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ABSTRACT

One of the most salient explanations for the distinctive path of economic and political development of the United States is captured by the 'Frontier (or Turner) thesis'. Turner argued that it was the presence of the open frontier which explained why the United States became democratic and, at least implicitly, prosperous. In this paper we provide a simple test of this idea. We begin with the contradictory observation that almost every Latin American country had a frontier in the 19th century as well. We show that while the data does not support the Frontier thesis, it is consistent with a more complex 'conditional Frontier thesis.' In this view, the effect of the frontier is conditional on the way that the frontier was allocated and this in turn depends on political institutions at the time of frontier expansion. We show that for countries with the worst political institutions, there is a negative correlation between the historical extent of the frontier and contemporary income per-capita. For countries with better political institutions this correlation is positive. Though the effect of the frontier on democracy is positive irrespective of initial political institutions, it is larger the better were these institutions. In essence, Turner saw the frontier as having positive effects on development because he already lived in a country with good institutions.

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1 Introduction

One of the great economic puzzles of the modern world is why, amongst a group of colonies founded at more or less the same time in the early modern period, by more or less rapacious Europeans, with more or less the same intentions, North America became such an economic and democratic success, while Latin America did not. There is no shortage of candidates, of course, but one of the most prominent is the notion of the 'Frontier'.[1] Many scholars have claimed that a crucial aspect of the uniqueness of the United States was the vastness of the open spaces (at least after the indigenous peoples had died, Mann, 2005) which heavily influenced the way society, economy and polity evolved.

The most famous exposition of this view, first developed in 1893, was due to Frederick Jackson Turner. Turner, postulating what has become known as the 'Frontier (or Turner) thesis' argued that the availability of the frontier had led to a particular type of person and had crucially determined the path of US society.

> "The existence of an area of free land, its continuous recession, and the advance of American settlement westward, explain American Development.
>
> Behind institutions, behind constitutional forms and modifications, lie the vital forces that call these organs into life and shape them to meet changing conditions." Turner (1920, pp. 1-2)

Turner emphasized that the frontier created strong individualism and social mobility and his most forthright claim is that it was critical to the development of democracy. He noted

> "the most important effect of the frontier has been to promote democracy" Turner (1920, p. 30)

and

> "These free lands promoted individualism, economic equality, freedom to rise, democracy ... American democracy is fundamentally the outcome of the experiences of the American people in dealing with the West." Turner (1920, pp. 259, 266)

[1] For other ideas on this topic of the exceptionalism of the United States see Hartz (1955, 1964), Lipset (1996), Engerman and Sokoloff (1997).

Moreover, the things that went along with democracy and helped to promote it, such as social mobility, most likely also stimulated economic performance.

Since Turner wrote, the 'Frontier Thesis' has become part of the conventional wisdom amongst historians and scholars of the United States.[2] Though the specific mechanisms that Turner favored, such as individualism, have become less prominent, arguments about the frontier have appeared in many places, particularly the literature on the democratization of the United States (Keyssar, 2000, Engerman and Sokoloff, 2005). Keyssar (2000, p. xxi) argues

> "The expansion of suffrage in the United States was generated by a number of key forces and factors ... These include the dynamics of frontier settlement (as Frederick Jackson Turner pointed out a century ago)."

Those who have contested this view (Walsh, 2005, for an excellent discussion) have tended to focus on the extent to which the Frontier did or did not have the postulated effects within the United States.

At some level the acceptance of the Frontier thesis and the nature of the debate is quite surprising. This is because the existence of a frontier clearly *did not* distinguish the United States from the other colonies of the Americas or indeed other societies such as Russia, South Africa or Australia in the 19th century. Every independent South American and Caribbean country, with the exception of Haiti, had a frontier in the 19th century. As in the United States, these frontiers were usually inhabited by indigenous peoples and they went through the same pattern of expansion into this zone which, as in the United States, coincided with the expropriation and oftentimes annihilation of indigenous communities. In these cases, however, there seems to be much less reason to associate frontier expansion with democracy or economic development. Indeed, one could conjecture that if the Frontier thesis had been developed by Latin American academics in the late 19th century it would have been formulated with a minus sign in front![3]

A small literature has examined the frontier hypothesis in comparative perspective, but it has come to inconclusive results. Turner did engage in some comparative observations but refers only to Europe, noting

> "The American frontier is sharply distinguished from the European frontier - a fortified boundary line running through dense populations." (Turner, 1920, p. 3)

[2] For some of the debate about the applicability of this thesis to the United States see Taylor (1956), Billington (1962, 1966, 2001), Hofstadter and Lipset ed. (1968) and Walsh (2005).

[3] Though the issue of the role of the frontier has been considered in Latin America studies, see Hennessy (1978) and Weber and Rausch (1994), it appears that nobody has made these comparative observations before.

Hennessy (1978) specifically addresses the applicability of the Frontier thesis to Latin America (see also the papers in Weber and Rausch, 1994).[4] Noting the absence of a literature on the Frontier thesis in Latin America Hennessy (1978, p. 13) reasons

> "If the importance of the Turner thesis lies in its ... ability to provide a legitimating and fructifying nationalist ideology, then the absence of a Latin American frontier myth is easy to explain. Without democracy, there was no compulsion to elaborate a supportive ideology based on frontier experiences."

Hennessy's general conclusion is that the thesis is irrelevant because

> "Latin American frontiers have not provided fertile ground for democracy. The concentration of wealth and the absence of capital and of highly motivated pioneers effectively blocked the growth of independent smallholders and a rural middle class" (Hennessy, 1978, p. 129)

The correlation between good outcomes and the frontier in the United States and Canada but the lack of such a correlation in Latin America raises the question of whether or not in general there is any connection between the frontier and economic and political development. Maybe the frontier was irrelevant? A myth?

We believe the answer to this is no. Some of the mechanisms described in the case of the United States certainly seem plausible, it is just that they don't seem to have operated in Latin America. The key to understanding why comes from examining how frontier land was allocated.[5] In the United States it was the 1862 Homestead Act which played a major role in governing who and on what terms had access to the frontier. In Latin America, on the other hand, only Costa Rica and Colombia passed and enforced legislation which resembled measures such as these. In a few other countries where some legislation was passed, it seems to have never been put into practice. Jefferson (1926, p. 167), for example, points out the difference between the "elevated aims and philanthropic language" of the Argentine legislation regarding landowning in frontier areas and "the actuality of events". More generally, frontier land was allocated in a relatively inegalitarian pattern by existing elites, and property rights over frontier lands of settlers were in many cases weak for non-elites. Though Turner continually talks about

[4] Other work looking, usually critically, at the Frontier thesis is comparative perspective include Winks (1971), Miller (1977), and Powell (1981). For more general discussions of frontier expansions in the modern world not focused on the Turner thesis see Richards (2003) and Belich (2009).

[5] Differences in labor institutions developed in frontier areas may also have played an important role, and were no doubt related to how land was allocated.

the frontier and 'free land' as if they were the same thing, as Adelman (1994, p. 101) points out

> "Turner ... overlooked two hard facts: land was not free, and workers had to be brought in from outside the region."

Outside of Costa Rica and Colombia, frontier land was not free in Latin America and indeed was allocated oligarchically by those with political power.[6] Hennessy (1978, p. 19) observed

> "Another contrast lies in the availability of 'free land'. Whereas free land was the magnet attracting pioneers into the North American wilderness, in Latin America most available land had been preempted by landowning patterns set in the sixteenth century."

The historical experience of Argentina is again revealing. Jefferson (1926 pp. 175-178) describes several episodes in the Paraná basin, the Nequén region to the South or even in La Pampa, where settlers found difficulties in maintaining their property rights over the lands they opened, both because state officials reneged on past promises or because of abuses from local elites. Interestingly, when Turner does discuss the issue of land laws with respect to the frontier, he seems to see these as an endogenous response to the existence of the frontier, for example arguing that

> "The disposition of the public lands was a third important subject of national legislation influenced by the frontier" Turner (1920, p. 25)

and

> "It is safe to say that the legislation with regard to land ... was conditioned on frontier ideas and needs." Turner (1920, p. 27)

The Latin American experience suggests to us not that the frontier is irrelevant, but rather that a more nuanced version of the Frontier thesis is required. We refer to this as the 'conditional Frontier thesis'. This takes into account the fact that the consequences of the frontier

[6] There is a large historical literature on the oligarchic allocation of frontier lands in 19th century Latin America. For overviews of the Central American experience see Williams (1994), Gudmundson (1997) and Mahoney (2001); McCreery (1976, 1994) for the important Guatemalan experience; Parsons (1949) is the classic work on frontier expansion in Colombia, see also Christie (1978) and LeGrand (1986); Dean (1971) and Butland (1966) analyze the Brazilian case; Solberg (1969) presents the evidence for Chile; Coatsworth (1974, 1981) for Mexico. Solberg (1987) and Adelman (1994) discuss Argentina and both books make interesting comparisons to the differential evolution of Canada.

are conditional on the initial political equilibrium when frontier expansion occurred. Although the opening up of a frontier might bring new opportunities for the establishment of equitable societies in ways that could promote democracy and economic growth, as Turner suggested, in relatively oligarchic countries the existence of an open frontier gave the ruling elite a new valuable instrument which they could manipulate to remain in power. They did this through the structure of land and laws, policies towards immigrants and clientelistic access to frontier lands. When initial political institutions were different, as they were in the United States, Canada, Costa Rica and Colombia, elites were less able to manipulate this resource and a more open society evolved. As Turner argued, it is quite likely in these circumstances that the existence of a frontier helped to induce further improvements in political institutions. In countries like Argentina or Mexico, it is possible that an oligarchically allocated frontier was worse than having no frontier at all.

In this paper we propose what we believe is the first empirical test of the Frontier thesis and also our extended 'conditional Frontier thesis'. To do this we construct an estimate of the proportion of land which was frontier in each independent country in the Americas in 1850. We combine this with data on current income per-capita, democracy and inequality. Our first main finding is that our estimates of the relative size of the frontier are positively correlated with long-run economic growth and the extent to which countries were democratic over the 20th century. The relative size of the frontier is also negatively correlated with income inequality. These initial results are quite consistent with the simple Frontier thesis.

Nevertheless, we then test the 'conditional Frontier thesis' by interacting the proportion of frontier land in 1850 with measures of initial institutions, specifically constraints on the executive from the Polity dataset which is available for every independent country in the Americas in 1850.[7] When GDP per-capita in 2007 is the dependent variable we find that neither frontier land in 1850 nor constraints on the executive are themselves statistically significant, but their interaction is. Indeed, the results imply that for countries with the lowest level of constraints on the executive (which is almost half our sample in 1850) long-run economic growth is *lower* the larger is the frontier. For higher levels of constraints, however, long-run growth is higher. These simple regressions are very consistent with the conditional Frontier thesis. With respect to democracy, when we look at the average Polity Score from 1900-2007 we again find that once we add the interaction term, neither frontier nor constraints themselves are significant. In this case we do not find that the frontier is ever bad for democracy, but rather its' impact on democracy is greater the greater are constraints on the executive in 1850.

[7] Except for Canada, for which data is available starting in 1867.

These results suggest, again consistent with the 'conditional Frontier thesis,' that the frontier on its own had no impact on democracy. When we turn to the democracy score averaged over the post World War II period (1950-2007) we find different results. Here frontier on its own tends to be positively correlated with democracy while the interaction term is not statistically significant. Finally, when we examine contemporary inequality as the dependent variable we do not find robust results. Though frontier and constraints on the executive in 1850 are both negatively correlated with inequality, when we add the interaction term none of the variables is statistically significant.

Taken seriously, our results provide quite strong support to the conditional Frontier thesis and suggest that the reason that Turner himself and so many subsequent scholars based in the United States may have accepted the simple Frontier thesis, is that they were living in a country which had relatively good institutions. Nevertheless, the size of our sample is small and we are limited to using cross-national variation, so our findings ought to be regarded as tentative.

Our argument about the conditional effect of the frontier is related to several important historical debates. For example, one interpretation of the arguments of Brenner (1976) is that large shocks in the middle ages, such as trade expansion or the Black Death had conditional effects which depended on initial institutions. In Britain where the serfs were relatively organized and where Lords did not have large estates, the Black Death empowered the lower orders and led to the collapse of feudal institutions. In eastern Europe, however, where the initial conditions were different, the Black Death ultimately led to the 'Second Serfdom'. A related argument is presented in Acemoglu, Johnson and Robinson (2005) who argue that the impact on Western Europe of trade and colonial expansion after 1492 depended on initial political institutions. In places where there were relatively strong political institutions, such as Britain and the Netherlands, trade expansion led to improvements of institutions and stimulated economic growth and further political change. In places which were more absolutist, such as Spain and France, trade expansion had opposite effects.[8]

The paper proceeds as follows. In the next section we discuss how we measure the extent of the frontier and present some basic data about its extent and nature. In section 3 we examine the correlation between the frontier and long run economic and political outcomes. Second 4 investigates whether or not there is a conditional effect of the frontier and section 5 concludes.

[8] This type of interaction also comes up in the literature of the impact of the resource curse, see Moene, Mehlum and Torvik (2006).

2 Measuring the Frontier

The literature on the frontier has been quite vague on how exactly to determine what was or what was not frontier. Turner himself noted (1920, p. 3)

> "In the census reports it is treated as the margin of that settlement which has a density of two or more to the square mile. The term is an elastic one, and for our purposes does not need a sharp definition. We shall consider the whole frontier belt, including the Indian country and the other outer margin of the "settled area" of the census reports."

It was the definition of the frontier as areas with a population density of less than two people per square mile that led the census bureau to declare in 1890 that the US frontier had closed.

Any attempt to measure the extent of the frontier across the Americas must confront several methodological issues. In the first place, frontiers in each country, and even within each country, looked very different around the mid-nineteenth century. Coming up with a measure of the frontier for each country therefore requires a compromise to select some basic simplifying but consistent criteria which will necessarily overlook many possibly important dimensions. Following the historical literature the natural candidates for such a classification are the presence or absence of native American communities not subject to state control and authority, overall population density (including any non-native American settlers), and the presence or absence of state institutions. All of these conditions were important determinants of the potential availability of free land and of the possibilities for successful settlement. Obviously problematic is that we would like to think of the frontier as a dichotomous condition, whereas its defining variables are in most cases inherently continuous, and its boundaries usually not clear-cut.

When dealing with the frontier experience of South America another issue arises; settlement of frontier lands was not an absorbing state in some regions. Several areas in Paraguay, for example, were significantly settled and run by Jesuit missionaries during the colonial period. After the expulsion of Jesuits from the Spanish Empire in 1767, the Crown reassigned the control of these regions to other religious communities who failed to maintain the economic viability of the missions and the political control of the indigenous communities inhabiting the areas. As a result, in a matter of decades the missionary regions degenerated to a virtual absence of state control and became frontiers once again. They remained as such until late in

the 19th century (Eidt, 1971, Bandeira, 2006). The case of Brazilian *bandeirantes* in the 17th and 18th centuries is similar. Brazil expanded its boundaries as these settlers moved west into the Amazon and its south-western basin. Nonetheless, many of these areas were subsequently unsettled and remained like that until late in the republican period. As a result, Brazilian historiography refers to them as "hollow" frontiers (Katzman, 1977). For our purposes we tried to include in our measure these regions, which around 1850 were in fact not controlled by republican states even if they had been so earlier in colonial times.

Once such decisions have been made, the second issue is related to the availability of information about location of frontier and non-frontier lands. Not only is detailed information scarce by the very nature of the subject, but the comparability of the data across countries might also be problematic. We collected three types of information, based on which we constructed three alternative measures of the frontier; (a) historical cartographic data depicting directly information on frontier territories or on population density for several of the countries in our sample of independent republics, at different dates starting in the mid 19th century, b) geographic (and georeferenced) information on current-day administrative divisions (provinces, departments or states), and c) direct country or regional historical accounts on the settlement of frontier areas during the 19th century. The appendix contains a detailed description of the sources used for each country. The reason that making use of current administrative divisions is helpful is that in fact the formation of administrative units in many regions across the Americas was precisely driven by significant settlement and State presence. The best examples of this might be the straight lines marking the boundaries of the western states of the United States, put in place as a first effort to regulate and control the newly occupied territories as the westward expansion moved on, or the Amazon rainforest frontier provinces of countries like Colombia, Brazil or Peru, which were designed precisely to delimit such frontier areas.

2.1 The Frontier in the United States and Canada

For these two countries we were able to find detailed cartographic information which allowed us to calculate the share of unsettled and settled land in 1850. More specifically, for the United States the United States Census Office (1898) and Gerlach (1970) contain detailed maps of population density. Both sources use the 19th century United States Census data, and following the Census Bureau, classify as frontier land the territory with less than 2 people per square mile (0.7725 people per square kilometer). For Canada, the Dominion Bureau of Statistics (n.d.) contains maps for several years in the second half of the 19th century, depicting population density by points on the map. We directly georeferenced these maps using GIS software, and

computed the share of total land area of each country with population density below 0.7725 people per square kilometer, in 1850 for the United States and in 1851 for Canada. Since these maps were based on detailed census data, we believe these frontier measures have the smallest possible measurement error, and are the only ones we consider for these two countries.

For the rest of countries in the Americas the information is not as detailed and is more scattered throughout different sources. As a result, we decided to create a set of alternative measures of the frontier, taking into account the differences we found when comparing the available information.

2.2 The Frontier in Central America

To measure the Frontier in Central America we relied heavily in Hall and Perez-Brignoli (2003), which contains rich historical maps for Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama, of settlement during the 19th century, and also has a thorough historical discussion of the frontier expansion throughout the region. We merged the information of these maps, which depict the frontier regions in each country, with a georeferenced sub-national level map of Central America, and coded each province/department/state as frontier or non-frontier depending on whether or not it fell into the regions considered as unsettled in the Hall and Perez-Brignoli (2003) maps. Of course, with this procedure a considerable number of sub-national units appeared as partially frontier areas. We thus created two different measures of the frontier, which we call narrow and wide. The narrow measure classifies as non-frontier the sub-national units for which an ambiguous coverage of the Hall and Perez-Brignoli (2003) maps had been obtained, while the wide measure classifies them a frontier. We further refined the classification of provinces using United States Bureau of the Census (1956a), which contains very detailed population density maps for all the Central American republics in 1950 at the province/department level. The comparison with these maps allowed us to reclassify provinces that might have been ambiguous, but which by 1950 clearly had a population density below 0.7725 people per square kilometer, and necessarily must have been frontier areas 100 years before. The Appendix presents the coding of each sub-national unit in its narrow and wide versions.

For the Mexican frontier we relied on the Bureau of Business Research (1975) population density map for 1900, a state-level map based on the 1900 Censo General de Población, together with Bernstein (1964) and Hennessy (1978). Since population density in 1900 was considerably higher than in 1850 everywhere in Mexico, we coded as frontier states not only those with less than 0.7725 people per square kilometer in 1900, but also any State with at most a population

density of 5 people per square kilometer in 1900, which were at the same time mentioned in the complementary references as frontier areas. This resulted in a relatively straightforward classification except for the state of Chiapas, which we coded as non-frontier in the narrow measure and as frontier in the wide measure.

2.3 The Frontier in the Caribbean Republics

Only Haiti and the Dominican Republic were independent by 1850, and as such are the only two Caribbean countries in our sample. Coding the frontier for them was a pretty straightforward job based on Anglade (1982) and Lora (2002). Anglade presents population density maps for the late 18th century, and mid 19th century, where it is clear that since the colonial period Haiti had population densities well above 0.7725 people per square kilometer, and almost everywhere significantly higher. Haiti therefore did not have a frontier. For the Dominican Republic the picture is very similar, except possibly for the provinces of Barahona and Pedernales in the south-western tip of the country. The United States Bureau of the Census (1956b) also contains detailed province-level maps of these two countries in 1950, which show a low population density in the southwest of the Dominican Republic. As a result, the narrow measure considers Barahona and Pedernales as non-frontier, while the wide measure codes them as frontier. All the rest of the country is coded as non-frontier.

2.4 The Frontier in South America

To measure the frontier in the South American countries we followed a procedure very similar to the one we used for the Central American republics, merging the information in usually country-specific historical maps and accounts with current-day sub-national units. The Appendix contains the historical references used for each country. When a sub-national unit was partially covered by settlement we again made the distinction by coding it as non-frontier in the narrow measure and as frontier in the wide version. This is the case, for example, of the north-eastern Brazilian province of Piaui or the Pacific coast province of Esmeraldas in Ecuador.

For South America we found an alternative source for the frontier. Butland (1966), which discusses in detail the frontier expansion in southern Brazil, presents a South American map depicting the frontier areas in mid 19th century. Unfortunately he does not explain how this map was drawn, but actually it coincides to a quite large extent with our own province-level codings. We used GIS software to georeference the frontier map in Butland (1966) and directly computed the share of each country which was frontier in the mid-19th century. As a result we have three different frontier measures for South America: narrow, wide and Butland.

Table 1 sums up the data from these calculations. For the United States and Canada we only have one number each, with 72.5% of the territory of the United States being frontier in 1850, while the corresponding number for Canada is 85.3%. Map 1 shows exactly where the frontier and non-frontier areas were. This is a pretty familiar picture with, for example, the United States being settled on the eastern seaboard and all the way west to the western boundaries of Arkansas and Missouri. Far to the west parts of coastal California and the central valley north of San Francisco were also settled. For the countries in South America we have three different estimates of the extent of the frontier. For example, Table 1 shows that for Colombia the narrow definition of the frontier suggests that 62.9% of the territory was frontier in 1850 and this exactly coincides with the wide definition. Butland's map gives a fairly similar estimate of 58.1%. For other countries, however, the differences between these estimates are much larger. For example, for Argentina the narrow definition is 49.3% while the wide one is 74.2%. The reason for this large difference is easy to see from Map 2. Here the settled areas intersect with many departments. For instance the narrow definition treats the departments of San Luis, Córdoba, Neuquén, Santiago del Estero and Salta as settled, while the wide definition treats them as frontier. For Argentina, Butland's estimate is close to our wide definition. Finally, Map 3 looks at Central America and the Caribbean.

These calculations clearly illustrate our conjecture from the introduction which is that simply in terms of the size of the frontier, the United States is not distinct. Uruguay had a frontier which was quite a bit larger relative to the size of the country and Brazil's frontier was also larger. Other countries such as Costa Rica, Nicaragua or Venezuela had frontier's which were only about 15% or so less.

3 Other Data

Apart from the data we constructed on the extent of the frontier in 1850, we use some other readily obtainable data. For our measure of historical political institutions we use constraints on the executive in 1850 from the Polity IV Project.[9] This variable is defined as the extent of institutional restrictions on 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 maybe the military in polities which are subject to the threat of military coups. The extent of constraints on the executive are

[9] http://www.systemicpeace.org/polity/polity4.htm

coded as being between 1, meaning "unlimited executive authority" and 7, implying "executive parity or subordination." A country would be in the first category if "constitutional restrictions on executive action are ignored" or "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 "the executive is chosen by the accountability group and is dependent on its continued support to remain in office."

Figure 1 shows the distribution of constraints on the executive in 1850 for the 21 countries in our dataset. One can see that 9 countries are assigned the minimum score of 1, while the United States and Canada have the maximum score of 7.[10] Interestingly for our hypothesis, Costa Rica and Colombia both have scores of 3 in 1850. The country with constraints of 5 in 1850 is Honduras.

We also use the Polity IV Project's measure of how democratic a country is, which they refer to as the Polity IV score, which is the difference between the Polity's Democracy and Autocracy indices.[11] The democracy index ranges from 0 to 10 and is derived from coding the competitiveness of political participation, the openness and competitiveness of executive recruitment and constraints on the chief executive. The Polity Autocracy Index also ranges from 0 to 10 and is constructed in a similar way to the democracy score based on scoring countries according to competitiveness of political participation, the regulation of participation, the openness and competitiveness of executive recruitment and constraints on the chief executive. This implies that the Polity IV score ranges from -10 to 10.

The other data we use is GDP per-capita in 2007 PPP adjusted from the World Bank's World Development Indicators CD Rom and from the same source we also take information of the Gini coefficient for income distribution which we average over the period 1996-2005.

Table 2 shows some basic descriptive statistics of the data. The rows correspond to our different dependent and key explanatory variables and we divide the sample according to the median extent of frontier land in 1850 according to our narrow definition. The first set of columns show the average data for countries with greater than median frontier land, while the last set of columns in the table show the data for less than median frontier land. The median country here is Mexico, 57% of whose land was frontier in 1850 according to our narrow definition. Note that for countries below the median the average amount of land which

[10] As previously noted, Polity data for Canada only starts in 1867, at which point it has a 7, which we used as the its 1850 number.

[11] This measure is a very standard one in empirical work on democracy, and other definitions typically give very similar results (see Acemoglu, Johnson, Robinson and Yared, 2008).

was frontier was 32% (with a standard deviation of 0.22), while for countries above the median the average proportion of frontier land was 70% (with standard deviation of 0.12).

The comparison of low and high frontier countries is quite revealing. For instance looking at the third row of Table 2 we see that GDP per-capita in 2007 on average was $11,466 for above median frontier societies, while it was only $3,744 for below median. The data shows that those countries which had a relatively large frontier in 1850 now have substantially higher income per-capita. In row 4 we show the average Polity IV score over the period 1900-2007. This is 2.43 for above median countries and -0.35 for below median. In the next row we instead look at the average Polity IV score for the period 1950-2007. Though there is a clear upward trend in the extent of democracy, the comparison looks quite similar with above median frontier countries which have an average polity score of 3.96 while below median countries have a score of 1.05. As with income per-capita, there seems to be a clear pattern with countries which had relatively large frontiers in 1850 being today more democratic than those which had relatively small frontiers in 1850.

Finally, the last row examines average inequality over the period 1996-2005. The average Gini coefficient for high frontier countries is 49.1 while for low frontier countries it is 53.4. Just as countries with relatively large frontiers are more prosperous and democratic, they also appear to be more equal.

These raw numbers are quite consistent with the basic Frontier thesis. It is interesting to examine them in figures. Figure 2 plots the share of frontier (narrow definition) against GDP per-capita in 2007. There is a pronounced positively sloped relationship which remains even if the United States and Canada are dropped. Figure 3 examines the raw relationship between the share of frontier land against the Polity score over the period 1900-2007. The picture is rather similar with a distinct positive correlation and with North America and Costa Rica far off the regression line. Figure 4 shows the same picture but now with the Polity IV score averaged over the post World War II period, 1950-2007. This is very similar to Figure 4. Finally, Figure 5 examines inequality and the extent of the frontier. This Figure suggests that there is a negative correlation between the extent of the frontier and contemporary inequality.

All of the above give support to the Turner Thesis. We now turn to regression analysis to investigate how robust they are and whether these numbers may also be consistent with our conditional Frontier thesis. As we shall see, the image which emerges from the descriptive statistics and simple scatterplots is not general.

4 Empirical Results

We now examine some simple regression models to examine the long-run consequences for economic and political development of having a frontier. In all cases we estimate Ordinary Least Squares regressions of the form

$$y_i = \alpha + \beta F_{i,1850} + \gamma C_{i,1850} + \delta \left(F_{i,1850} \times C_{i,1850} \right) + \varepsilon_i \tag{1}$$

where y_i is the dependent variable of interest for country i. This is respectively GDP per-capita in 2007, the democracy score of Polity averaged over different periods, or the Gini coefficient of inequality averaged over some period. $F_{i,1850}$ is the proportion of the country which was frontier land around 1850, $C_{i,1850}$ is constraints on the executive from Polity in 1850, and ε_i is a disturbance term which we assume to have the usual properties. Here, following the discussion above, we also allow for the interaction between constraints on the executive and frontier land in 1850.

4.1 Income per-Capita

We first look at regressions where y_i is GDP per-capita for country i in 2007. These are recorded in Table 3. The table is split into three sets of columns where each set uses a different definition of the frontier. The first three columns use our narrow definition of the frontier, the second three our wide definition and the final three columns use the Butland definition[12].

The first column shows the most parsimonious OLS regression of GDP per-capita on the proportion of land that was frontier in 1850. The coefficient $\beta = 18324.1$ (with a standard error of 9953.3) is statistically significant. To see what this coefficient implies, consider Mexico, which is the median frontier country, with 57% of its territory comprised of frontier. This coefficient implies a GDP per-capita for Mexico of -1738 +18324×0.57 = \$8706, which is pretty close to the actual value for Mexico which is \$8340. The coefficient on the frontier share implies that if one changed the frontier from the median level to the level of the United States, which is 0.72, GDP per-capita would increase by (0.72-0.57)×18324=\$2748, which is a 31% (=2748/8706) increase of the predicted income for the median country. Alternatively, if Mexico's frontier increased by 10%, from 57% to 62.7%, income would increase by (0.627-0.57)×18324=\$1,044.5.

It is important to note, however, that one should be very cautious about proposing any type of causal interpretation of the data. For example, we have treated the extent of the frontier in 1850 as econometrically exogenous, while in fact it may be the endogenous outcome of other

[12] Since the Butland data are only available for the South American countries, the Butland frontier definition uses the narrow frontier measure for the rest of the sample.

factors that influence economic or political development. Perhaps countries that had good fundamentals had expanded more, for instance by attracting greater numbers of migrants, and thus tended to have relatively small frontiers in 1850. Of course if this form of omitted variable bias were important, it actually suggests that we might be underestimating the effect of the frontier because it suggests that relatively small frontiers ought to be associated with factors that also lead to good long-run development. We are also treating constraints on the executive as exogenous, which is again unlikely to be the case.

In column 2 we add constraints on the executive in 1850. This greatly increases the extent of variation explained by the model and both constraints and frontier are significant, though the estimated coefficient on frontier falls. The coefficient on constraints, $\gamma = 4405.86$ (s.e.=1346.5) is statistically significant.

Column 3 then adds the interaction term. This term is highly significant, $\delta = 11843.7$ (s.e.=3015.5) and the estimated coefficient on frontier now changes sign so that $\beta = -13489.29$ (s.e.=7835.69). One can see here that when constraints on the executive are equal to 1 (which is the case in 9 out of our 21 countries in 1850) the total effect of frontier is $\beta + \delta \times 1 = -13489.29 + 11843.7 = -1,645.59 < 0$. In other words for countries with the lowest value of constraints on the executive, representing "unlimited executive authority" the greater is the relative size of the frontier in 1850, the poorer is the country today. However, as long as constraints are 2 or above, frontier land is positively correlated with long-run growth.

It is also interesting to examine the quantitative impact of these results. For example, if we held the extent of frontier fixed and increased the level of constraints on the executive in a country from 1 to 7, then this would imply a change in income of

$$\begin{aligned} & (-13849 \times F_{1850}) + (11843 \times F_{1850} \times 6) - (3657 \times 6) \\ = \quad & (-13849 \times F_{1850}) + (71058 \times F_{1850}) - 21942 = (57209 \times F_{1850}) - 21942 \end{aligned}$$

Hence, a country with median frontier would increase its current income by 0.57×57209-21942=$10667 which would eliminate about one third of the income gap between Mexico and the United States.

Columns 4-6 then re-estimate the same 3 models using our wide definition of the frontier. The results are very similar to those in the first three columns with the narrow definition except that now neither frontier nor constraints on the executive are significant when they are entered with the interaction. The final three columns use the Butland definition of the frontier with similar results.

In all specifications when we enter the interaction term it is robustly estimated and very

significant and in all cases suggests that when constraints are at their minimum, the presence of the frontier was bad for economic development, while at higher levels of constraints, the frontier was good for long-run economic growth. The results in this section are not consistent with the Frontier thesis but they are consisted with the conditional Frontier thesis.

4.2 Democracy

We now turn to regressions where y_i is the Polity score for country i averaged over different periods. We look at two such periods, one is 1900-2007 and the other is 1950-2007. These regressions are in Tables 4 and 5 respectively. As with Table 3, each table is split into three sets of columns where each set uses a different definition of the frontier.

Table 4 column 1 shows the simplest regression of the Polity score 1900-2007 on frontier in 1850. There is a significant positive correlation with $\beta = 8.189$ (s.e.=2.458). The second column adds constraints on the executive in 1850. Constraints are also significantly positively correlated with democracy in the 20th century with an estimated coefficient of 1.474 (s.e.=0.195).

The third column then adds our interaction term. The interaction term is marginally significant with a t-statistic of 1.78 and has a positive coefficient of $\delta = 1.263$. However, unlike in the regressions where income per-capita was the dependent variable, the frontier share on its own remains positive and significant, even if the magnitude of the coefficient falls by 50%.

The rest of Table 4 shows that these results are not completely robust. The interaction terms remains positive and basically significant, but when we use the wide definition of the frontier, frontier entered on its own is not statistically significant in column 6, or using the Butland definition in column 9. Nevertheless, there is no evidence here of any negative effect of the frontier, unlike in the income regressions. The results in Table 4 suggest that even for the lowest level of constraints on the executive, the greater was the frontier in 1850, the more democratic the country was in the 20th century. Nevertheless, the quantitative effect is larger, the greater are constraints in 1850.

In Table 5 we re-estimate the same models as in Table 4 except that now we average the dependent variable only over the post World War II period. As is quickly seen this gives some quite different results. When we just control for frontier and constraints on the executive, the results in terms of the size and significance of the coefficients are very similar to those in Table 4. However, once we control for the interaction we find that the interaction term is never close to significant while the estimated coefficient on frontier on its own remains more or less the same quantitatively and mostly significant (only marginally so in column 6). This table shows

that the conditional effect on democracy is actually a phenomenon of the first half of the 20th century. In the second half the simpler version of the Frontier thesis captures the patterns in the data quite nicely.

4.3 Inequality

Finally, we let y_i in (1) be the average Gini coefficient for country i over the period 1990-2007. The results of estimating this model are reported in Table 6. A quite robust pattern emerges in all three sets of columns, irrespective of how we measure the extent of the frontier. When entered on its own, frontier is negatively and significantly correlated with contemporary income inequality, as are constraints on the executive. These results suggest that either having a bigger frontier in 1850 or better political institutions is associated with lower inequality today. However, as columns 3, 6 and 9 indicate, once the interaction term is included none of the coefficients are statistically significant.

5 Conclusions

In this paper we have developed what to our knowledge is the first test of the 'Frontier (or Turner) thesis.' Turner argued that it was the existence of the frontier that generated the particular path of development that the United States followed in the 19th century. Though his work on the United States has been criticized, it still appears to heavily influence the ways scholars think about these issues. The starting point of our assessment of this thesis is the observation that every country in the Americas, with the possible exception of El Salvador and Haiti, had a frontier in the 19th century. The United States was certainly not exceptional in either this or the relative extent of the frontier. In consequence, seen in comparative context, the existence of a frontier does not seem to be obviously correlated with long run economic and political development.

We hypothesized, however, that there may be a conditional relationship between the extent of the frontier and political institutions at the time of the allocation of frontier land. Historical evidence suggests that even if most countries in the Americas had an open frontier, how that frontier land was allocated differed a lot. For example, while the United States, Costa Rica and Colombia passed Homestead Acts or something approximating them, in places like Argentina, Chile or Guatemala, political elites allocated frontier lands to themselves or associates in a very oligarchic manner. This indicates that the impact of the frontier might be conditional on the existing political institutions which influenced how the land was allocated - a notion we dubbed

the 'conditional Frontier thesis'. Our hypothesis suggests 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.

To investigate more systematically the relationship between the frontier and long-run development we constructed measures of the extent of frontier land for 21 independent countries in the Americas in 1850. Using some simple regressions we showed that the data does indeed support our conditional hypothesis. With respect to both income per-capita today and democracy over the 20th century, it is the interaction between the extent of the frontier in 1850 and constraints on the executive in 1850 that plays the primary explanatory role. For example, for a country with the lowest level of constraints on the executive, the larger is the relative size of the frontier, the lower is GDP per-capita today. For countries with higher constraints, however, a larger frontier is positively correlated with current GDP per-capita. With respect to democracy we found that for a given level of constraints in 1850, greater size of the frontier is correlated with greater democracy in the 20th century, though this effect comes primarily from the first half of the century.

There 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. Still, the United States also had large areas of the Rocky Mountains which were not high quality lands. Trying to control or adjust for this explicitly is an important area for future research. Moreover, while 1850 seemed to us to be an interesting year to focus on because it marked the beginning of the period of the rapid expansion of world trade which created such huge frontier movements in the Americas, one could argue it is too late. An important area for future research is a more intensive sensitivity analysis than is presented here.

Nevertheless, results suggest that the role of the frontier is much more complex than the original Turner thesis suggests. 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. If El Salvador and Haiti had had frontiers in the 19th century, this would have made them poorer today, not richer. Though we found no such negative effect for democracy, we did find that the impact of the frontier on the democratization of a society was conditional on initial political institutions. If Turner thought that the United States frontier had a strong democratizing effect, this was only because it was

in a country which already had good political institutions. This effect was severely muted in Latin America.

Though our results are not consistent with a large part of the Turner thesis, they are consistent with the research of Brenner (1976) and Acemoglu, Johnson and Robinson (2005) which emphasized that the implications of large shocks or new economic opportunities depends on the initial institutional equilibrium. More specifically in the Americas, they are also consistent with the work of Engerman and Sokoloff (1997) and Acemoglu, Johnson and Robinson (2001, 2002) who emphasized the critical importance of the creation of institutions in the colonial period and their path dependent consequences. In a sense, our results on income per-capita show how different paths were reinforced by the availability of frontier lands in the 19th century.

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Table 1

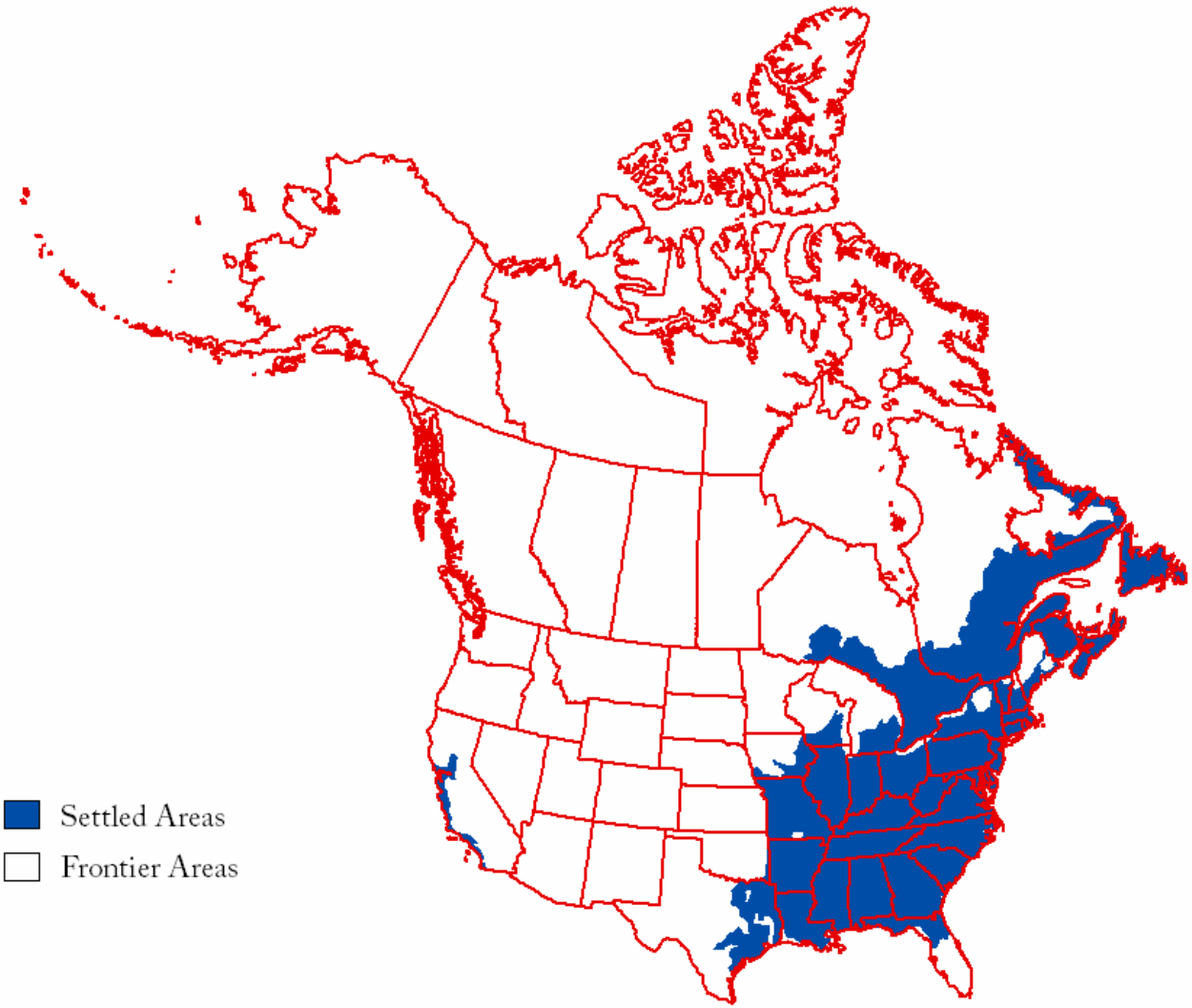
The Frontier in the Americas

Country	Total Number of Subnational Units	Total Land Area (square Kms.)	Number of Narrow Frontier Subnational Units	Total Narrow Frontier Land Area (square Kms.)	Narrow Frontier Share	Number of Wide Frontier Subnational Units	Total Wide Frontier Land Area (square Kms.)	Wide Frontier Share	Total Frontier from Butland (1966) and Historical cartography	Frontier Share from Butland (1966) and Historical cartography
Argentina	24	2,780,403	11	1,370,454	49.3%	15	2,063,942	74.2%	1,922,371	69.1%
Bolivia	9	1,098,581	4	685,635	62.4%	4	803,853	73.2%	861,507	78.4%
Brazil	27	8,498,331	15	6,354,737	74.8%	17	7,192,601	84.6%	7,606,006	89.5%
Chile	13	756,095	5	398,745	52.7%	5	398,745	52.7%	562,762	74.4%
Colombia	33	1,141,748	15	718,130	62.9%	15	718,130	62.9%	663,584	58.1%
Costa Rica	7	51,102	4	32,870	64.3%	5	43,011	84.2%	32,870	64.3%
Dominican Republic	32	46,891	0	-	0.0%	2	3,665	7.8%		
Ecuador	23	256,370	7	116,519	45.4%	9	151,309	59.0%	120,827	47.1%
El Salvador	14	21,040	0	-	0.0%	0	-	0.0%		
Guatemala	22	108,889	2	44,892	41.2%	7	69,692	64.0%		
Honduras	18	112,492	3	45,262	40.2%	6	64,904	57.7%		
Haiti	9	27,700	0	-	0.0%	0	-	0.0%		
Mexico	32	1,970,774	11	1,131,990	57.4%	12	1,207,619	61.3%		
Nicaragua	17	120,339	4	77,129	64.1%	7	91,601	76.1%		
Panama	12	75,071	6	35,102	46.8%	7	46,773	62.3%		
Peru	25	1,285,199	4	595,813	46.4%	7	709,235	55.2%	786,028	61.2%
Paraguay	18	406,752	3	246,925	60.7%	13	378,370	93.0%	365,955	90.0%
Uruguay	19	175,016	19	175,016	100.0%	19	175,016	100.0%	175,016	100.0%
Venezuela	25	916,445	6	598,945	65.4%	8	707,231	77.2%	655,533	71.5%
United States	51	9,372,587							6,792,227	72.5%
Canada	13	9,017,699							7,819,625	85.3%

Source: www.geohive.com for land areas of subnational administrative units, Butland (1966), Dominion Bureau of Statistics (n.d), Gerlach, (1970), Bureau of Business Research (1975). Frontier coding calculated by the authors.

Map 1

The Frontier in North America circa 1850 (current administrative boundaries)



Map 2

The Frontier in South America circa 1850 (current administrative boundaries)

Map 3

The Frontier in Central America circa 1850 (current administrative boundaries)

Figure 1


Constraints on the Executive in 1850
Frequency
10
9
8
7
6
5
4
3
2
1
0
1
3
5
7
Constraints on the Executive in 1850

Table 2

Descriptive Statistics

Variable	Countries with Frontier Share >= Sample Median Frontier Share					Countries with Frontier Share < Sample Median Frontier Share				
	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
Share of Frontier Land circa 1850	11	0.700	0.127	0.574	1	10	0.322	0.225	0	0.527
Constraints on the Executive 1850	11	2.636	2.335	1	7	10	2.600	1.265	1	5
Per Capita Income 2007	11	11466.36	15725.61	980	46040	10	3744	2296.15	560	8350
Polity Score average 1900-2007	11	2.427	5.325	-3.537	10	10	-0.350	1.935	-3.107	2.333
Polity Score average 1950-2007	11	3.964	5.008	-3.293	10	10	1.052	2.482	-5.339	3.828
Income Gini average 1996-2005	11	49.113	8.389	32.560	58.770	10	53.435	2.614	50.630	59.2

Note: The sample median country for Frontier Share is Mexico, with a frontier share of 0.574 (based on our prefered measure of frontier). For the years in which the Polity score records a political transition we asign the average score of the years before and after the transition, and years in which the Polity score assigns Interruption or Interregnum periods are excluded from the averages.

Figure 2

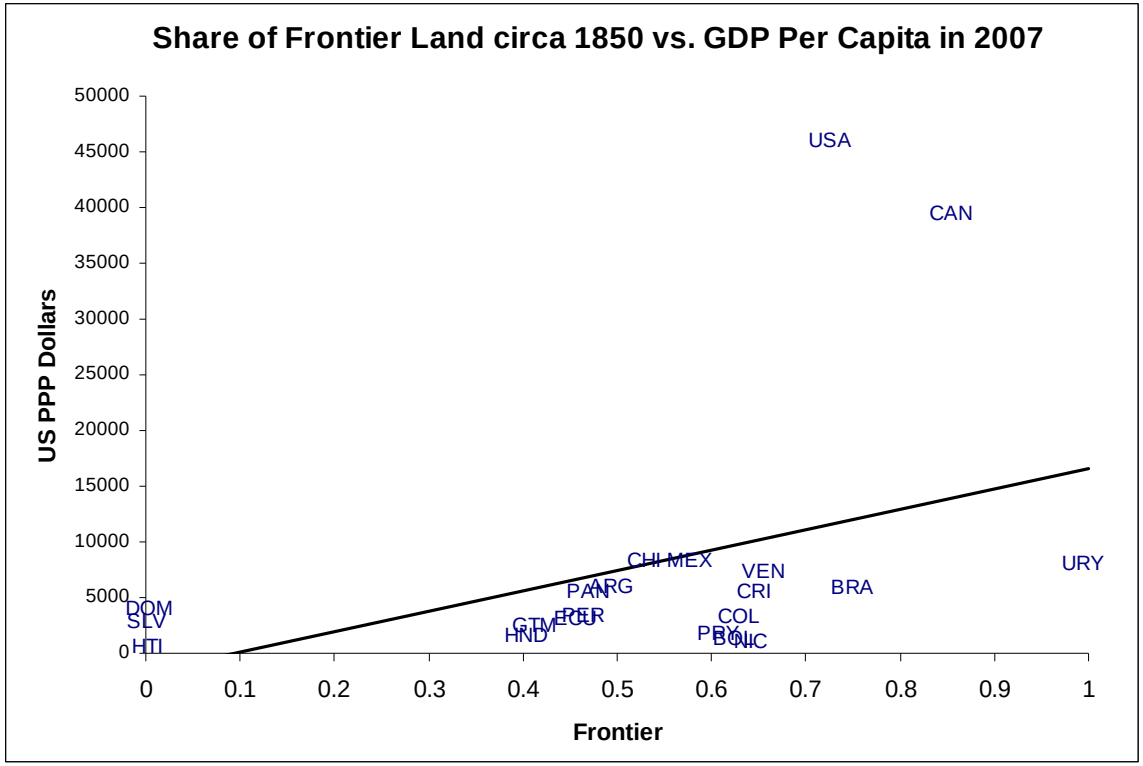

Share of Frontier Land circa 1850 vs. GDP Per Capita in 2007
US PPP Dollars
Frontier
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
USA
CAN
CHL
MEX
VEN
URY
ARG
PAN
CRI
BRA
DOM
SLV
HTI
HND
COL
NIC

Figure 3

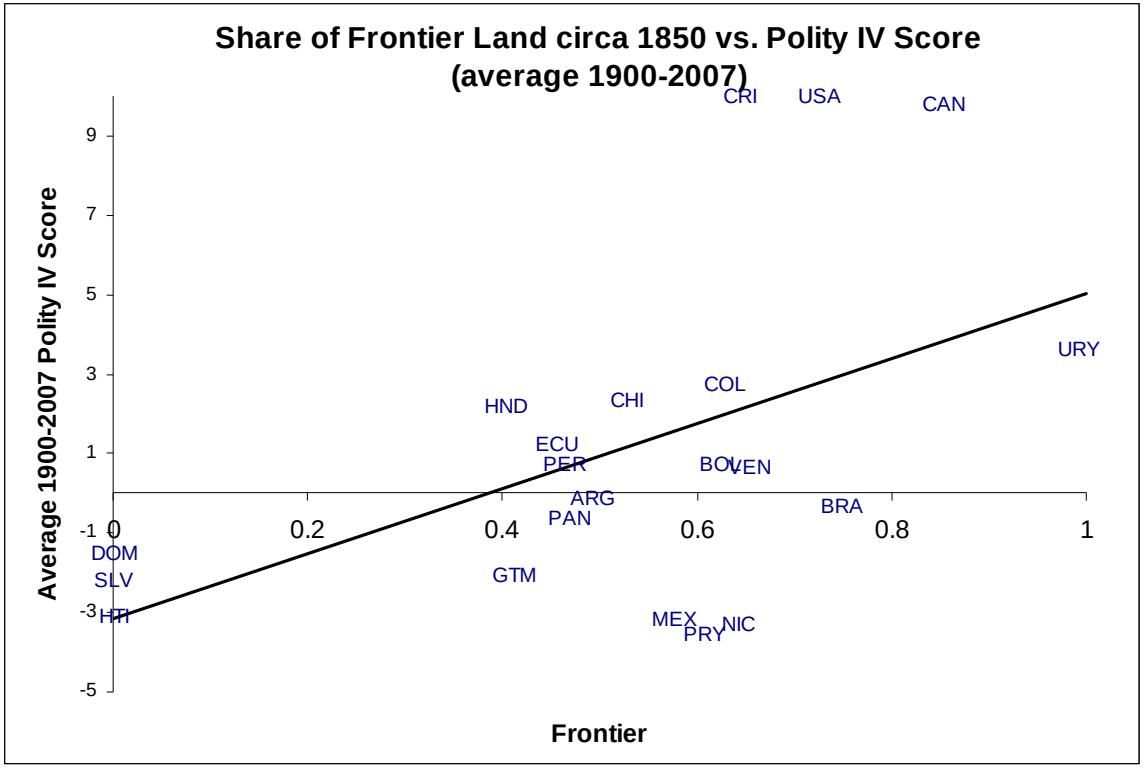

Share of Frontier Land circa 1850 vs. Polity IV Score
(average 1900-2007)
Average 1900-2007 Polity IV Score
Frontier
9
7
5
3
1
-1
-3
-5
0
0.2
0.4
0.6
0.8
1
CRI
USA
CAN
URY
COL
HND
CHI
ECU
PER
BOL
VEN
ARG
PAN
BRA
DOM
SLV
GTM
HTI
MEX
PRY
NIC

Figure 4

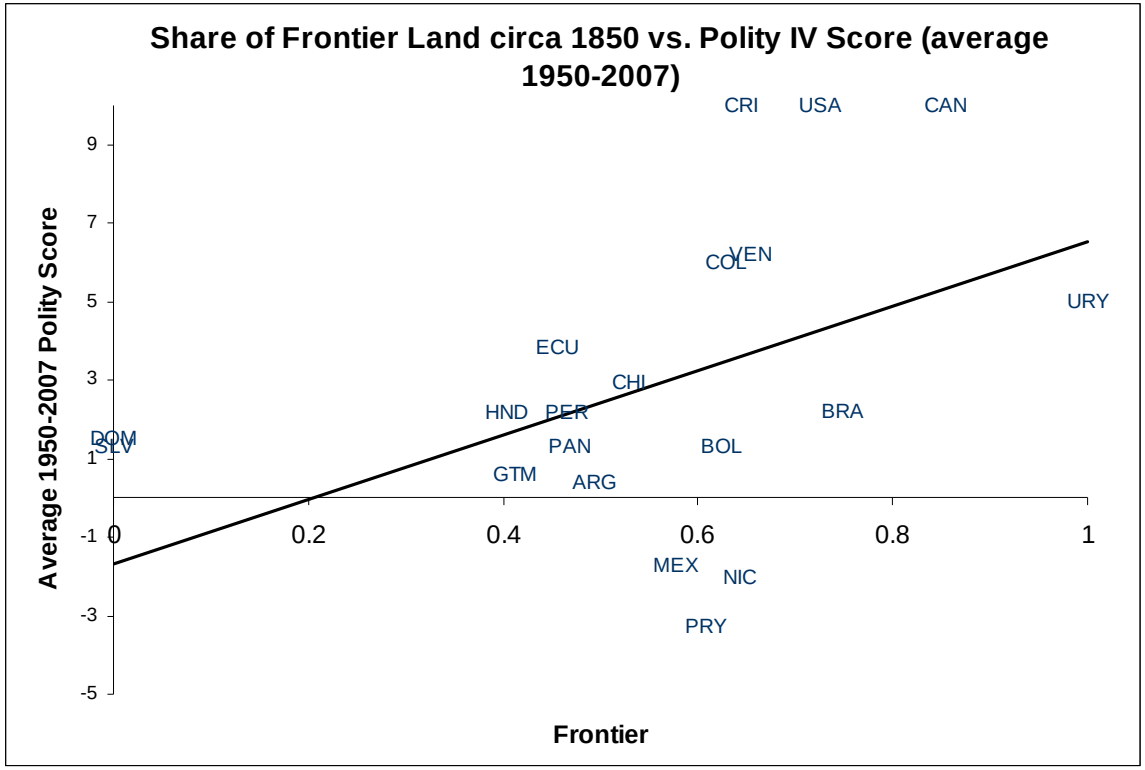

Share of Frontier Land circa 1850 vs. Polity IV Score (average 1950-2007)
Average 1950-2007 Polity Score
Frontier
9
7
5
3
1
-1
-3
-5
0
0.2
0.4
0.6
0.8
1
CRI
USA
CAN
VEN
COL
URY
ECU
CHL
HND
PER
BRA
DOM
SLV
PAN
BOL
GTM
ARG
MEX
NIC
PRY

Figure 5

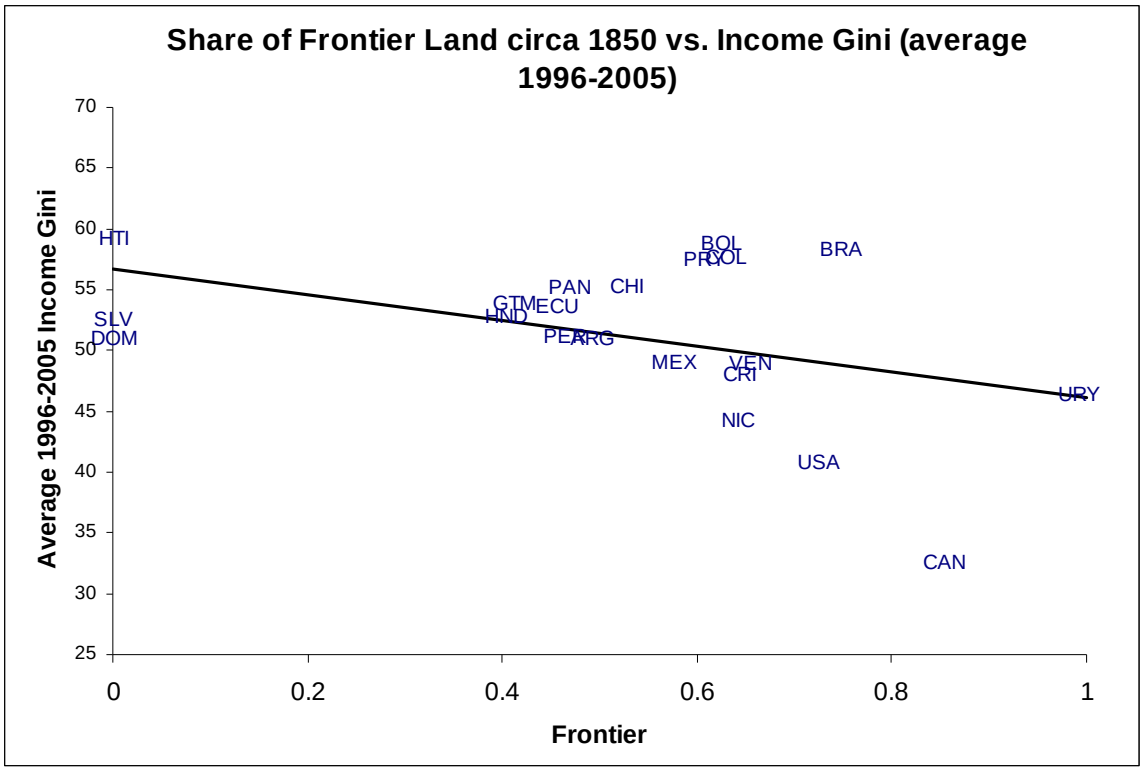

Share of Frontier Land circa 1850 vs. Income Gini (average 1996-2005)
Average 1996-2005 Income Gini
Frontier
70
65
60
55
50
45
40
35
30
25
0
0.2
0.4
0.6
0.8
1
HTI
SLV
DOM
HND
GTM
ECU
PAN
CHI
PER
ARG
BOL
PRY
COL
BRA
MEX
VEN
CRI
URY
NIC
USA
CAN

Table 3

	Dependent Variable: Per Capita GDP 2007 (PPP Adjusted)								
	Narrow Frontier			**Wide Frontier**			**Butland Frontier**		
Frontier Share	18324.10	15777.35	-13849.29	10535.48	10397.26	-12590.71	12611.73	14272.81	-10397.47
	(9953.30)	(4900.72)	(7835.69)	(6043.12)	(3884.45)	(8253.17)	(6934.05)	(4840.60)	(6118.02)
Constraints on the Executive 1850		4405.86	-3657.29		4579.16	-3029.61		4708.54	-2663.75
		(1346.50)	(2228.71)		(1526.40)	(3360.24)		(1371.11)	(2332.80)
Constraints 1850 x Frontier Share			11843.70			10391.53			10341.30
			(3015.50)			(3765.30)			(2880.38)
R-squared	0.162	0.631	0.773	0.061	0.571	0.655	0.094	0.632	0.738
No. Observations	21	21	21	21	21	21	21	21	21

Note: Robust Standard Errors in parenthesis.

All regressions include a constant (omitted).

Table 4

	Dependent Variable: Polity IV Score, average 1900-2007								
	Narrow Frontier			Wide Frontier			Butland Frontier		
Frontier Share	8.189	7.337	4.178	5.886	5.839	0.281	5.608	6.176	3.159
	(2.458)	(1.297)	(2.243)	(2.317)	(1.789)	(2.975)	(2.180)	(1.424)	(2.454)
Constraints on the Executive 1850		1.474	0.615		1.554	-0.285		1.611	0.710
		(0.195)	(0.552)		(0.240)	(0.798)		(0.192)	(0.487)
Constraints 1850 x Frontier Share			1.263			2.512			1.265
			(0.708)			(1.074)			(0.706)
R-squared	0.256	0.672	0.685	0.151	0.617	0.655	0.147	0.646	0.659
No. Observations	21	21	21	21	21	21	21	21	21

Note: Robust Standard Errors in parenthesis.

All regressions include a constant (omitted).

The Polity score for Panama is average over the 1903-2007 period.

Table 5

	Dependent Variable: Polity IV Score, average 1950-2007								
	Narrow Frontier			Wide Frontier			Butland Frontier		
Frontier Share	8.213	7.455	9.809	5.822	5.780	6.474	5.304	5.815	7.597
	(2.960)	(1.851)	(2.676)	(3.119)	(2.151)	(4.388)	(2.873)	(1.865)	(3.866)
Constraints on the Executive 1850		1.313	1.954		1.394	1.624		1.448	1.980
		(0.254)	(0.959)		(0.282)	(1.197)		(0.252)	(1.080)
Constraints 1850 x Frontier Share			-0.941			-0.314			-0.747
			(1.120)			(1.514)			(1.354)
R-squared	0.262	0.599	0.606	0.150	0.533	0.533	0.134	0.545	0.550
No. Observations	21	21	21	21	21	21	21	21	21

Note: Robust Standard Errors in parenthesis.

All regressions include a constant (omitted).

Table 6

	Dependent Variable: Income Gini, average 1996-2005								
	Narrow Frontier			**Wide Frontier**			**Butland Frontier**		
Frontier Share	-10.585	-9.579	-2.755	-7.086	-7.030	-1.901	-5.923	-6.596	1.723
	(5.632)	(4.126)	(7.922)	(4.628)	(3.520)	(8.094)	(4.897)	(3.707)	(9.226)
Constraints on the Executive 1850		-1.740	0.117		-1.845	-0.147		-1.906	0.580
		(0.676)	(1.745)		(0.767)	(2.347)		(0.745)	(2.220)
Constraints 1850 x Frontier Share			-2.728			-2.319			-3.487
			(2.727)			(3.523)			(3.207)
R-squared	0.177	0.417	0.442	0.091	0.362	0.376	0.068	0.358	0.397
No. Observations	21	21	21	21	21	21	21	21	21

Note: Robust Standard Errors in parenthesis.

All regressions include a constant (omitted).

Appendix

Country	Sources for Frontier Cartographic Source	Historical References
Argentina	Butland (1966)	Eidt (1971), Bandeira, (2006), Jefferson, (1926), Moniz (2006)
Bolivia	Butland (1966)	Gill (1987), Fifer (1982)
Brazil	Butland (1966)	Bandeira (2006), Katzman (1977), Katzman (1975), James (1941)
Canada	Dominion Bureau of Statistics (n.d).	Silver (1969), Landon (1967)
Chile	Butland (1966)	James (1941), Villalobos (1992)
Colombia	Butland (1966)	James (1941), LeGrand (1986), Rausch (1993)
Costa Rica	Hall and Perez Brignoli (2003), United States Bureau of the Census (1956a)	Hall and Perez Brignoli (2003), James (1941),
Dominican Rep.	United States Bureau of the Census (1956b)	Lora (2002)
Ecuador	Butland (1966)	Dueñas (1986), Sampedro (1990)
El Salvador	Hall and Perez Brignoli (2003), United States Bureau of the Census (1956a)	Hall and Perez Brignoli (2003)
Guatemala	Hall and Perez Brignoli (2003), United States Bureau of the Census (1956a)	Hall and Perez Brignoli (2003), McCreery (1976)
Haiti	United States Bureau of the Census (1956b)	Anglade (1982)
Honduras	Hall and Perez Brignoli (2003), United States Bureau of the Census (1956a)	Hall and Perez Brignoli (2003), Davidson (2006)
Mexico	Bureau of Business Research (1975)	Bernstein (1964)
Nicaragua	Hall and Perez Brignoli (2003), United States Bureau of the Census (1956a)	Hall and Perez Brignoli (2003), Aguirre (2002)
Panama	Hall and Perez Brignoli (2003), United States Bureau of the Census (1956a)	Hall and Perez Brignoli (2003)
Paraguay	Butland (1966)	Moniz (2006)
Peru	Butland (1966)	Milla (1995)
United States	United States Census Office (1898), Gerlach, (1970)	Billington (2001), Billington (1962), Wyman and Kroeber (1965)
Uruguay	Butland (1966)	Moniz (2006), Bollo (1896)
Venezuela	Butland (1966)	

Frontier classification by Subnational Administrative Units

Country	Province/State/Department	Land Area (square Kms.)	Narrow Frontier	Wide Frontier
ARGENTINA	BUENOS AIRES	307,571	0	1
	CATAMARCA	102,602	0	0
	CHACO	99,633	1	1
	CHUBUT	224,686	1	1
	CIUDAD DE BUENOS AIRES	203	0	0
	CÓRDOBA	165,321	1	1
	CORRIENTES	88,199	1	1
	ENTRE RÍOS	78,781	1	1
	FORMOSA	72,066	1	1
	JUJUY	53,219	0	0
	LA PAMPA	143,440	1	1
	LA RIOJA	89,680	0	0
	MENDOZA	148,827	0	0
	MISIONES	29,801	1	1
	NEUQUÉN	94,078	0	1
	RÍO NEGRO	203,013	1	1
	SALTA	155,488	0	1
	SAN JUAN	89,651	0	0
	SAN LUIS	76,748	0	0
	SANTA CRUZ	243,943	1	1
	SANTA FE	133,007	0	0
	SANTIAGO DE ESTERO	136,351	0	1
	TIERRA DEL FUEGO	21,571	1	1
	TUCUMÁN	22,524	0	0
BOLIVIA	BENI	213,564	1	1
	CHUQUISACA	51,524	0	0
	COCHABAMBA	55,631	0	0
	LA PAZ	133,985	0	0
	ORURO	53,588	0	0
	PANDO	63,827	1	1
	POTOSÍ	118,218	0	1
	SANTA CRUZ	370,621	1	1
	TARIJA	37,623	1	1
BRAZIL	ACRE	152,522	1	1
	ALAGOAS	27,819	0	0
	AMAPÁ	142,816	1	1
	AMAZONAS	1,570,947	1	1
	BAHIA	564,272	0	0
	CEARÁ	145,712	0	0
	DISTRITO FEDERAL	5,802	1	1
	ESPÍRITO SANTO	46,047	0	0
	GOIÁS	340,119	1	1
	MARANHÃO	331,919	1	1
	MATO GROSSO	903,385	1	1
	MATO GROSSO DO SUL	357,140	1	1
	MINAS GERAIS	586,553	0	1
	PARÁ	1,247,703	1	1
	PARAÍBA	56,341	0	0
	PARANÁ	199,282	1	1
	PERNAMBUCO	98,526	0	0
	PIAUÍ	251,311	0	1
	RIO DE JANEIRO	43,797	0	0
	RIO GRANDE DO NORTE	53,077	0	0
	RIO GRANDE DO SUL	268,836	1	1
	RONDÔNIA	237,565	1	1
	RORAIMA	224,118	1	1
	SANTA CATARINA	95,286	1	1
	SÃO PAULO	248,177	0	0
	SERGIPE	21,962	0	0
	TOCANTINS	277,297	1	1
CHILE	ANTOFAGASTA (II)	126,049	0	0
	ATACAMA (III)	75,176	0	0
	AYSÉN (XI)	108,494	1	1
	BIO-BIO (VIII)	37,063	0	0
	COQUIMBO (IV)	40,580	0	0
	LA ARAUCANÍA (IX)	31,842	1	1
	LOS LAGOS (X)	67,013	1	1
	MAGALLANES Y ANTÁRTICA CHILENA (XII)	132,297	1	1
	MAULE (VII)	30,296	0	0
	O'HIGGINS (VI)	16,387	0	0
	SANTIAGO	15,403	0	0
	TARAPACÁ (I)	59,099	1	1
	VALPARAÍSO (V)	16,396	0	0
COLOMBIA	AMAZONAS	109,665	1	1
	ANTIOQUIA	63,612	0	0
	ARAUCA	23,818	1	1
	ATLANTICO	3,388	0	0
	BOGOTA	1,587	0	0
	BOLIVAR	25,978	0	0
	BOYACA	23,189	0	0
	CALDAS	7,888	1	1
	CAQUETA	88,965	1	1
	CASANARE	44,640	1	1
	CAUCA	29,308	0	0
	CESAR	22,905	0	0
	CHOCO	46,530	1	1
	CORDOBA	25,020	0	0
	CUNDINAMARCA	22,623	0	0
	GUAINIA	72,238	1	1
	GUAJIRA	20,848	0	0
	GUAVIARE	42,327	1	1
	HUILA	19,890	0	0
	MAGDALENA	23,188	0	0
	META	85,635	1	1
	NARIÑO	33,268	0	0
	NORTE DE SANTANDER	21,658	0	0
	PUTUMAYO	24,885	1	1
	QUINDIO	1,845	1	1
	RISARALDA	4,140	1	1
	SAN ANDRES	44	1	1
	SANTANDER	30,537	0	0
	SUCRE	10,917	0	0
	TOLIMA	23,562	0	0
	VALLE DEL CAUCA	22,140	0	0
	VAUPES	65,268	1	1
	VICHADA	100,242	1	1
COSTA RICA	ALAJUELA	9,758	1	1
	CARTAGO	3,125	0	0
	GUANACASTE	10,141	0	1
	HEREDIA	2,657	1	1
	LIMÓN	9,189	1	1
	PUNTARENAS	11,266	1	1
	SAN JOSÉ	4,966	0	0
DOMINICAN REPUBLIC	AZUA	2,688	0	0
	BAHORUCO	1,244	0	0
	BARAHONA	1,647	0	1
	DAJABÓN	1,004	0	0
	DISTRITO NACIONAL	91	0	0
	DUARTE	1,640	0	0
	EL SEIBO	1,775	0	0
	ELIAS PIÑA	1,397	0	0
	ESPAILLAT	825	0	0
	HATO MAYOR	1,324	0	0
	INDEPENDENCIA	1,754	0	0
	LA ALTAGRACIA	3,001	0	0
	LA ROMANA	656	0	0
	LA VEGA	2,274	0	0
	MARÍA TRINIDAD SÁNCHEZ	1,212	0	0
	MONSEÑOR NOUEL	992	0	0
	MONTE CRISTI	1,886	0	0
	MONTE PLATA	2,613	0	0
	PEDERNALES	2,018	0	1
	PERAVIA	785	0	0
	PUERTO PLATA	819	0	0
	SALCEDO	430	0	0
	SAMANÁ	845	0	0
	SAN CRISTÓBAL	1,240	0	0
	SAN JOSE DE OCOA	853	0	0
	SAN JUAN	3,360	0	0
	SAN PEDRO DE MACORÍS	1,255	0	0
	SÁNCHEZ RAMÍREZ	1,191	0	0
	SANTIAGO	2,809	0	0
	SANTIAGO RODRIGUEZ	1,152	0	0
	SANTO DOMINGO	1,302	0	0
	VALVERDE	809	0	0
ECUADOR	AZUAY	7,995	0	0
	BOLÍVAR	3,926	0	0
	CAÑAR	3,142	0	0
	CARCHI	3,750	0	0
	CHIMBORAZO	6,470	0	0
	COTOPAXI	5,985	0	0
	EL ORO	5,817	0	0
	ESMERALDAS	15,896	0	1
	GALÁPAGOS	8,010	0	0
	GUAYAS	20,566	0	0
	IMBABURA	4,615	0	0
	LOJA	10,995	0	0
	LOS RÍOS	7,151	0	0
	MANABÍ	18,894	0	1
	MORONA SANTIAGO	23,797	1	1
	NAPO	12,483	1	1
	ORELLANA	21,675	1	1
	PASTAZA	29,325	1	1
	PICHINCHA	13,270	0	0
	REGIÓN ZONAS NO DELIMITADAS	775	1	1
	SUCUMBÍOS	18,008	1	1
	TUNGURAHUA	3,369	0	0
	ZAMORA CHINCHIPE	10,456	1	1
EL SALVADOR	AHUACHAPÁN	1,240	0	0
	CABAÑAS	1,104	0	0
	CHALATENANGO	2,017	0	0
	CUSCATLÁN	756	0	0
	LA LIBERTAD	1,653	0	0
	LA PAZ	1,224	0	0
	LA UNIÓN	2,074	0	0
	MORAZÁN	1,447	0	0
	SAN MIGUEL	2,077	0	0
	SAN SALVADOR	886	0	0
	SAN VICENTE	1,184	0	0
	SANTA ANA	2,023	0	0
	SONSONATE	1,225	0	0
	USULUTÁN	2,130	0	0
GUATEMALA	ALTA VERAPAZ	8,686	0	1
	BAJA VERAPAZ	3,124	0	1
	CHIMALTENANGO	1,979	0	0
	CHIQUIMULA	2,376	0	0
	EL PETÉN	35,854	1	1
	EL PROGRESO	1,922	0	1
	EL QUICHÉ	8,378	0	1
	ESCUINTLA	4,384	0	0
	GUATEMALA	2,126	0	0
	HUEHUETENANGO	7,400	0	0
	IZABAL	9,038	1	1
	JALAPA	2,063	0	0
	JUTIAPA	3,219	0	0
	QUETZALTENANGO	1,951	0	0
	RETALHULEU	1,856	0	0
	SACATEPÉQUEZ	465	0	0
	SAN MARCOS	3,791	0	0
	SANTA ROSA	2,955	0	0
	SOLOLÁ	1,061	0	0
	SUCHITEPÉQUEZ	2,510	0	0
	TOTONICAPÁN	1,061	0	0
	ZACAPA	2,690	0	1

HONDURAS	ATLÁNTIDA	4,372	0	1
	CHOLUTECA	3,923	0	0
	COLÓN	4,360	1	1
	COMAYAGUA	8,249	0	0
	COPÁN	5,124	0	0
	CORTÉS	3,242	0	0
	EL PARAÍSO	7,489	0	1
	FRANCISCO MORAZÁN	8,619	0	0
	GRACIAS A DIOS	16,997	1	1
	INTIBUCÁ	3,123	0	0
	ISLAS DE LA BAHÍA	236	0	0
	LA PAZ	2,525	0	0
	LEMPIRA	4,228	0	0
	OCOTEPEQUE	1,630	0	0
	OLANCHO	23,905	1	1
	SANTA BÁRBARA	5,024	0	0
	VALLE	1,665	0	0
	YORO	7,781	0	1
HAITI	ARTIBONITE	4,984	0	0
	CENTRE	3,675	0	0
	GRAND' ANSE	3,310	0	0
	NORD	2,106	0	0
	NORD-EST	1,805	0	0
	NORD-OUEST	2,176	0	0
	OUEST	4,827	0	0
	SUD	2,794	0	0
	SUD-EST	2,023	0	0
MEXICO	AGUASCALIENTES	5,569	0	0
	BAJA CALIFORNIA NORTE	70,113	1	1
	BAJA CALIFORNIA SUR	73,677	1	1
	CAMPECHE	56,859	1	1
	CHIAPAS	75,629	0	1
	CHIHUAHUA	247,087	1	1
	COAHUILA DE ZARAGOZA	151,571	1	1
	COLIMA	5,455	0	0
	DISTRITO FEDERAL	1,499	0	0
	DURANGO	119,648	1	1
	GUANAJUATO	30,350	0	0
	GUERRERO	63,749	0	0
	HIDALGO	20,987	0	0
	JALISCO	80,137	0	0
	MÉXICO, ESTADO DE	21,461	0	0
	MICHOACÁN DE OCAMPO	59,864	0	0
	MORELOS	4,941	0	0
	NAYARIT	27,336	0	0
	NUEVO LÉON	64,555	0	0
	OAXACA	94,964	0	0
	PUEBLA	33,919	0	0
	QUERÉTARO DE ARTEAGA	11,769	0	0
	QUINTANA ROO	50,843	1	1
	SAN LUIS POTOSÍ	60,547	0	0
	SINALOA	58,092	1	1
	SONORA	184,934	1	1
	TABASCO	24,661	0	0
	TAMAULIPAS	79,829	1	1
	TLAXCALA	4,061	0	0
	VERACRUZ-LLAVE	72,815	0	0
	YUCATÁN	39,337	1	1
	ZACATECAS	74,516	0	0
NICARAGUA	BOACO	4,177	0	1
	CARAZO	1,081	0	0
	CHINANDEGA	4,822	0	0
	CHONTALES	6,481	0	0
	ESTELÍ	2,230	0	0
	GRANADA	1,040	0	0
	JINOTEGA	9,222	1	1
	LEÓN	5,138	0	0
	MADRIZ	1,708	0	0
	MANAGUA	3,465	0	0
	MASAYA	611	0	0
	MATAGALPA	6,804	0	1
	NUEVA SEGOVIA	3,491	0	1
	REGION AUTÓNOMA ATLÁNTICO NORTE	33,106	1	1
	REGION AUTÓNOMA ATLÁNTICO SUR	27,260	1	1
	RÍO SAN JUAN	7,541	1	1
	RIVAS	2,162	0	0
PANAMA	BOCAS DEL TORO	4,644	1	1
	CHIRIQUÍ	6,548	0	0
	COCLÉ	4,927	0	0
	COLÓN	4,868	1	1
	COMARCA EMBERÁ	4,384	1	1
	COMARCA KUNA YALA	2,341	1	1
	COMARCA NGÖBE BUGLÉ	6,968	1	1
	DARIÉN	11,897	1	1
	HERRERA	2,341	0	0
	LOS SANTOS	3,805	0	0
	PANAMÁ	11,671	0	1
	VERAGUAS	10,677	0	0

PERU	AMAZONAS	39,249	1	1
	ANCASH	35,915	0	0
	AREQUIPA	63,345	0	0
	AYACUCHO	43,815	0	0
	CAJAMARCA	33,318	0	0
	CUSCO	71,987	0	0
	DEPARTAMENTO APURÍMAC	20,896	0	0
	EL CALLAO	147	0	0
	HUANCAVELICA	22,131	0	0
	HUÁNUCO	36,849	0	1
	ICA	21,328	0	0
	JUNÍN	44,197	0	0
	LA LIBERTAD	25,500	0	0
	LAMBAYEQUE	14,213	0	0
	LIMA	34,802	0	0
	LORETO	368,852	1	1
	MADRE DE DIOS	85,301	1	1
	MOQUEGUA	15,734	0	0
	PASCO	25,320	0	1
	PIURA	35,892	0	0
	PUNO	71,999	0	0
	SAN MARTÍN	51,253	0	1
	TACNA	16,076	0	0
	TUMBES	4,669	0	0
	UCAYALI	102,411	1	1
PARAGUAY	ALTO PARAGUAY	82,349	1	1
	ALTO PARANÁ	14,895	0	1
	AMAMBAY	12,933	0	1
	ASUNCIÓN	117	0	0
	BOQUERÓN	91,669	1	1
	CAAGUAZÚ	11,474	0	1
	CAAZAPÁ	9,496	0	1
	CANINDEYÚ	14,667	0	1
	CENTRAL	2,465	0	0
	CONCEPCIÓN	18,051	0	1
	CORDILLERA	4,948	0	0
	GUAIRÁ	3,846	0	1
	ITAPÚA	16,525	0	1
	MISIONES	9,556	0	1
	ÑEEMBUCÚ	12,147	0	0
	PARAGUARÍ	8,705	0	0
	PRESIDENTE HAYES	72,907	1	1
	SAN PEDRO	20,002	0	1
URUGUAY	ARTIGAS	11,928	1	1
	CANELONES	4,536	1	1
	CERRO LARGO	13,648	1	1
	COLONIA	6,106	1	1
	DURAZNO	11,643	1	1
	FLORES	5,144	1	1
	FLORIDA	10,417	1	1
	LAVALLEJA	10,016	1	1
	MALDONADO	4,793	1	1
	MONTEVIDEO	530	1	1
	PAYSANDÚ	13,922	1	1
	RÍO NEGRO	9,282	1	1
	RIVERA	9,370	1	1
	ROCHA	10,551	1	1
	SALTO	14,163	1	1
	SAN JOSÉ	4,992	1	1
	SORIANO	9,008	1	1
	TACUAREMBÓ	15,438	1	1
	TREINTA Y TRES	9,529	1	1
VENEZUELA	AMAZONAS	180,145	1	1
	ANZOÁTEGUI	43,300	0	1
	APURE	76,500	1	1
	ARAGUA	7,014	0	0
	BARINAS	35,200	1	1
	BOLÍVAR	238,000	1	1
	CARABOBO	4,650	0	0
	COJEDES	14,800	0	0
	DELTA AMACURO	40,200	1	1
	DEPENDENCIAS FEDERALES (DF)	120	0	0
	DISTRITO FEDERAL	433	0	0
	FALCÓN	24,800	0	0
	GUÁRICO	64,986	0	1
	LARA	19,800	0	0
	MÉRIDA	11,300	0	0
	MIRANDA	7,950	0	0
	MONAGAS	28,900	1	1
	NUEVA ESPARTA	1,150	0	0
	PORTUGUESA	15,200	0	0
	SUCRE	11,800	0	0
	TÁCHIRA	11,100	0	0
	TRUJILLO	7,400	0	0
	VARGAS	1,497	0	0
	YARACUY	7,100	0	0
	ZULIA	63,100	0	0