Act of 1877, which abolished 56 land statutes and created a uniform system. The new Act provided for Crown land to be sold for cash or with deferred payments and it required the purchaser to improve the land and reside there. In Canterbury and Otago special conditions were applied to sheep runs, leases were offered at auction and occupiers were given the right to obtain freehold land around their homesteads. There was a lot of speculation in both provinces and a great deal of aggregation took place.

In the 1880s, there were several experiments in land organization public land such as a 30-year perpetual lease with the right to renew or purchase, small grazing run leases, associative modalities of settlement and village homesteads, but small farming still did not prosper because large estates thrived on demand from the wool industry. Only in the 1890s were the conditions suitable to make lasting changes to the land ownership system, and the focus was on breaking up the big estates. The population was increasing, the labour market was troubled (there were high unemployment rates in the 1880s) and refrigeration arrived, all of which made small farming more important. In addition to these economic pressures there were political changes. The Liberal Party won the 1891 general election with a policy that included promoting closer settlement, extending state leasehold rather than freehold, re-purchasing large estates and sub-dividing them, introducing a land tax to force sub-division, and providing cheap finance for the development of new farms.

The 1892 Land Act proposed a lease in perpetuity for 999 years with no right to freehold, established restrictions on the acquisition of Crown land by individuals who already had sufficient land, limited the area for new settlers and introduced changes in the small grazing and cooperative modalities. In the same year a progressive land tax was introduced, which was aimed at breaking up the big estates. In 1892, the government was authorized to buy private land to promote closer settlement. The land was disposed of on the basis of leases in perpetuity or small grazing runs with fixed rents (5 per cent on capital value), and mechanisms to facilitate farming credit were set up. The same Law granted the government a budget of £50,000 per year to expropriate land and promote the sub-division of the big estates, and in 1894 the amount was raised to £250,000.

In 1903, the government implemented a policy of land recovery and undertook to drain, reclaim and settle swamp land. In 1907, the lease in perpetuity was abolished and tenants had the right to purchase the land outright. However, most leaseholders preferred to retain the benefits of low rents

(with contracts for 33 or 66-year terms and periodic revaluations) and the state established a new system of land tenure whereby only leasehold was admitted (National Endowment). The state bought and distributed land and thereby contributed to dividing up the large estates, particularly in North Island where small farmers now formed a numerous and important class. The total surface area of the large estates fell from 3.2 million hectares in 1891 to 1.4 million in 1910 as a result of public policies and because more capital-intensive types of exploitation were coming to the fore with dairy farming challenging the wool industry.

On the eve of the WWI, a new political change closed a long and intensive period of formation of the land system landownership. The Reform Party extended the right to obtain freehold Crown leases, made the terms on which perpetual leases could be purchased more favourable to tenants, and extended freehold rights (with some limitations) to leaseholders of national endowments. WWI marked the end of the era of general land settlement. From then until 1961, official land settlement was geared to placing restricted classes of settlers on land, particularly ex-servicemen from the two world wars and unemployed people during the Great Depression of the 1930s.

In New Zealand democracy can be seen as a movement that used the instrument of expanded state action and intervention to bring about a more humane, democratic and egalitarian society. "New Zealand shared the same fragment culture as Australia, even its Liberal reforms would reflect the same underlying egalitarian, communally-focused, working-class radical values and presuppositions as Australia's 'mateship' society." (Paulson, 1988). In a similar way to Victoria and New South Wales, in South Island, "…most of the colonial wealthy had their origins in the British lower-middle class or among wage-earners" (Mcaloon, 2002:208), which made for shared values and a consensus in society about certain questions. This socio-political context made land one of the main issues in public policy, and politicians, theorists, and common citizens identified these concerns early on.

> "Two main aspects of the land question have from time to time loomed large in the public mind in New Zealand. The first of these is, 'Should the state sell its lands at all or merely lease them? The second is, 'What is the most effective means of preventing land monopoly and the aggregation of large estates" (Downie, 1909b:82).

These concerns at the beginning of the 20th century clearly reflected the problems that different governments had faced since the closing decades of the 19th century. From the very beginning, land regulations in New Zealand seem to have been expressly designed to prevent land aggregation, but people circumvented the regulations by various strategies like "gridironing" and "spotting", and the common pattern was land grabbing. The Land for Settlement Act of 1894 was the main starting point of the state policy to acquire and divide up large estates for closer settlement. These

regulations promoted the re-purchase of land (supported by external financial resources) and its division into small farms that had long-run leases (initially for 999 years and afterwards on a lease renewable every 33 or 66 years) at a fixed rental rate on capital value. This policy placed many settlers on the land but at an increasing financial cost to the government, and there were serious conflicts of opinion between experts about the value of land (Downie, 1909a). The administration reacted to this situation by passing the Land and Income Assessment Act in 1907 to implement a graduated land tax. According to the figures, it "…would appear that there has been a reduction in the total held in areas of 10,000 acres and over of 2,797,658 acres during the period 1889-1906. Purchasing by government contributed to this result, but only to the extent of about one-third, voluntary subdivision accounting for the balance." (NZOY, 1908). This change in the remainder was due to new economic conditions, especially the growth of the dairy industry (Hawke, 1985), and people avoided the taxes in the most ingenious ways. There were many methods to evade taxes such as bogus partnership, one-man companies, collusion in sales and leases, declaring trusts and making nominal gifts (Downie, 1909b), but the most common way was to divide ownership of the property among members of the family but continue working it as one estate.

The state had a central role in challenging the economic conditions and the rational behaviour of agents so as to promote the intensification of settlement and the break up of the large estates. The results show that it seemed more successful in terms of incomes than assets (see Chapter 4), and that probably because reforms contributed with a better functioning of the markets and a more efficient assignation of resources. Additionally, the social culture and the predominant ideology would contribute significantly in this direction with the formation of appropriability conditions more favorable to promote an egalitarian structure of the income.

2.3 The River Plate: land-ownership concentration and weak states

In the historiography of Argentina and Uruguay it has been emphasized that the process of land distribution in the 19th century was characterized by confused and insecure arrangements that usually favoured the accumulation of land in few hands. Only in the 1870s did local governments at last establish the institutional structure of land ownership systems. They gave security and effectiveness to the different types of land tenure, but it was the same old story and the result was that land ownership was concentrated in few hands, there was owner absenteeism, and agrarian production was mainly based on large estates.

2.3.1 Argentina

In the 19th century the expansion of the Argentine frontier was led by successive governments that waged various military campaigns to conquer land that was controlled by native communities. From a long run perspective, frontier expansion and the distribution of land ownership rights was a

process of acquisition and territorial concentration by rich owners (mostly stockbreeders and speculators) who were closely connected to political power and the social elites. In this process the state was consolidated and organized on a national scale. Most land was appropriated and distributed before the mass arrival of European immigrants, which happened towards the end of the 19th century and in the first decades of the 20th century.

Starting in the independence period (1816-1822), different governments tried to set up a new legal framework for the ownership of land. After years of revolutionary confrontation and the dissolution of the Spanish colonial dominion, land distribution was a problem that had to be solved as the new state was organized and national authorities took control. During this time provincial governments granted land ownership rights called *moderada composición* (with the obligation to make some improvements) or simply made grants called donations (*donación* or *mercedes)*. The liberalism that inspired Argentine governments facilitated the private ownership of the land and eliminated restrictions that during the colonial period had tended to keep the *realengas* lands or fiscal territories subject to public authority. Thus, after independence, cattle farmers expanded their estates, and the territorial borders of Buenos Aires province pushed outwards at a time when the natives were a permanent threat to settlers outside its borders.[166] The state had a problem in that it was difficult to sell land if ownership rights were not adequately protected, and the solution was to concede the land to private agents. In this agrarian regime the diffusion and propaganda of novel democratic ideas represented liberty and equality in land distribution, encouraged work and guaranteed property rights. However, this ownership system was in fact based on compulsion and fraud, and legislation governing land suffered from the severe ill effects of the country's colonial heritage (Cárcano, 1917[1972]:26).

During the Rivadavia presidency[167] (1826-1827), the government enacted a law to consolidate the public debt, which affected liabilities contracted before 1820. This law established that public land was the guarantee for the payment of the debts and forbade the sale of land throughout the country (Avellaneda, 1865). In 1826, the National Law of *enfiteusis* banned the sale of state land (Halperin Dongui, 1963, 1971; Trías, 1974) and created a new public land regime. Public land was a financial and political resource and *enfiteusis* was the mechanism to provide the guarantee for international credit and to meet the need to populate the countryside. This law meant that land was given to individuals on 20-year leases and subject to the payment of annual canons. In the first 10 years, the holder (*enfiteuta*) would pay a cannon equivalent to 8 per cent of the value of the land for cattle breeding purposes and 4 per cent for agricultural production. The valuation was made by a

[166] A series of military fortifications marked the "limits of the civilization" to the south along the Salado River (Chascomus, Ranchos, Lobos, Monte, Navarro, among others). (Lobato and Suriano, 2004:185).
[167] Bernardino Rivadavia was president of the *Provincias Unidas del Río de la Plata* from February 1826 to July 1827.

panel of neighbours, and at the end of 10 years the legislature set the rent to be paid from then on, which depended on new estimates (Scorkink, 2001). This national law was not applied nation-wide but only in the province of Buenos Aires (where it came into force in 1822) and Corrientes (from 1830). In the initial stage, the law did not cover basic aspects such as the establishment of maximum land areas or the obligation to occupy the estate. This situation not only fostered speculation but also allowed transfers among private individuals and contributed to the concentration of land (Ramos, 1965).[168] The state's main aim in renting out public land was to increase fiscal income, and a secondary objective was to make the state financially stable so it did not have to depend on customs duties. However, the government did not try to prevent the concentration of land in the hands of a few rich owners. The *enfiteusis* law did not work towards this end, and in fact huge areas of land were given to private agents (some of these properties exceeded 27,000 hectares). Between 1826 and 1837 around 1 million hectares were given as *enfiteusis* but the fiscal incomes generated from leasing were poor and the *enfiteusis* system did not improve public finances (Burgin, 1946). The *enfiteusis* system was problematic for a number of reasons. The government had very few tax collectors. A commission of owners (a panel or jury, who were not public servants) valued the land in accordance with their own economic interests so land was consistently undervalued. Until the first half of the 19th century, land ownership laws were not completely consolidated and occupiers of land confused *de jure* and *de facto* occupation. Landowners, tenants or squatters without legal title enjoyed the advantages of the "open countryside" and used grazing land without any limits.

During the period dominated politically by Juan Manuel de Rosas (1829-1852) the *enfiteusis* system underwent progressive changes. In 1828 the law had been amended to establish a uniform valuation for all land ($ 3,000 to the north of the Salado River and $ 2,000 to the south) and to fix the canon at the low rate of 2 per cent of the arbitrary fixed value. In 1832 Rosas enacted a decree which authorized grants of properties of 2,328 hectares in areas where the province of Buenos Aires bordered on land controlled by native communities. This was part of the preparations for the *Campaña del Desierto* (Desert Campaign), an armed invasion and war against those autochthon communities that took place in 1833 and 1834. This was a part of the official policy to extend the productive land frontier and it involved the privatization of public land on a massive scale.

In 1836, a new land law authorized the government to sell off millions of hectares of public land, and a huge part of the land under the *enfiteusis* system passed into private hands. About 2.5 million hectares were donated to army officers who took part in *Campaña del Desierto*, and the dominant pattern was for land ownership to be concentrated. Like in the past, the aim was not to foster the

[168] At the end of 1827 the maximum size of a holding was fixed at 12 leagues, and in 1832, the norm was changed by a

population of the frontiers with military forces but to reward the military for their services in the campaign. The officers sold their titles or just gave the land away, which opened up great opportunities for speculation. From 1836 to 1840, various regulations crucially undermined people's rights in the *enfiteusis* system and the government sold huge swathes of land to private agents. In 1840, 52,000 square miles of Argentina, that is to say 13.3 million hectares, was owned by just 893 individuals (Avellaneda, 1865:122). Between 1830 and 1852, people occupied 16.5 million hectares which belonged to 782 landowners (Ramos 1965; Trías, 1974). There were over 100 estates of more than 40,000 hectares. At that time there were internal conflicts, Argentina was very unstable, and each province was administered as an independent region in accordance with the intentions and interests of its local leaders (*caudillos*[169]). Cattle production developed considerably during the period, "However, this system of exploitation did not induce people to settle in the countryside and nor did it give the country greater capacity to progress. It preserved the same features as in colonial times: links between power groups, rootless individuals and land devaluation." (Cárcano, 1917 [1972]: 72; own translation).

The Constitution of 1853 established individual land ownership as a right for everyone throughout the country, but conflicts and confrontations about the form of government caused a brief separation between Buenos Aires and the Confederation of Provinces (1853-1860). The two sides had contrasting settlement strategies: Buenos Aires was confident that spontaneous immigration would come, attracted by rich land and liberal institutions, but the Confederation was proactive in the process and contracted colonizer entrepreneurs, financed ship tickets, granted land and gave economic support.

After the Rosas' administration, new laws governing the sale and leasing of public land were enacted. By that time, the *enfiteusis* system had deteriorated and it was abolished in 1857 through a law that regulated the leasing of large areas for long periods. All the people in the *enfiteusis* system were recognized as the legal holders of public land (Scornik, 2001) under a form of a leasing for a period of 8 years, but the state retained the right to sell the land at any time, although it had to give preference to the current occupier. Between 1858 and 1863, more than 2,000 square leagues (9,660 km^2) outside the frontier line had been conceded and 759 within the defended borders. Subsequent laws (1859, 1864) reiterated the conditions and served the government's purposes in terms of coping with financial difficulties and raising the value of the currency. Part of the government's intention was to attract settlers to these lands, but that was a secondary objective in the overall plan. From 1856 to 1876, some 650 leasing contracts were signed, and as a result private individuals

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decree that established effective land occupation within a 6-month period.

[169] *Caudillo* is a Spanish term for the political-military leaders with charismatic and populist features that characterized the history of Latin America during most of the 19th and 20th centuries.

occupied some 5 million hectares (D'Agostino, 2005). In 1864, the authorities sold 2 million hectares in Buenos Aires province, and in 1871 there was a new law that allowed leasing contracts for public land outside the province boundaries. As a consequence, 3.8 million hectares went into the hands of just 438 owners.

During Mitre's presidency[170] the consolidation of the Argentine union began, the country was reorganized and central authority was enforced. In 1862 it was legally established that all land not in the possession of province authorities was "national" land, and this was a fundamental change in the distribution and land ownership. Demand for public land for colonization increased, the construction of railways and roads was reactivated and politicians and authorities came to recognize that the best way to attract immigrants and settle the land was to have stable institutions and secure land ownership systems. This new attitude found expression in the *"Avellaneda"* law of 1876. In the 1870s, economic and political conditions were changing and the authorities moved from a "defensive conception" of the territory to an offensive and active stance (Rapoport, 2007:42).

During Avellaneda's presidency[171] a law with some elements from North American land legislation was enacted, and the authorities changed their priorities from fiscal concerns to two other main objectives: to attract settlers to the countryside and to distribute land on the basis of individual ownership. In accordance with the law of 1876, leasing was not a suitable system for holding land, and the state established the progressive sale of public land when leasing contracts expired. These regulations involved graduated prices depending on the region, no interest payments, and that the current occupier had the option to buy. If he did not wish to take up his option the land was sold by auction, or as a last resort was bought by the government. At the same time the government faced up to the problem of the sale and subdivision of the *ejidos* and areas adjacent to cities and villages. Slowly the character of *Buenos Aires* province changed from an economic structure based on cattle exploitation to an increasing share for agriculture. The first signs of the "wheat boom" that surprised the world by the end of the century started to emerge in the 1870s. The law authorized five settlement or colonization systems: (i) Direct control by the state; (ii) Indirect state control through private enterprises; (iii) By individual initiative; (iv) By provincial governments and stimulated by the central government; (v) By private agents. The national government supported immigration, subdivided the land and prepared the soil. The first 100 families to arrive at each colonization section (a land area of 16 square leagues) received plots of 100 hectares free of charge, and those who came later paid a fixed price of $ 2 per hectare, in instalments, and when this was fully paid the holders would acquire definitive legal ownership.

[170] Bartolomé Mitre was President of Argentina from 1862 to 1868.
[171] Nicolás Avellaneda was Minister of Justice and Public Instruction in the period 1868-1873 and President of the Republic from 1874 to 1880.

According to Cárcano (1972 [1917]), the law had many limitations but it would have been possible to improve it within the same conception of public land. However, subsequent administrations opened the door to large land grants, speculation and favouritism and the consequence was that "public land was distributed all over the country without people were being settled on it" (Cárcano [1972 (1917)]:163; own translation).

In 1878 a new frontier law was passed that established the borders of the provinces of La Pampa, Buenos Aires, Córdoba, San Luis and Mendoza, which traditionally had jurisdiction ambitions that extended to Patagonia. Expansion to the south was up and running. The government issued land titles of $ 400 (from a total emission of $ 1.6 million that was increased to $ 2.2 million) with an interest rate of 6 per cent and repayment with adjudication of the ownership of the land within a 5-year period. The land price was fixed at $ 400 per league and the purchase only could be effective in titles. This solved the financial difficulties of the project, and land was acquired by the military conquest of new territory. In 1879 Julio Roca led the "*Conquista del Desierto"* (Conquest of the Desert) and overthrew many native communities (*Mapuches*, *Tehuelches*, *Ranqueles*). The main aim of this effort was to extend the frontiers to the west of Buenos Aires and to the south into the Patagonia region. The *"Conquista del Desierto"* (1879-1884) added huge areas of land to the productive system. According to Di Tella (1989), around 30 million hectares were added as a result of wars against the native population.

In 1882 the government enacted legislation that showed how little expertise it had, how much it was guided by wishful thinking and how completely it was dominated by the interests of speculators. This law classified land as either cattle or cultivation land and provided for its division into sections of 1 million and 10,000 hectares, respectively, subdivided into estates of 10,000 and 100 hectares. Cattle land would be auctioned with a fixed upset price, with a maximum (40,000 hectares[172]) and a minimum (2,500 hectares) that each purchaser could acquire, and with the obligation to capitalize the estate in two years. Cultivation land was sold privately in lots of between 24 and 400 hectares, at fixed prices, and with the obligation to cultivate the land within a 3-year period. Most of the purchasers did not pay the stated price and claimed that official information about the quality and location of the land and about the threat from native communities was false, and then legal procedures were delayed. Ruffini (2006) points out that people used false names and fake documents to break the rules. The end result of all of this was that, yet again, land ownership was concentrated in few hands. Evidently, institutions were not capable to reduce the appropriability conditions of natural resources and landowners capturing rents derived from the high quality land that characterized land frontier expansion in Argentina.

[172] 40,000 hectares was the traditional measure used for estates in the colonial times (*"suertes de estancia"*).

A number of the conditions established previously were consolidated in a law of 1884 and, in addition, the norm included a couple of specific clauses related to pioneering people and national organization of territories. On the one hand, this legislation dealt with a group of particular cases and different situations concerning "pioneers" and people settled in the southern region in special relationships with native communities or other countries' jurisdictions (Chile or Britain). To a large extent the actual expansion of the frontier was being effected by these people, and the state was compelled to recognize and institutionalize a *de facto* situation. However, speculators and swindlers took advantage of loopholes in the law and weak central control of the system to appropriate large areas for themselves. On the other hand, "national territories" were set up, which constituted administrative divisions that were not provinces. This concept lasted until the first half of the 20th century in the margins of the federal system, and then these areas were officially changed into provinces (Chaco, Chubut, Formosa, La Pampa, Misiones, Neuquén, Río Negro, Santa Cruz and Tierra del Fuego) and integrated into the federal regime.

Previous analysis refers to rules issued from Buenos Aires or central government, but each province had public lands under own jurisdiction and acted in particular way. In the middle of the 19th century, Santa Fe, which owned large areas of fertile public land, began to improve and organize these properties. The government implemented a colonization policy as a more general way to distribute the land and contracted private firms to administer it. Land was offered freely, but this was not in line with a general regulation but flowed from a succession of special dispositions. The construction of the railways contributed to a policy that combined the promotion of small holders, cultivation and groups of colonies. Like Santa Fe, the province of Entre Ríos did well in regularizing the public property situation and organizing land ownership, but it was always very compromised by *de facto* situations inherited from tradition and custom. The provincial government rented out and sold public land, created official registers of estates, imposed the obligation to measure land and promoted settlement by groups of colonizers. In Córdoba, the law of 1862 regularized and clearly divided private property from public land, and this facilitated the transfer of estates. The province government set up a new land deeds register and used auctions as its main sale mechanism. In the 1870s it started to receive immigrants and it promoted colonization, especially after 1887. The province government used public land to obtain resources, and between 1860 and 1885 all fiscal land had been transferred. On the eve of WWI, Corrientes had a land ownership system very similar to the regimes that dominated the rural environment in the first half of the 19th century, in spite of the fact that it was relatively close to the Pampa region. Its successive governments undertook various public land distribution initiatives, first by leasing and later by

private sales, [173] and they promoted centres of colonization, but significant progress was impeded by persistent political struggles and fiscal financial problems. It is not casual we find evidence about institutions arrangements ruling –informal and formally– the distribution of lands in those provinces that we called "La Pampa" in Chapter 3, Subsection 3.1.3. This was the more dynamics region of Argentina in the First Globalization and it was permanently subject to pressures derived from the land frontier expansion.

The land legislation structure and its effective application were the result of historical circumstances, where "the power of facts was superior to the power of ideas" (Cárcano, 1917 [1972]:291; own translation], and specific action and regulations were often overturned in power struggles between rival interest groups. The initiatives of the Confederation government and the first constitutional presidents, the mechanisms to protect immigrants and farmers, the private colonization projects in Santa Fe, Entre Ríos and Córdoba, the Avellaneda law and the railway concessions[174] all created firm bases for agrarian progress. The 17 million hectares sold from 1880 to 1895 was in no way equally distributed, nor was the sale carried out on a scientific land ownership organization basis; it was the disorderly occupation of these territories by different social groups. Special laws were used continually to distribute fiscal land. From 1884 to 1896 41 laws were enacted to administer the sale or granting of large areas of land. In 1895, the government decreed the auction of 100 leagues in Rio Negro but did not take responsibility for the land's productive condition. The authorities knew very little about the public land in question, and it was also an effective way to keep small capitalists away from the expanding southern land frontier. Only the big capitalists had the resources to invest in territory that might be useless or unsafe. However, in the 1890s these government laws and deals began to come in for angry criticism.

Starting in 1895, the authorities undertook new exploration and measured and sub-divided land to offer title deeds and contracts, and they also organized agrarian statistical offices and set out to exploit forests and *yerbatales*. In 1903 a new land law was enacted to organize the 8 general laws that were in force plus other special laws, decrees and resolutions. The starting point of the new regulations was a careful exploration and characterization, in terms of land aptitudes, of the new territories. Seven land categories were established: cultivation, cattle breeding, forest, mineral, *yerbatales*, mixed production and islands. There were various mechanisms for land transfers including grants, direct sales, auction, and leasing with an option to buy and the obligation to make improvements (buildings, crops, cattle) within a 2-year period. However, this law did not alter the country's traditions in the agrarian sphere; speculation and corruption continued under weak

[173] Until the 1870s, leasing alleviated the government's financial difficulties but sale was not a viable solution. The value of the land was so low that it seemed better to wait for property transfer.
[174] Especially, this is the case of the Central Argentino railway.

governments, and capitalists took over federal lands before the settlers arrived.

Cárcano (1917 [1972]) emphasizes that abuses were rife under all the governments and under all the different laws. The power of the big landowners (*latifundistas*) and the central administration's lack of knowledge about public land were the main factors that undermined the successive land laws, and the situation was exacerbated by the fact that the administrations were politically weak and corrupt. The provinces of Buenos Aires, Santa Fe, Córdoba and Entre Ríos consolidated their agrarian wealth and successfully penetrated international markets with cereals and meat products. There were also other successful developments like vineyards in Mendoza, the expansion of sugar cane cultivation in Tucumán and the forestry industry in Santiago del Estero. The country left its internal armed struggles behind and moderated the risk of international conflicts. It was taking advantage of the long upward trend of the First Globalization and the time was ripe to incorporate all its national resources into the development effort. On the eve of WWI the government was promoting large infrastructure projects like the railways to the south and, along with the irrigation law, this was a clear indication it intended to bring the new territories of Neuquén, Chubut, Santa Cruz, Formosa and Chaco into the general economic movement. As we found in our econometric exercises, institutions were functional to economic growth, but were not capable to moderate the curse of a worsening income distribution derived from the land frontier expansion in the interaction with the natural resources.

2.3.2 Uruguay

In Uruguay, like other settler societies, the distribution of land during the colonization process meant the transfer of land ownership rights from the state to colonists. The distribution of land began in the colonial period, before the 1810s, and the landowner was the King of Spain, who held the land as a "trophy of conquest" (Ots Capdequi, 1946). Land distribution was governed by the *Leyes de Indias* (1680) which were established especially in the River Plate. There were several ways in which colonists could acquire land rights: i) *repartimiento* (sharing out) to the settlers of the first urban centres established on the territory; ii) *gracia* or *merced real*, a type of grace and favour which amounted to enormous areas of land being given to individuals that the Spanish authorities regarded as favourites; iii) *venta*, an expensive, intricate bureaucratic procedure that could only be carried out in Buenos Aires; iv) *composición*, a procedure which meant occupation and the exploitation of natural resources.

In the second half of the 18th century the process of land occupation and frontier expansion received a new impulse, and there were several reasons for this. First, native communities moved to the North; second, the *Real Instrucción* of 1754 made grants of land occupied before 1700 automatic and ownership did not require royal confirmation; and lastly, the *Pragmática de Libre*

Comercio (free trade pragmatism) of 1778 made it easier to export agrarian production, and consequently stimulated the institution of land ownership rights.

In general, the appropriation of land took place in an imprecisely-defined legal framework. In most cases the people occupying land did not have title deeds, and many of the legal owners lived in the cities (Montevideo or Buenos Aires) and knew nothing about their land. In the colonial period large estates came into being and there was a lack of legal transparency about property rights. There were three reasons for this: i) the territory was very sparsely populated; ii) the economy was extractive but the main wealth was in cattle, not land; and iii) the Kingdom of Spain was politically weak in the region because the main aim was to consolidate the border against the Portuguese Empire rather than to define internal land ownership rights.

In 1830, when Uruguay enacted its first Constitution, some 80 per cent of the territory was public land, the country's frontiers had been explored and the borders fixed, and the total population was only 70,000 inhabitants. Acquiring land was a very conflictive process and the government failed to organize it properly because of pressure from the big landowners, the financial demands of frequent fiscal crises, and the military and political power of the *caudillos*. The occupation of public land was so chaotic that at the beginning of the 20th century, when the Batlle y Ordoñez's[175] administration tried to implement new policies to encourage agricultural production, it did not know what the actual extent of public land was. It is likely that at that time some 15 per cent of the country's territory was public land but the state received no income at all from it.

In the 19th century there was no clearly defined policy on public land. On the contrary, the state was very vulnerable politically as regards institutions and it suffered recurring financial crises and did not effectively control the national territory. Between 1830 and 1870, successive governments followed a policy of selling public land instead of leasing it, and between 1830 and 1836 private ownership rose from 20 per cent to 42 per cent of total land. Laws were enacted in 1831, 1833 and 1835 to promote private ownership and to regulate the leasing of public land, the extension of granted land and the contract duration of leasing. But the political instability in Uruguay at that time was such that a genuine land market was not established before 1870. The state lost its control of public land and was unable to determine precisely how much land it had and where it was.

In the period from 1850 to 1870, after the *"Guerra Grande",* the authorities sought to bring order to the public land situation. [176] This was part of a process that included the political reorganization of the country. The 1852 land law forbade the sale of public land to individuals so as

[175] José Batlle y Ordoñez was President of Uruguay in 1903-1907 and 1911-1915.

[176] *"Guerra Grande"* was an armed conflict in the River Plate (1839-1851). The two main political forces in Uruguay (*Partido Blanco* and *Partido Colorado*) were at war and both received backing from Argentine political parties (*federales* and *unitarios*), and the British Empire and France also participated, as well as a legion of Italian volunteers.

to use it to guarantee the service of the public debt. A decree enacted in 1854 again suspended the prohibition on sales of public land. In 1860 there was another decree, which made it incumbent upon people who were occupying land but had no legal title deeds to declare their current situation and obtain the land as renters, and if they did not comply they could be expelled from their holding. In accordance with this decree, some 313,580 hectares were reported by their informal owners.

It was only in the second half of the 1870s, in the context of a military regime under Lorenzo Latorre (who came to power in March 1876), that land ownership rights in the rural sector were finally established. The government acquired a decisive advantage over the rural *caudillos* thanks to new technologies in weaponry (Mauser and Remington rifles), transportation (the railways) and communications (the telegraph). In addition, the delimitation of rural properties was made possible by the diffusion of the wire fence (*alambramiento*) in the countryside (Barran and Nahum, 1967, 1971, 1972, 1973, 1977, 1978; Jacob, 1969; Millot & Bertino, 1996; Moraes, 2001; Vázquez Franco, 1968). This consolidated the dominance of large estates in the rural sector, and a substantial amount of public land was eventually incorporated into these holdings. A significant proportion of the rural population, almost 10 per cent (Barrán and Nahum, 1971), was driven off the land as a consequence of the consolidation of the large estates.

In the early years of the 20th century various governments tried to limit the estates and the economic power of the cattle stock-rearers by imposing taxes on land, but this initiative was not successful. The main characteristic of the agrarian structure in Uruguay was the concentration of land ownership, and this was consolidated even more during the First Globalization. As in the Argentine case, where the functional income structure was "dominated" by land rents, the concentration of the land meant, in fact, the concentration of the income. Institutional arrangements did not moderate the capacity of the landowners for capturing rents, and the incomes derived from the natural capital structured an unequal income distribution.

2.4 Discussion about the main characteristics: two "models" of land tenure systems

2.4.1 An overview

In our analysis we have identified two land distribution patterns in our settler economies, which are connected to different ownership structures and land tenure systems.

In Australia and New Zealand, the British colonial regime established a strong state that regulated the settlement of European colonists and attempted to promote equitable land distribution. This process was regulated by a legal framework that transferred property rights since early in the 19th century from the Crown (the "original" owner) to the colonists, and this ensured the effective ownership of land and moderated land concentration. These objectives were achieved because these

two states had enough political and institutional power to guarantee secure property rights and this favoured a suitable functioning of the productive factor markets. The high salary mass in agrarian activity in the two economies is a clear effect of this process and it makes Australasia different from the settler economies of the River Plate where the rentist profile predominated. Land was considered as an important economic resource in economies like Australia and New Zealand that were based on agrarian production and that needed immigrants in order to develop, and this importance was expressed in public policies. Land was also important as a source of fiscal income, together with the transference of land ownership rights, and different tenure regimes were set up (leasing, grants, sale by auction, etc.). The leasing systems made it possible for small agrarian producers to access land even though they did not have enough capital to become owners. In addition, state limitations on the size of estates moderated (but they did not eliminate) the trend towards land ownership concentration.

In Argentina and Uruguay the processes of land distribution started before the wars of independence and, therefore, initially it developed under the Spanish legal regime. In that period land was not very valuable and the main economic resource was wild cattle. Large estates (*latifundia*) came into being because populations were very small and the Spanish forces in the Viceroyalty of the River Plate were politically weak and mainly concerned with combating resistant native populations to the west and the south and the Portuguese Empire in the east. According to the Spanish land distribution laws, colonists were supposed to physically occupy the land and to produce on it, but in fact these conditions were rarely fulfilled.

Most land frontier expansion and the transfer and distribution of land ownership rights occurred after Argentina and Uruguay became independent. Public land was transferred from the state to settlers through a variety of legal regimes that moved incoherently between direct sales and leasing. The former was inspired in liberal principles and it was aimed at transferring land to the private sector, and the latter was an effort to retain public land as a source of fiscal income and support the public debt. However, it turned out that neither Argentina nor Uruguay benefited for the transfer of land. Both countries lacked the political power to make an ordered distribution of land. Until the last quarter of the 19th century these states were weak in political, institutional and military terms, and the land distribution process favoured social and economic groups and local elites. During First Globalization land became much more valuable because of its connection with rising international commodity prices, and the large estates consolidated their position in the land ownership structure. These social groups also supported the oligarchy regimen that dominated the political scene up to WWI. A basic concept in the Argentine Constitution of 1853 was “to govern is to settle”, a notion

first advanced by Juan María Alberdi. But it turned out that hard facts were stronger than ideas and most of the land fell into the hands of capitalists and absentee landowners rather than settlers.

The land distribution pattern in the River Plate did not have secure ownership rights and was further undermined by political weakness on the part of the authorities. Public policies were incoherent and inefficient, and when land ownership rights finally became more secure (in the 1880s) the result was that a highly concentrated ownership pattern was consolidated. For decades the authorities focused their efforts on organizing the country and the provinces instead of on how land was distributed within those boundaries, and this weakened the state's capacity for action in that matter. A combination of deficient functioning of the productive factor markets, a strong association between economic and political power (with features of the colonial heritage), and a persistent social differentiation (based also on idiosyncratic factors) are, at least partially, the result of land concentration, and it created the "environment" of worsening of income distribution experienced by both countries in the last decades of the 19th century.

2.4.2 Similarities and differences

On a conceptual level and taking a broad view, the process in the settler economies in the 19th century was dominated by four principles:

(i) The creation of a private land tenure system whereby, depending on the period and with differing intensity, land ownership was transferred to colonizers. Initially the land was freehold and this was seldom questioned, but it was not long before doubts began to arise, especially towards the end of the 19th century, and there were tentative experiments with leasehold systems that were not always well thought out.

(ii) There was a permanent idea that a new population should be brought onto the land so as to create a society based on immigrants.

(iii) The authorities were convinced that land was the nation's wealth and land settlement would be the basis of prosperity.

(iv) There was a notion that equality in land distribution was valuable as the basis to construct an independent and democratic nation.

The authorities in the different countries all had these notions and all faced similar problems:

(i) Strictly, the land was not "empty". The expansion of the frontier meant displacing the native population and taking over the land they had subsisted on for centuries. However, land had to be brought into civilization and put to use, and the best results would be obtained by bringing in settlers to establish a stable, sedentary society of farmers (Williams, 1975: 63).

(ii) There was a certain amount of theory involved,[177] but basically the way land was administered and how ownership rights for public land came into being was a matter of trial and error. It was very difficult to define land boundaries because of ignorance and information asymmetries, and there were problems too with determining the size of estates and their productive aptitude.

(iii) Land policies were dominated by conflicts among interest groups in which each faction played its own game. Occupiers used their wealth and influence to evade attempts to reallocate land, and many evasion methods were used such as "dummying", "peacocking" and forcing auctions.[178] In addition, land oligarchies usually participated actively in the various levels of government and fostered legislation that furthered their own interests.

There are two main models, and there are four main differences between them:

(i) The colonial heritage in the River Plate –as explained by Acemoglu et al. (2001, 2005) and Engerman & Sokoloff (1997, 2002)– contrasts with the delayed institutional development of Australasia.[179] In some sense, in Australia and New Zealand the absence of "path-dependence" allowed a really "new" system to be created that was close to the British tradition and had the North American system as a model.

(ii) The oligarchic elites in the River Plate exerted broad control over land ownership, and with the development of constitutional government they consolidated their hold on political power. This contrasts with the pastoral economy of Australasia that was shaped by rules imposed by a bureaucracy that was relatively disinterested –it was dependent on the Crown– and involved the active political participation of small farmers (Denoon, 1983),[180] who were motivated by democratic values.

(iii) In Australasia the various states participated in the "agrarian question", and a well-organized public administration made it possible to implement and enforce autonomous action. In the River Plate, on the other hand, chronic fiscal deficits and continuous political struggles –even after the independence– prevented the implementation of long-run policies. As a result, the governments of Australasia set up administrative and institutional arrangements that were closer to the notion of a developmental state.

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[177] Some of the most influential theorists were Robert John Wilmot-Horton and Edward Gibbon Wakefield in the early part of the 19th century, and Alfred Russell Wallace and Henry George toward the end of that century.

[178] "Dummying" is acting on the behalf of another individual in legal matters. "Peacocking" refers to the acquisition of the best pieces of land in such a way that the surrounding land is useless to others.

[179] Bértola et al. (2010) present an analysis of the evolution of income distribution in the Southern Cone of South America considering the colonial heritage as a main factor.

[180] "…Australian wheat-farmers enjoyed a security of tenure and a degree of state sympathy which '*arrendatarios'* in Argentina would scarcely have believed possible" (Denoon, 1983:102).

(iv) Australia and New Zealand shared the same fragment culture and the reforms reflected the same fundamental egalitarian, communally-focused, working-class radical values. Both societies shaped a socio-political context in which the land question was one of the main aspects of public policy, and quite early on politicians, theorists, and citizens identified with these concerns. The colonial social hierarchy lacked the appearance of permanence and a change of status was a relatively common experience. This social homogeneity made for a powerful unity in political questions (Paulson, 1988; Rosecrance, 1964).

Questions of land tenure were enormously important in the political economy of newly settled regions, and there was concern "with property as a function rather than a right" (Hawke, 1979: 382). This notion can help us understand the differences that emerged. In conceptual terms, the institutional arrangements than governed the distribution of land ownership and the behaviour of landowners (effective as well as potential) were similar between the regions. The regulations were written with similar concerns and interests in mind, and the American system was identified as an attractive model. Agents acted in accordance with their own interests, created mechanisms to obtain land for themselves and took advantage of other proprietors when circumstances permitted. The great differences between the two systems were that the governments in the River Plate were weak when it came to enforcing regulations, and there were elites (whose power was based on land ownership) that influenced state policy. This aspect is dealt with by Robinson, et al. (2006), and it is a feature that derived from a strong colonial heritage. The authorities in Australasia created a more favourable environment for colonization and land settlement because they had the power to enforce the regulations, they were guided by notions of development that stemmed from the colonial government, and they enjoyed a context that was more stable economically and politically. In terms of land distribution the differences were not so significant between regions (see Chapter 4) but, in terms of the functioning of the markets and the incomes derived from the productive factors, they were. In particular, the different appropriability capacity of the agents might go some way towards explaining why income evolved differently in the two regions. The conditions of appropriability were clearly different; they were more intense in the River Plate where they influenced distinctly income distribution rather than wealth distribution, and where they were accompanied by idiosyncratic factors that reinforced the negative consequences on inequality of natural resources exploitation.

Therefore, we can come back to our appropriability hypothesis. The environmental factors –the landholding system– that control the innovator's ability –the holder's capability– to get returns generated by an innovation –the incorporation of "new" land– characterized two different "models". Within similar economic growth conditions, one of them rendered an income inequality pattern of

high concentration and rentist societies (Hispanic model) and, the other, a more egalitarian model with higher participation of wages and profits and, consequently, broader markets (associated to wider middle-social classes) that function more efficiently and encourage economic growth (British model). The differences in terms of income distribution in the agrarian activity, land property, capacity of influence of the states, colonial heritage and social homogeneity, explain two different ways to interact with the abundant natural resources.

3. Conclusions and final remarks

We analyze the effect of natural resources on economic growth and on functional income distribution in agrarian activity, and our discussion is guided by considering the hypothesis of the curse (or blessing) of natural resources. Our initial conjecture is that settler economies are characterized by abundance of natural resources, but natural capital is not homogeneous in composition (soils, humidity, temperature) or in intensity (as regards ease of extraction and use) and this generates differences in terms of economic development.

We focus on the effects of a country's abundance of natural resources and of the quality of its institutions in terms of making resources appropriable. We propose two methodological approaches. One is based on estimating the statistical relationship between economic performance, natural resources and institutions. The other is a historical description of the distribution of land ownership rights and the institutional arrangements related to land property in four countries, Argentina and Uruguay (Spanish ex-colonies) and Australia and New Zealand (British ex-colonies).

In the first approach we do not reject the curse of natural resources on agricultural production, but if we admit that the curse can also be seen in terms of high inequality, it is possible to reject it. In other words, open frontiers (huge natural resources that may be incorporated into production) would be associated with low levels of agrarian production and egalitarian societies. Institutional quality, acting alone or in combination with natural resources, was able to promote positive effects because it strengthened the blessing or moderated the curse. In addition, we find evidence in favour of the appropriability hypothesis in terms of inequality and in the technical dimension, but we reject it in terms of agricultural production. The expansion of the land frontier onto relatively higher aptitude land meant a more moderate curse on the agrarian production, but it amounted to a "less blessed blessing" as regards income distribution.

What were the consequences of these conditions in the long-run? As abundance of natural resources (land wealth) decreases (in relative terms) with the occupation of territory, economies that incorporated "new" land into production "escaped from the curse" of natural resources and enjoyed sustained expansion that raised their income to levels approaching that of the core countries in the

world economy. However, in this process, our economies left the blessing, in terms of income distribution, of an extensive open territory, to configure a persistent non-egalitarian trajectory.

Our second approach is based on a historical description of the distribution of land rights and the formation of institutional arrangements for land ownership in the River Plate (Argentina and Uruguay) and Australasia (Australia and New Zealand). The enforcement capacity of the authorities in Australasia, which had its roots in the colonial government, made for a more stable economic and political context and markets that functioned better, and created an environment more conducive to colonization and land settlement. The conditions of appropriability in the Anglo-Saxon settler economies were clearly different to those in the River Plate.

The question of appropriability is an attractive dimension to the argument about the relationship between economic performance and natural resources. The institutional arrangements regulating land ownership may be suitable for economic growth but inadequate when it comes to promoting more egalitarian societies. This evolution was more apparent in the Hispanic ex-colonies that in the economies that adhered to the Anglo-Saxon model in which "good" institutions foster the blessing (and moderate the curse) of natural resources. Differences in land aptitude would create different incentives and possibilities for agents to appropriate the rental differential between different types of land. The appropriability dimension will be more important, or more intense, when the land occupied is of higher quality because the agents in question would have greater opportunities to appropriate rents, but this process did not affect the production side but the inequality pattern. This trend could be moderated by the action of institutions and the path dependence of the settlement (as in the Australasian case) or legitimated by the "environment factors" that regulated the capacity of the holders to appropriate the returns of the "new" land (River Plate).

Appendix to Chapter 5
Institutional quality indicators and database

1. Polity IV: constraints on the executive

1.1 Presentation

"Polity IV Project: Political Regime Characteristics and Transitions, 1800-2008" is a program that provides broad information for coding the authority characteristics of states in the world system for purposes of comparative and quantitative analysis (http://www.systemicpeace.org/polity /polity4.htm). The "Constraints on executive" data base is accessible through the Integrated Network for Societal Conflict Research (INSCR), and it considers a wide sample of countries from the mid-19th century to 2008.

"Constraints on the executive" is a measure of historical political institutions and is defined as the extent that institutions can restrict the decision making powers of the chief executive, whether individual or collective. According to Marshall & Jaggers (2009), in a democracy, constraints would come from the legislative or judicial branches of government. In a dictatorship, constraints may come from the ruling party in a one-party system, military coups, a council of nobles or powerful advisors. The extents of constraints on the executive are coded from 1, meaning "unlimited executive authority" to 7, which is "executive parity or subordination". A country would be in the first category if "constitutional restrictions on executive action are ignored", or if "there is no legislative assembly, or there is one but it is called or dismissed at the executive's pleasure". A country would be in the latter category if "a legislature, ruling party or council of nobles initiates much or most important legislation" or if "the executive is chosen by the accountability group and is dependent on its continued support too remain in office" (Marshall & Jaggers, 2009: 67-68).

1.2 Time coverage

Argentina: 1860-1913; Australia: 1901-1913; Canada: 1867-1913; Chile: 1860-1913; New Zealand: 1860-1913; Uruguay: 1860-1913.

The data base (annual data) considers only independent countries and this is why Australia and Canada have shorter series. Both were dependent on British Crown in the 19th century but enjoyed a governmental regime with a high degree of autonomy and had political systems with broad popular participation, at least compared to other countries at that time. For both, independence was not a traumatic episode and political and governmental conditions changed gradually. It seems reasonable to give both countries the same level of the indicator that they had in their first year (1867 for Canada and 1901 for Australia). However, to avoid introducing a bias towards our hypothesis, we "punish" them by reducing them one step in the indicator rating.

2. CIM: contract-intensive money

2.1 Presentation

Clague et al., (1999) define contract-intensive money (*CIM*) as the ratio of non-currency money to the total money supply, or $CIM= (M_2-C)/M_2$, where M_2 is a broad definition of the money supply and *C* is currency held by people (outside banks).

2.2 Sources

- For Argentina, Australia and Canada we use Prados de la Escosura and Sanz Villarroya (2009, 2006). Data kindly provided by the authors.
- For Chile we use our own elaboration with data derived from Jeftanovi et al. (2003).
- For New Zealand we use our own elaboration with data derived from Statistics New Zealand-Long Term Data Series (SNZ-LTDS) based on Bloomfield (1984), and our own estimates.

  The source considers banknotes and coin held by the public since 1935, and for the previous years (1875-1934) the category considers notes in circulation. The first figure is $ 10,778,000 and the average of the second for 1933-1935 is 11,049,000. The differences are small and we consider notes in circulation as a good proxy for the currency held by the public.

  SNZ-LTDS presents its own estimates of M_2 for 1877-1913, and for the previous years we adjust these data with the movement of M_1 series.
- Uruguay: the data is from Román & Willebald (2010). Data kindly provided by the authors.

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3. Database for econometric exercises

Country	Year	GDPA	GDPAG	RW	C	CIM	CIMI	F	HI	MI	LI	HL	ML	FEH	FEM	FEL
1	1860	1			3	0.56	1.00	0.92	0.99	0.99	1.00	0.99	0.99	0.96	0.96	1.00
1	1870	2	0.95	1.60	3	0.55	0.97	0.90	0.98	0.98	1.00	0.98	0.98	0.95	0.95	1.00
1	1880	8	2.66	2.16	3	0.55	0.97	0.89	0.96	0.97	1.00	0.96	0.97	0.94	0.95	1.00
1	1890	30	3.01	1.51	3	0.55	0.98	0.86	0.94	0.95	1.00	0.94	0.95	0.93	0.93	1.00
1	1900	62	1.05	1.67	3	0.66	1.17	0.83	0.92	0.93	1.00	0.92	0.93	0.91	0.92	1.00
1	1910	84	0.35	3.22	3	0.74	1.31	0.79	0.89	0.92	1.00	0.96	0.92	0.89	0.90	1.00
2	1860	21			6	0.77	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.99
2	1870	34	0.63	1.64	6	0.83	1.08	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.99
2	1880	51	0.48	1.64	6	0.88	1.15	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.99
2	1890	72	0.42	2.36	6	0.92	1.19	0.96	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.99
2	1900	91	0.26	1.57	7	0.92	1.20	0.96	1.00	0.99	1.00	1.00	1.00	1.00	0.98	0.99
2	1910	123	0.35	1.55	7	0.94	1.22	0.96	1.00	0.99	1.00	1.00	0.99	1.00	0.98	0.99
3	1860	24			6	0.47	1.00	0.93	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.93
3	1870	31	0.29	2.21	7	0.63	1.33	0.93	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.93
3	1880	40	0.29	1.87	7	0.72	1.52	0.93	1.00	1.00	1.00	0.99	0.99	1.00	1.00	0.94
3	1890	47	0.17	2.05	7	0.79	1.68	0.93	1.00	1.00	1.01	0.99	0.99	1.00	1.00	0.94
3	1900	67	0.41	1.87	7	0.85	1.81	0.93	0.99	0.99	1.00	0.99	0.99	1.00	1.00	0.94
3	1910	99	0.48	2.40	7	0.89	1.88	0.92	0.99	0.98	1.00	0.99	0.99	0.99	0.99	0.93
4	1860	39			2	0.09	1.00	0.70	1.00	1.00	0.99	1.01	1.01	0.95	0.89	0.86
4	1870	48	0.25	3.50	3	0.28	3.07	0.69	1.00	0.99	0.96	1.05	1.04	0.95	0.89	0.85
4	1880	53	0.10	4.23	4	0.39	4.21	0.67	0.98	0.99	0.96	1.03	1.04	0.95	0.89	0.83
4	1890	61	0.16	3.63	7	0.51	5.55	0.65	0.98	0.99	0.96	1.02	1.04	0.93	0.88	0.83
4	1900	71	0.15	2.35	7	0.63	6.83	0.65	0.97	0.99	0.96	1.02	1.03	0.93	0.88	0.83
4	1910	94	0.34	3.82	7	0.75	8.12	0.65	0.98	0.99	0.96	1.02	1.03	0.93	0.88	0.83
5	1860	8			7	0.81	1.00	0.94	0.94	0.98	0.98	0.96	1.00	0.96	0.99	0.99
5	1870	21	1.78	1.46	7	0.87	1.08	0.85	0.88	0.96	0.97	0.90	0.99	0.91	0.97	0.97
5	1880	39	0.84	1.20	7	0.92	1.14	0.77	0.85	0.95	0.96	0.88	0.99	0.85	0.95	0.96
5	1890	59	0.51	1.36	7	0.93	1.15	0.73	0.82	0.94	0.96	0.85	0.98	0.83	0.94	0.96
5	1900	72	0.23	1.86	7	0.93	1.16	0.69	0.80	0.93	0.95	0.84	0.98	0.80	0.94	0.95
5	1910	99	0.37	1.70	7	0.93	1.16	0.66	0.78	0.92	0.95	0.89	0.97	0.78	0.93	0.95
6	1860	25			1	0.57	1.00	0.87	0.93	1.00	1.00	0.93	1.00	0.88	0.99	1.00
6	1870	38	0.56	1.23	1	0.61	1.07	0.81	0.88	1.00	1.00	0.88	1.00	0.82	1.00	1.00
6	1880	54	0.41	1.86	1	0.64	1.13	0.77	0.76	1.00	1.00	0.76	1.00	0.77	1.00	1.00
6	1890	81	0.50	2.31	1	0.69	1.22	0.66	0.68	0.99	1.00	0.68	0.99	0.67	0.99	1.00
6	1900	88	0.08	1.92	2	0.65	1.14	0.59	0.63	0.99	1.00	0.63	0.99	0.60	0.99	1.00
6	1910	97	0.10	3.23	4	0.63	1.11	0.54	0.57	0.99	1.00	0.77	0.99	0.56	0.99	1.00

1: Argentina; 2: Australia; 3: Canada; 4: Chile; 5: New Zealand; 6: Uruguay.

Chapter 6
Conclusions, final remarks and contributions

The First Globalization was a period of expansion for the Atlantic economy from the mid-19th century up to WWI. It was characterized by the incorporation of new regions into the global economy and the configuration of broad markets for commodities and productive factors. We focused our analysis on regions of recent European settlement ("settler economies"), which were involved in this process in the period 1870-1913. At the beginning of the 20th century these economies appeared to have a promising future, but it became apparent in the 1930s that the results of several members of this "club" had fallen short of these expectations. In the 20th century the main problem for these countries was how to deal with the transition from a settler economy to some form of post-settler society, and they took different paths and adapted to the new environment with different degrees of success. However, even considering a similar development pattern of the "club", differences were important and they constitute one of the main motivations of our research. Levels of product per capita were higher and the deterioration of income distribution less intense in the ex-British colonies (Australia, New Zealand and Canada) than in ex-Spanish ones (Argentina, Chile and Uruguay), and manufacturing came to the fore much more in the first economies.

How did the similarity among the members of the club operate historically? Many parts of South America, Oceania and Africa benefited from the consequences of the Second Industrial Revolution as their temperate climate and fertile soils were especially suitable for the production of food and raw materials. Their natural resource endowments enabled them to make dynamic progress and reach income per capita levels on a par with the richest economies in the world. Their abundance of natural capital was understood as a "blessing" as these economies participated in external trade with resources that had been practically unexploited and for which international demand, mainly from Europe, was strong and sustained for a long period. However, in recent years, and particularly since the 1990s, the perception of the connection between abundant natural resources and economic growth has changed.

A new literature has developed that focuses on the so-called "resource curse hypothesis", a confusing paradox whereby resource-rich countries would tend to grow more slowly than resource-poor ones. Evidently, in the context of the settler economies during the First Globalization, it is difficult to see the issue in terms of clear and determinant causalities. The First Globalization was a period in which settler economies developed sustained export-led growth with a persistent primary specialization and worsening income distribution (we call these processes as the three main stylized facts of the period). Therefore we cannot label an abundance of natural resources as a complete

blessing or a complete curse. Current theoretical and empirical literature about the "curse hypothesis" discusses mixed influences and proposes wider perspectives that introduce concerns other than economic growth, such as poverty, education and inequality. In this new perspective some processes are seen as conditional upon the formation of specific aspects of the economic environment, typically the institutional arrangements that came into being. Following this approach, we find that when the settler economies were exposed to the effects of the First Globalization they took advantage of their abundant natural capital, applied their resources productively, and in this process they received the blessing of their natural wealth but at the same time incurred the curse of an increasing inequality.

The recent literature on the evolution of the Atlantic economy during the First Globalization uses the H-O-S trade theory to explain the performance of the New World economies. This theoretical framework can be useful to explain the three typical overall trends in the period –productive expansion, primary specialization and inequality– and it considers international economic relations and the formation of prices as key factors, but it does not pay enough attention to domestic conditions and it does not offer arguments to differentiate performance within the "club". For this reason we are interested in an alternative analytical approach based on the tradition of the "staple thesis" and supplemented with elements from the appropriability hypothesis of natural resources. This should give us new insights into the question.

Our approach has a different focus to recent standard analyses and this enables us to discuss key aspects of the First Globalization in terms of the endogenous expansion of the land frontier, differentials in sector productivities and different evolutions in functional income distribution. The main "domestic contribution" of settler economies to economic growth was the incorporation of "new" land (of variable quality) into production. This had consequences for structural change, the evolution of factor remuneration and the quantity and intensity of the use of productive factors. In spite of this, natural endowments are not the whole story. The expansion of the land frontier was related to the formation of land property rights, and consequently to the configuration of different land ownership systems and different designs of incentive mechanisms associated with them. These differences in land frontier expansion and the corresponding formation of institutional arrangements governing it are core factors in the explanation of why incomes and distributive patterns in settler economies evolved in different ways. Land quality and institutional quality are central elements in our analytical and empirical approach.

Our main argument is that the mere availability of abundant natural resources can not explain the success or failure of the settler economies. Indeed, it was the discovery of natural resources, the existence of commercial opportunities, the rate of exploitation and the distribution of rents all acting

together that created the conditions for economic development. Therefore we focused on the transformation of natural resources as an endogenous process that explains the evolution of these economies and their structures in productive and distributive terms. The incorporation of "new" land was a process that went on at the same time that specific institutions dealing with land ownership were being set up. In consequence, a second central aspect of our research was to examine the connection between the evolution of land incorporation and the quality of the institutions involved. Because worsening income distribution is a key subject, we employed a theoretical framework that proposes the different rental appropriability capacities of natural resources as a key element, and we evaluated the formation of the land ownership system in accordance with it. The appropriability conditions of natural resources (depending on their quality), the quality of institutions (in terms of their capacity to moderate concentrated rent appropriation and crowding-out effects) and the interaction between both had different consequences in different countries. In the English-speaking countries, and in relative terms, these conditions moderated the crowding-out effects of natural resources because stimulated a more efficient functioning of productive factor markets, with increasing capital accumulation (physical and human) and salarization of the agrarian production. The result was a better economic performance than that of the South American Southern Cone in the long run, where the rental profile of the agrarian production characterized economies with small markets and low chances to affront the structural change of the industrialization (persistent primary specialization was a feature present in all settlers, but it was more intensive in the Spanish speaking economies).

In accordance with our hypotheses and a review of the literature about the curse and the blessing of the natural resources, and paying attention to the main stylized facts or overall characteristics of our "club" of economies, we focused our efforts on three main questions, (i) endogenous land frontier expansion; (ii) the influence of land quality on economic performance; and (iii) the interaction between an abundance of natural resources and institutional quality. To deal with these questions we worked in three different directions, (i) to design an analytical model suitable to tackle our questions and hypotheses, (ii) to operationalize two of the main concepts and variables of interest: land frontier expansion and functional income distribution in agriculture; and (iii) to propose empirical exercises and detailed descriptions to understand the relationships between natural resources and institutional quality (in terms of the appropriability hypothesis).

First, in Chapter 2, we presented an analytical model that represents the three stylized facts mentioned above so as to analyze some aspects of the blessing and the curse of natural resources. This complements the view derived from the H-O-S theory. In the tradition of "specific factors" models, we studied two main aspects of domestic conditions: endogenous land frontier expansion

(our proxy for the effects of the land abundance) and the use of a decision rule whereby agents could understand this movement (agents react to marginal changes in incomes and costs related to the land that, potentially, can be incorporated into the production). Our main contribution is to propose some modifications to the theoretical formulation and introduce the effect of different land qualities on the results. Our objective is to emphasize the role of endogenous advance on the land in the First Globalization as a reaction to changes in the relative prices of commodities and changes in the relative endowments of productive factors (basically, capital and labour). We extend the model to increase its flexibility and adapt its application to the different ways the countries in the "club" developed. In particular, we focused out discussion on the influence of different patterns of land frontier expansion (or settlement) –depending on land quality– on the formation of particular income distribution patterns. We assume specific formulations of the equations of the model and propose numerical analyses to determine the changes in functional income distribution derived from changes in relative prices (agricultural versus manufacture goods). With this we represent the price boom of the closing decades of the 19th century and the beginning of the 20th century that settler economies enjoyed, and its consequences in terms of growth, structural change and worsening income distribution. Under these assumptions, the different intensity of the increase in inequality in the settler economies during the First Globalization may be explained by the fact that land of differing quality was occupied and thus agents received differing rewards. The wide gaps between land rentals and wages that characterized the period depended on the effective existence of land returns that could be appropriated. The abundance of excellent land in La Pampa or Uruguay made for greater possibilities to capture rents –as against wages– but this was not the case in Australia, where the territory became more arid the farther inland the producer moved, or Canada, where the exceptional prairies were all of 2,000 km from the east coast. But, land frontier expansion occurred at the same time as specific institutional arrangements came into being, so the institutional explanation of the natural resource curse (and blessing) is a useful tool to guide our analysis.

The effect of natural resources on economic development is not determined by resource endowments alone but rather by the interaction between the type of resources and the quality of institutions. This combination represents the so-called "appropriability" of a resource. This concept generally alludes to the environmental factors that control the innovator's ability to obtain returns generated by an innovation. In the case of land, we can express the concept in terms of the landholding systems that control innovator's ability (the land proprietor) to obtain rents derived from the incorporation of "new" land. The concept captures the probability that they will lead to rent-seeking, corruption, anti-competitive actions or conflicts, which in turn hamper economic development. In economies where resources are highly appropriable, the abundance of resources may make economic development difficult, and the opposite would happen in countries where

resources are less appropriable. We applied these concepts to help us understand the evolution of settler economies during the period.

From the discussion of Chapter 2, two questions are crucial for our analysis of economic performance: land frontier expansion and income distribution, and we operationalize these two concepts in two chapters.

In Chapter 3, we present different notions and measures of land frontier expansion. First, we review the literature about the "frontier myth" of settler economies, from the pioneering contributions of Frederick Turner to the recent theoretical and empirical developments that, with a critical and sometimes excessively superficial approach, deal with that conceptualization. Second, in order to identify different "settlement patterns", we present and discuss ways to measure the process. We base our quantification proposal on the use of Georeferenced Information Systems (GIS) and the elaboration of land frontier indexes ("extensive", "intensive", and "contribution" indicators). With this strategy we can circumvent some of the limitations of previous approaches. First, we calculate indicators of natural resource abundance in terms of the stock potentially used for production (we work with indicators of wealth), and of their evolution on time. Second, we consider different land aptitudes (in agricultural terms) and distances (from certain "centres of gravity" in the case of Argentina) depending on the potential vegetation, and thus we define specific settlement patterns. The trajectories of the countries in the club were not homogenous and they reacted to the effects of the First Globalization in different ways, depending on their dynamics of settlement. In these terms, we can identify two patterns.

On the one hand, in the River Plate, frontier expansion was mostly onto high and medium aptitude land throughout the period (low aptitude land contribution was absolutely marginal), and this was also the pattern in Chile from the 1880s. On the other hand, land frontier expansion came at a different time in the development of Australia and Canada. In Australia it came before the First Globalization boom, and in Canada the process only became intensive at the end of the 19th century. In addition, and in contrast to Australia, the contribution of the three types of land (high, medium and low quality) was important for Canada. New Zealand had features of both economies. As in Australia, land frontier expansion became more dynamic before the price boom but, like in Canada, all three kinds of land made their contribution to development. In accordance with our theoretical framework, we can expect that the different intensity of expansion onto different natural resources would have resulted in a more serious worsening of income distribution (a "blessing less blessed") in the Southern Cone of South America than in Australasia and Canada. In Chapter 4 we present our estimates of income distribution and contrast our findings.

In accordance with the discussion of Chapter 2, we advance different notions and measures of two dimensions of inequality in settler economies. We consider asset and income distribution to identify different "distributive patterns" in the club. First we study the distribution of land ownership in the eve of the WWI. We present percentile indicators, Gini indexes and land holding sizes for each country in the club and for large regions within them. Inequality indexes hide certain "shapes" in land distribution that relativize some comparisons and drive us to put the emphasis on different regional realities that improve our approach to the topic. Second, we estimate functional income distribution in the agrarian sector. Agriculture was the most important productive activity in the settler economies and it played a leading role in land frontier expansion. Therefore we study the evolution of income distribution in this sector and gain some interesting insights. We present the notion of functional income distribution and elaborate a database with figures by decade between the 1870s to the 1910s for all the settler economies. This contains estimates of total wages, land rentals and profits. With this information, we discuss the two distributive patterns. In the Anglo-Saxon countries capitalist relationships predominated and in the Spanish-speaking countries economic relationships were based on agrarian rental incomes. The former group suffered a less severe worsening of income distribution than the latter group, and this pattern coincided with different dynamics of frontier expansion (settlement patterns in Australasia and Canada where high quality land did not predominate or it evolved together with the contributions of the other qualities). In accordance with our measure of land frontier expansion in terms of aptitude –which we use as an indicator of the productive application of natural capital– and supported by our theoretical framework, we argue that the different endowments of natural resources and their effective productive application go some way towards explaining these differences.

Lastly, the formation of specific institutional arrangements, especially property rights, and land frontier expansion were concurrent processes, so their influence on economic performance should not be studied separately. In Chapter 5 we examine how they both evolved and the effects they had. We discuss the effect of natural capital on economic development through the interaction between the type of natural resources a country possesses and the quality of its institutions. We consider types of natural resources in terms of land aptitude ("high", "medium" and "low" aptitude to be used as grassland). We approach institutional quality in two ways. First, we use a macro approach to analyze governance, contract enforcement and property rights, and second, we use an agents' behaviour approach to study the formation and configuration of the land ownership system. We guide our argument with the appropriability hypothesis and we study the question in two separate directions. One of these is based on estimating the statistical relation between economic development (growth, production and income distribution in the agrarian sector), natural resources and institutions, where we apply the concepts of constraints on the executive and contract-intensive

money as indicators of institutional quality. The other is a historical description of the distribution of land ownership rights and the institutional arrangements governing land ownership in four countries: Argentina and Uruguay (as representatives of the Spanish ex-colonies) and Australia and New Zealand (as British ex-colonies).

In accordance with the first approach, we do not reject the curse of natural resources on agricultural production, but if we admit that the curse can also include severe inequality we can reject it. For this reason, open frontiers –huge natural resources that may be incorporated into production– would be related to low levels of agrarian production and egalitarian societies. Institutional quality –acting alone or in combination with natural resources– was able to reverse the possible negative effect of natural resources because it strengthened the blessing or moderated the curse. In addition, we find evidence in favour of the appropriability hypothesis in its technical dimension, as regards inequality, but we reject it as regards agricultural production. The expansion of the frontier onto relatively higher aptitude land (with a greater degree of appropriability) made for a more moderate curse on the production of the economy, but it was a "blessing less blessed" in distributive terms. In other words, to advance relatively more by high quality land (when they showed higher contributions to the land expansion) is "good" for growing but bad for equality. What were the consequences of these conditions in the long-run? As an abundance of natural resources (land wealth) decreases (in relative terms) with the occupation of territory, economies that incorporated "new" lands into production "escaped from the curse" of natural resources, enjoyed sustained expansion and reached income levels similar to those in the core of the world economy. However, in this process our economies left the blessing (in terms of income distribution) of an extensive open territory behind and evolved along a persistently non-egalitarian trajectory.

In accordance with the second approach, we confirm that the land tenure question was extremely important in the political economy of the newly settled regions, and the emphasis of our discussion was on identifying ownership as a function rather than a right. The institutional arrangements than governed the distribution of land ownership and the behaviour of the landowners involved (effective and potential) were similar in Australasia and the River Plate. The regulations were written with the same kinds of concerns and interests in mind, and the United States system was seen by both as an attractive model for constituting rules and norms. Agents acted in accordance with their own interests, they created mechanisms to obtain land for the lowest price possible and took advantage of other proprietors when circumstances permitted. What were the differences between the two regions or systems?

The most far-reaching differences between the two systems were that the governments in the River Plate were too weak to effectively enforce the regulations, and there were elites whose power

was based on land ownership that influenced state policy, a feature that probably had its roots in the field of colonial heritage. Governments in Australasia created a more positive context for colonization and land settlement because they had more power to enforce the regulations. Furthermore, they were guided by ideas close to development notions and they enjoyed a more stable economic and political environment, where a higher social homogeneity helped to put the land question in the centre of the debate. The differences were not as significant in land distribution as they were in terms of income distribution and, in consequence, in the functioning of factor markets, and this might help to explain the income divergence between the two regions. The adverse conditions of appropriability were clearly more intense in River Plate economies.

We now return to our appropriability hypothesis and express it in terms of our main questions. The "environmental factors" in this concept may be identified with the landholding systems that emerged in the settler economies. This framework controls the "innovator's ability" to obtain "returns generated by an innovation", which is to say that framework governs the landholder's capacity to obtain rents derived from the incorporation of "new" land. Under similar economic growth conditions and external forces, the Hispanic model led to an income inequality pattern with high concentration and rentist societies. The British model, on the other hand, generated a more egalitarian pattern with a greater share of wages (and profits) and broader markets (associated with a larger middle class). This functioned more efficiently and encouraged economic development. These two different ways to interact with abundant natural resources can be explained by differences in land ownership, in the government's ability to influence development, in colonial heritage and in social homogeneity. This is why the "blessing was dammed" in some economies but in others was a factor that promoted development.

What are the main contributions of our Thesis?

(i) We extend an analytic model in the tradition of the "staple thesis" to incorporate land quality into the conceptual and empirical analysis. We propose calibration and contrafactual exercises from the numerical analysis of the model to make our understanding of the economic changes that took place in the period more precise.

(ii) We apply the natural resources curse hypothesis in a historical perspective and, in accordance with the appropriability hypothesis, we relate land frontier expansion to the formation of institutional arrangements (land ownership rights) in terms of a gradient of appropriability of rents associated with different land qualities.

(iii) We discuss the concept and measurement of the land frontier expansion process and the use of tools that are innovative in economic history, such as the Georeferenced Information Systems (GIS).

(iv) We make new estimates of functional income distribution in agriculture for the six countries in the settler "club", covering the period from the 1870s to WWI.

(v) We use panel data econometric exercises to test our main hypotheses, and this yields interesting insights of indicative character.

(vi) We give a historical account of the development of land ownership rights in four economies in the "club" (Argentina, Australia, New Zealand and Uruguay) from the beginning of the 19th century to WWI. We pay attention to the formation of the different land ownership systems and the behaviour of the agents involved, with special emphasis on the role of the state and of social groups.

We consider our Thesis as part of a research programme that opens up new areas for further research, which will improve our knowledge of the development process we are studying. Specifically, our future aim is to advance in two directions that together can enrich some of our conclusions. First, our analysis requires the exploration of questions connected to technological progress. Land frontier expansion is closely related to the technical conditions that make it possible to access new territories and our issue results an interesting guidance to advance in that direction. In particular, we will study: (i) the relationships between the dynamics of the land frontier expansion and the extension of the railways along the territory, especially to precise our concept of "frontier"; (ii) those technological progresses directly induced by the land quality. Second, from our historical analysis of land ownership systems in agrarian activity, it emerges that many components respond to the endogenous formation of institutional arrangements. In particular, we will study: (i) how some characteristics of the land ownership structure (as the size of the estates) depended on the land quality; (ii) how some features of the agrarian entrepreneur organization depended on the natural endowments and its effective exploitation. We will propose to pursue these questions in next stages of our research.

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Chapter 2. Land abundance, frontier expansion and income distribution in settler economies during the First Globalization (1870-1913): analytical framework

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