HISTORICAL COMPARISONS OF INCOME: A SHORT-CUT APPROACH[1]

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The expansion of quantitative economic history has increased the need for new data at national and international levels. Efforts to produce new historical national accounts are now widespread in Europe rendering data sets widely used in the past (i.e., Bairoch 1976) obsolete. In turn, a shift towards a macro-economic approach in the narrative of European history has taken place that outdates classical textbooks written in a sectoral, industry by industry fashion, and makes the prospects for a new, comparative history of Europe look brighter than it seemed to a decade ago (O'Brien 1986).

Historical comparisons of product per head across countries usually start from present day levels of GDP, adjusted for its purchasing power (PPP), extrapolated backwards with growth rates taken from national accounts.[2] It is the aim of this paper to contribute to the debate on comparative performance through a more economically sound alternative. By providing PPP adjusted levels of output at current prices, the new approach improves GDP cross-sectional comparability, as it represents a superior alternative to usual constant price comparisons.

CROSS-COUNTRY COMPARISONS OVER TIME

Substituting purchasing power parity adjusted exchange rates for trading exchange rates has become common practice in international GDP comparisons with pervasive effects on country rankings. Historical comparisons have been affected by the new comparative approach and levels of product per person or per worker for remote years are now expressed in present-time

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2. PPP is defined as the number of units of a country's currency required to purchase the same amount of goods and services in the country as one dollar would buy in the US (Ahmad 1994: 54).

PPP adjusted dollars. Thus, 1960 dollars (Bairoch 1976) have been given way to each new round of the International Comparisons Project (ICP) that provides, in its latest version, GDP expressed in 1990 international EKS or Geary-Khamis dollars.

Accepting trading exchange rates to carry out product comparisons across countries clashes with the evidence gathered by ICP according to which the view that the equilibrium exchange rate at which the currencies of two countries will trade will be determined by the relative price levels of the countries should be rejected (Summers and Heston 1991). The conversion problem emerges from a violation of the law of one price. As clearly put by Kravis, Heston and Summers (1978a: 9):

> International trade tends to drive the prices of traded goods [...] towards equality in different countries. With equal or nearly equal prices, wages in the traded goods industries in each country will depend upon productivity. Wages established in the traded goods industries within each country will prevail in the country's non-traded goods industries. In non-traded goods industries, however, international productivity differentials tend to be smaller. Consequently, in a high-productivity country high wages lead to high prices of services and other non-traded goods, whereas in a low productivity country low wages produce low prices. The lower a country's income, the lower will be the prices of its home goods and the greater will be the tendency for exchange rate conversions to underestimate its real income relative to that of rich countries.

Therefore, the international price of non tradeables is measured by the opportunity cost of the production factors used to prodce them in relatively high income countries (Isenman 1980:65). Hence, the use of current exchange rates as a proxy for the purchasing power parity is not acceptable.

The practical arguments in favour of PPP-converted GDP have been eloquently expressed by Maddison (1995:162): trading exchange rates only reflect the purchasing power of tradeable goods, and are influenced by capital movements and exchange controls. In addition, they became too volatile in the last two decades. The obvious and painstaking solution to the problem will be the construction of PPP converters on the basis of own-currency prices for a fixed, common basket of goods for each country each year. Efforts carried out at the ICP demand-oriented program and, more recently, by the Groningen group for International Comparisons of Output and Productivity (ICOP) have

provided us with purchasing power parity adjusted exchange rates to convert GDP expressed in national currency into international comparable units (Van Ark 1993).[3] However, ICP and ICOP do concentrate their research on recent years and, for earlier periods, only recently PPPs have been constructed from the output side (mostly agriculture and manufacturing), with the exception of Williamson's (1995) income approach.

Thus, the only alternative available to the economic historian who aims at establishing space and time comparisons for its national aggregate results rests upon backasting present-day PPP adjusted GDP levels on the basis of growth rates derived from national accounts data. In fact, a clear presentation advantage of the Laspeyres, fixed-base PPP, real product data is that growth rates corresponding to common currency units are the same as those calculated at national accounts.

However, this procedure is not enough to offset the distortions introduced by accepting a remote PPP as the reference in inter-temporal comparisons. In fact, it leads to a classical example of the index number problem since the validity of the comparisons depends on how stable the basket on which the PPP converters have been established remains over time, and it should be born in mind that relative prices would usually change after a while rendering the base year weights obsolete. If, as it happens in history, growth takes place and relative prices vary, the economic meaning of comparing real product per head based upon remote PPPs becomes questionable.[4] It might happen that a PPP projection casts a larger error than the one involved when trading exchange rates are used (Eichengreen 1986). In the context of advanced, open countries under the Classical Gold Standard, Crafts (1984b) claimed that comparisons on the basis of the trading exchange rates are acceptable.

3. ICOP has not escaped criticism. Summers and Heston (199: 22) critizise production side comparisons approach because of the assumptions made about the relations of gross output to value added and unit values to prices of specified items.

4. In fact. Summers and Heston (1988, 1991) have attempted to mitigate the Laspeyres fixed-index problem through the reconciliation of national accounts and international benchmark data by producing a chain index real GDP series in which the growth rate for any period is based upon international prices closer to this period. Summers and Heston (1991) results have been disputed because of its lack of transparence and ambiguity, and later reconsidered by their own authors (Summers and Heston 1993). Maddison (1991, 1995), for example, rejected the implied modification of growth rates in national accounts and argued that the "consistentising" of the succesive ICP rounds is a more probable source of error than national accounts. In fact, Maddison (1995) advocates for an average of succesive ICP rounds if an average procedure is used, as preferable to the consistentising procedure carried out by Summers and Heston (1991).

This type of reasoning could be extended to less developed nations that offset their comparatively low price levels in services and construction with relatively high price levels in protected agriculture, rendering overall price levels not too far below those of advanced countries since in manufacturing, more exposed to international competition, price levels are not far away from those prevailing in the world market.[5] If this argument were accepted, the lack of correspondence for, say, 1913, between the country rankings resulting from PPP-adj usted levels of GDP at 1960 or 1990 dollars and the one obtained by converting income expressed in national currency into dollars at the current exchange rate should call for an explanation (see Table 3, cols. 1-4).

Moreover, the choice of a single ICP benchmark, i.e. 1970 or 1990, conditions a country's relative income level. In fact, Maddison (1995, Table C-10) shows that the widest range of variation between different ICP rounds can reach around 20% for Norway, Italy, Belgium, Germany or Ireland (some of the countries considered in this paper).

A SHORT-CUT APPROACH TO HISTORICAL PPP COMPARISONS

A short-cut solution to the historical comparability problem was suggested by Eichengreen (1986) but never put into practice. The proposal was to adopt the method Kravis, Heston and Summers (1978b) [KHS, thereafter] used to derive PPP-adjusted real product for non-benchmark countries in their cross-sectional dataset, to obtain analogous historical estimates. The KHS approach assumes for all countries a stable relationship between purchasing power parity- and trading exchange rate-converted income conditioned upon their degree of openness, relative to the star or reference country, to capturing structural change.[6] Arbitrary as it is, this assumption is less stringent that the one implicit in the usual backward projection of PPP-adjusted levels of present GDP to remote periods with no regard of structural transformation overtime. This short-cut approach has the advantage of allowing us to carry out cross-country comparisons of real product at current prices. Hence, it casts a more accurate economic picture of a country's relative position than

5. Crafts (1984a) pointed out that relative positions in 1970 dollars are not much different from those obtained at current exchange rates, and carried out comparisons of labour productivity in manufacturing for advanced European countries prior to World War I using trading exchange rates.

6. The approach was followed in revised form by Summers, Kravis and Heston (1980) and Summers and Heston (1984).

it is the case when a remote, constant PPP is used, since economic agents react to current and not to constant prices.

In PPP comparisons, transitivity and characteristicity (that is, the extent to which the sample of items price-compared and the weights used in the aggregation reflect those of the countries being compared (Kravis 1984:10), are in conflict, and they represent the trade off between the binary and multilateral approaches to PPP (Daban, Domenech and Molinas 1997). The lower the number of countries and the more homogeneous their expenditure patterns, the stronger will be the appeal of the binary approach. Characteristicity this case will prevail despite the fact that comparisons among countries will have to be carried out through each country's binary comparison to the reference country, the US, and the results will not always be transitive. In fact, only when Paasche PPPs are chosen and, therefore, Laspeyres value measures are obtained, transitivity will be kept within a star-country system (Kravis 1984:10).[7]

In pre-WWII studies and in most ICOP papers, PPPs are obtained through the binary approach that, despite failing to satisfy transitivity, additivity and country invariance conditions, provides a more clear economic meaning than Geary-Khamis (or EKS) multilateral PPPs (Maddison 1982). In the present case, a sample of countries from Europe and European off-shoots (plus Japan) are considered and, as Maddison (1982) pointed out, those are the nations whose tendencies to converge towards the star country's (the US) patterns of demand and productivity are stronger. Moreover, the data available for PPPs in 1950 and 1955 (Gilbert and Kravis 1954; Gilbert and Associates 1958) were derived through the binary method. Also, it should be beared in mind that the Laspeyres PPP-converted real product (that is, the one obtained through a Paasche PPP), in which each country's output is valued at prices of the star country, is the binary comparison that casts closer results to the multilateral Geary-Khamis PPP-converted per *capita* GDP, since in the latter countries are weighted according to size. However, both Paasche and Geary-Khamis PPPs tend to be vulnerable to the Gerschenkron or own weight effect, that is, the tendency for the quantity index to be lower the higher the correlation between its own price structure and the price structure used for valuation. The reason is that valuation by own prices leads to a lower aggregate

7. Transitivity through the star country, as in Paasche binary comparisons, represents, however, the disadvantage of making the results depend upon the selection of the base country. The ICP convention is to define Laspeyres and Paasche indices by regarding the higher income country in any pair of countries as the base situation (Kravis 1984: 8).

valuation because the set of quantities has adapted to this set of prices. A country tends to consume relatively more of those goods for which its prices are relatively low (Kravis 1984: 9).

Nevertheless, while current PPPs improve space comparability, it no longer allow one to carry out time comparisons. Such a problem was confronted by O'Brien and Keyder (1978) and Fremdling (1991), who constructed current PPPs for physical output. A possible way of circunventing it would be to deflate current PPP-converted GDP rendering constant price estimates of real product that, in turn, would permit us to carry out inter-temporal comparisons while maintaining unchanged each country's current price relative cross-sectional position. A volume series can be easily obtained by deflating current PPP-adjusted GDP values with the reference country's (US) implicit GDP deflator though, in purity, a volume series can only be derived with the star country's deflator when we are dealing with a Laspeyres value measure. Here there is a good reason to prefer Paasche to Laspeyres PPPs since using a Paasche PPP to convert GDP in national currency into comparable units, will cast a Laspeyres value measure "which values output in all countries at US prices" (Maddison 1995), that is, a price structure that corresponds to an identifiable reality (Maddison 1991).

Not everybody agrees with this approach to derive constant price estimates of PPP-adjusted GDP and their implicit rates of growth.[8] The short-cut approach presented here can be reconciled with the choice to keep unaltered the growth rates implicit in national accounts just by linking the constant-price series derived from historical national accounts to a PPP-adjusted real product benchmark closer to the period under study (i.e.,the 1913 PPP-adjusted per *capita* income if the late 19th century is being considered). In such a way, the approach will be similar to the one in place when 1970 or 1990 PPP dollars are used but the index number problem will be significantly reduced.[9]

8. Kravis and Lipsey (1991) argued that "the best general-purpose estimates of growth rates are those obtained from national accounts," while Isenman (1980:66) pointed out that "ICP prices do not appear useful either for resources allocation, or for measuring or comparing income growth rates." In fact, comparing two benchmarks is like comparing two current price values and the implicit growth rate between them is not expected to match the one computed from constant price values (Ahmad 1994).

9. This is the procedure favoured by Williamson (1995) to establish real wage time comparisons across countries.

REGRESSION ANALYSIS

The estimation procedure to establish a structural relationship between the PPP-adjusted GDP per head of each country, relative to the US, and the corresponding estimate using the trading exchange rate departs from KHS formulation in two aspects. First, in addition to the exchange rate-converted GDP and its quadratic term, and to each country's relative degree of openess (to the US), we added the latter's quadratic term. The adoption of a non-linear form is an attempt to capture a relationship that fades away over time, that is, it acknowledges a certain threshold above which an increase in the independent variable has a diminishing effect on the dependent variable. In terms of our regression, we should expect, as already posit by KHS, the more open the economy, the smaller the differential between PPP- and exchange rate-adjusted real product will be. Thus,

$$\text{In (RPPPY)j=a, ln(RXRY}_j\text{)+ a, (In RXRYj)}^2\text{+ a}_3\text{ (In ROPENP+ a}_4\text{ (In ROPENj)}^2 \quad [I]$$

where RPPPY is Laspeyres- (Paasche-) PPP converted product per head for each country j relative to the star country; RXRY is the corresponding relative GDP per head, converted into dollars at the trading exchange rate; ROPEN represents exports plus imports of goods as a ratio to GDP, measured at current prices (lack of historical data prevented to include services), and relative to the US ratio. Independent variables in the regresion have been transformed into natural logarithms. Attempts to capture differences in the structural relationship as a result of alternative monetary regimes (under Bretton Woods and after) yielded not statistically significant results.

A second difference to KHS method is that, instead of a cross-sectional analysis, we approach the estimation as a pooling of different cross-sections.[10] We take into account all the available information from ICP rounds I toVI covering an ever larger sample from 1967 to 1990, at roughly five year intervals (with the exceptions of 1967 and 1973), and from Gilbert and Associates

10. In the case where the largest set of countries is a priority, choosing the lattest and more sophisticated ICP round, as it is the case of Maddison's studies (1991, 1995), may be justified. In our present case, this choice is unclear since characteristicity prevails over transitivity, and more important, opting for a single benchmark implies a loss of information given the fact that, from the point of view of indirect estimation of PPPs for earlier periods, all information from different ICP rounds, starting in the 1950s should be considered. As Summers and Heston (1993: 359) put it, "we should view the results of succesive benchmark comparisons as informing us about the relative positions of the countries throughout the period covered."

(1958) for 1950 and 1955. Hence, we allow for changes in the relationship between PPP- and exchange rate-convertedper *capita* income overtime, as opposed to KHS who only concentrated on its cross-sectional variation. Our estimation with panel data techniques has the advantage of increasing the degrees of freedom and, therefore, the robustness of the resulting parameters.'

The sample of countries considered here (Table 1) includes all OECD members for which benchmark estimates were derived by Gilbert's team and by the different ICP rounds, with the exception of Turkey, because of lack of historical data, and the addition of Argentina, an area of new settlement that completes this group of countries (Australia, New Zealand, Canada). Thus, we tried to restrict the sample so differences in economic organisation and culture were reduced even though income, climate, and dependence on trade vary significantly across the sample.

The regression results have been obtained through generalised least squares (GLS), and are reported in Table 2. By applying the parameters obtained from equations (I) and (II) to the value of each independent variable over time, current PPP-adjusted levels of product per head relative to the US are obtained and, then, absolute values can be derived by applying them to the US levels of GDP per head. Here, the potential user of the new comparative levels should be warned, as Kravis (1984:18) already pointed out about ICP extrapolations to non-benchmark countries, that "on average, the short-cut estimates [...] come closer to the truth than exchange-rate conversions .The difficulty is that the margins of error [...] still create a degree of uncertainty about relationships among individual countries that may be deemed unacceptable for some operational purposes." However, a measure of the estimation error can be computed when the estimating procedure for non-benchmark countries is applied to benchmark countries (Table 1) and the forecasted results compared to the actual ones (Summers and Heston 1984: 218).

11. For this kind of panel data estimate, using binary comparisons has the additional advantage of avoiding the incomparability problem of the multilateral approach that emerges when country coverage changes over time since, in the latter, a set of countries is compared simultaneously and, therefore, addition and deletion of countries alter the relationship between two countries (Ahmad 1994: 57-60).

THE NEW GDP DATA SET: HOW DOES IT CHANGE THE PICTURE FOR 1913?

A way of testing the new short-cut approach to real product comparisons is to show the results for the eve of World War I, a date used as a reference year in many historical studies.The outcome from our exercise for 1913 is presented in Table 3 (col. II) that shows levels product per head, relative to the US, expressed in current PPP dollars. The new figures have been obtained by converting each country' own currency GDP into PPP-adjusted US dollars. In this case, Fisher relative levels of real product, computed as a geometric average of the Laspeyres and Paasche relative income levels estimated from equations (I) and (II). [n]

A sinthetic way of presenting these provisional results is by setting them against available comparative GDP estimates such as Bairoch (1976) and Maddison (1995)'s latest vintage of constant-price dollar estimates (PPP adjusted).[13] We also added a set of GDP in US dollars derived through the trading exchange rates to the comparison.

The comparison of alternative PPP-adjusted product per head estimates to the corresponding exchange-rate converted output provides some interesting information about relative price levels. PPP-adjusted product above (below) the exchange-rate converted product implies a lower (higher) price level for the country under study relative to the star country (the US). According to the literature examined in Section I of the paper, the relative position of a country expressed in PPP-converted dollars should improved relative to its own position converted in common currency units through the trading exchange rate, provided the country is poorer than the reference country, the US. Nonetheless, it could be the case that despite its relative backwardness a stronly protectionist country would have high price levels relative to the star country (Table 3, cols. V-VII).[14] Levels of average nominal protection figures (Bairoch 1989) help to explain that poor but protectionist countries such as Russia, Bulgaria or Greece (and to less extent Spain) do not improve their position in PPP estimates (col. II) compared to trading exchange rates (col. I) as much

12. It should be bome in mind that Laspeyres and Fisher real product tend to cast closer results to those of modern Geary-Khamis and EKS real product series, respectively (Maddison 1995).

13. A previous conversion was required to trasform Maddison's international dollars, derived from Geary-Khamis PPP converters, into Fisher PPPs. Maddison (1995: Table C-6) provides the appropriate ratios for the conversion.

14. This is the case of Southern European agriculture in the eve of World War I, when refered to the UK (O'Brien and Prados de la Escosura 1992).

as other countries in the same range *of per capita* product such as Finland, or Hungary, because apparently their domestic price levels are relatively high. The opposite happens for rich but free trade countries such as Switzerland, Belgium and the Netherlands or Sweden. A few points could be made about the alternative comparative GDP sets.

1) Country rankings (italic figures in brackets for each column) vary according to which data set we choose to carry out international comparisons. In addition, the degree of (sigma) convergence, as measured by the coefficient of variation, also changes with each dataset. The new estimates shows the stronger convergence for the whole sample (c.v. 0.34 against 0.43 (Maddison) and 0.54 (exchange rate)) and for the European group of countries (c.v. 0.27 against 0.39 (Maddison), 0.37 (Bairoch) and 0.40 (exchange rate)). A closer looks reveals that the difference lies in the new dataset's closer convergence among the richest (9) European countries (c.v. 0.07 against 0.18 (Maddison), 0.17 (Bairoch) and 0.14 (exchange rate)) whereas for the 10 poorest European countries the differences are much narrower.[15] The obvious implication is that the new PPP-adjusted country ranking suggests that a convergence club of rich European nations was already formed (and it would not change its membership a great deal over the 20th century!).

2) However, top and bottom countries in the ranking remain the same in all alternative estimates, stressing the favourable position of countries in the areas of new settlement and the backward position of countries in the geographical periphery of Europe. It is worth stressing the advantage of the areas of new settlement. It could be argued that the pattern of comparative advantage described by Wright (1990) for the US, emphasising the intense use of natural resources as a differential element in US supremacy should be extended to the areas of new settlements.

3) US leadership is reinforced by the new estimates, with Britain already far behind, contradicting Maddison's view. In turn, France's position, though unaltered relative the US with respect to earlier estimates, gets closer to Britain and Germany. Thus, in terms of real product per head, the French were only slightly below (11%) the British and above (6%) the Germans in the eve of World War I, contradicting the view shared by Bairoch, Crafts (1984a) and

15. The narrower coefficient of variation is not explained by Britain's relative position. When Britain is excluded, c.v. values are 0.05 for the new dataset versus 0.10 (Maddison), 0.13 (Bairoch) and 0.08 (exchange rate).

Maddison, while providing support for the revisionistic picture drawn by O'Brien and Keyder (1978).[16]

4) The main question is, however, which one among the available estimates is the most reliable?. An indirect way to get an answer is to take a look at the comparative price levels (CPL), that is, the ratio of PPP to trading exchange rates (Table 3, cols V-VII). It has been argued that CPLs are "a rising function of the development stage" (Summers and Heston 1991), and, as discussed above, that market exchange rates tend to exaggerate the price levels for low income countries. In fact, the new CPLs (col V) show that this is generally the case though it requires some qualifications. Higher price levels in the Americas and Oceania are probably related to labour being the scarce factor of production.[17] In turn, isolation behind trade barriers help to explain relatively high price levels in some Peripheral countries (Spain, Greece, Bulgaria, Russia). If we turn now to Maddison's implicit CPLs (col. VI), some striking results appear. For example, Britain, Belgium, the Netherlands and Switzerland show implicit price levels ranging from one-forth to more than one-third below the one prevailing in the US, that is, a quite implausible result for advanced and open economies in 1913. It seems, therefore, that the new results are, at least, more economically sound than earlier one.

FINAL REMARKS

In the paper we have presented a new set of GDP estimates converted into common currency units that derive from a short-cut method to derive current price comparisons in periods for which aggregate PPPs are not available yet. The new results, alternative to well known sets by Bairoch (1976) and Maddison (1995) expressed in present-day constant dollars, can be adopted as a less remote benchmark from which to carry out constant price time comparisons and, therefore, allow us to perform better comparisons across countries and over time.

16. It must be acknowledged, however, that the new GDP estimates by Toutain (1997) do contribute to the French improvement substantially, though they are already included in Maddison (1995).

17. The mechanism through which labour scarcity affects prices is a simple one. Wages in the non-traded sector adjust to those in the tradeable sector that are set according to their relative productivity, and the implied higher costs derived from higher wages in the non-traded sector reflect upon higher prices (Eichengreen 1986).

APPENDIX

Table 1. *Sample of Countries for which PPPs are Available, 1950-1990.*

	1950	1955	1967	1970	1973	1975	1980	1985	1990
Argentina							x		
Australia								x	x
Austria						x	x	x	x
Belgium	x	x		x	x	x	x	x	x
Canada							x	x	x
Denmark	x	x				x	x	x	x
Finland							x	x	x
France	x	x		x	x	x	x	x	x
Germany	x	x		x	x	x	x	x	x
Greece							x	x	x
Ireland						x	x	x	x
Italy	x	x		x	x	x	x	x	x
Japan			x	x	x	x	x	x	x
Netherlands	x	x		x	x	x	x	x	x
New Zealand								x	x
Norway	x	x					x	x	x
Portugal							x	x	x
Spain						x	x	x	x
Sweden								x	x
Switzerland									x
UK	x	x	x	x	x	x	x	x	x
US	x	x	x	x	x	x	x	x	x

Sources: 1950-1955, Gilbert and Assoc. (1958), Table 5; 1967, Kravis, Kenessey, Heston and Summers (1975), Tables 13.12,13.14; 1970-1973, Kravis, Summers and Heston(1978), Chapter 5; 1975-1990, Maddison (1995), Tables C-2 to C-6.

Table *2. Regression Results (Estimation method: GLS).*

DEPENDENT VARIABLE: Equation (I) Laspeyres PPP-adjusted GDP per head
Equation (II) Paasche PPP-adjusted GDP per head

Eq	constant	RXRY	RXRY2	ROPEN	ROPEN2	AR(1)	Obs Adj	R^2	DW	F-start
I	-0.3837	0.3907		0.2909	-0.0808	0.5418	97	0.8715	2.0803	163.7
	(0.0449)	(0.0213)		(0.0595)	(0.0226)	(0.0930)				
II	-0.7396	0.4033	-0.1059	0.5939	-0.1868	0.4205	97	0.8757	2.1188	136.3
	(0.0599)	(0.0550)	(0.0397)	(0.0831)	(0.0314)	(0.1072)				

Note: All variables expressed in natural logarithms. RXRY is *GDP per capita* converted into US dollars at the trading exchange rate, and ROPEN the openness ratio (commodity exports and imports ratio to GDP), both relative to the US. RXRY2 and ROPEN2 are their quadratic terms. Standard errors in brackets.

Table 3. *Relative GDP per Head and Comparative Price Levels [CPL] in 1913: Alternative Estimates.*

	GDP per Head [US=1]			Comparative Price Levels**			
	[I] Exchange Rate	[II] Fisher New	[HI] PPP Maddison	[IV] Bairoch*	[V] log I/II	[VI] log I/III	[VII] log I/IV
Australia	1.07(7) 1	0.81(2)	1.02(7)	—	0.28	0.05	—
US[a]	1.00(2)	1.00(7)	1.00(2)	1.00(7?)	0.00	0.00	0.00
Canada[b]	0.97(5) \	0.79(4)	0.79(5)	—	0.20	0.20	—
New Zealand[c]	0.97(4)	0.81(3)	0.96(3)	—	0.18	0.01	—
Britain[d]	0.75(5)	0.72(5)	0.92(4)	0.76(5?)	0.04	-0.22	-0.05
Argentina[e]	0.67(6)	0.69(6)	0.57(73)	—	-0.03	0.16	—
France[f]	0.64(7)	0.64(8)	0.64(77)	0.52(72)	0.00	0.00	0.21
Belgium[g]	0.58(5)	0.63(9)	0.77(7)	0.60(5)	-0.08	-0.28	-0.03
Denmark	0.58(5)	0.65(7)	0.67(70)	0.59(9)	-0.11	-0.14	-0.02
Norway	0.54(70)	0.63(9)	0.40(77)	0.42(75)	-0.15	0.30	0.25
Switzerland	0.53(77)	0.62(77)	0.78(6|	0.64(7)	-0.16	-0.37	-0.17

	GDP per Head [US=1]			Comparative Price Levels**			
	[I] Exchange Rate	[II] Fisher New	[HI] PPP Maddison	[IV] Bairoch*	[V] log I/II	[VI] log I/III	[VII] log I/IV
Germany[h]	0.53(77)	0.60(72)	0.72(9)	0.58(70)	-0.12	-0.31	-0.09
Netherlands[i]	0.52(73)	0.55(74)	0.73(8)	0.55(77)	-0.06	-0.34	-0.06
Swedek[j]	0.50(74)	0.60(72)	0.57(73)	0.48(73)	-0.18	-0.13	0.04
Ireland[k]	0.40(75)	0.52(75)	0.50(75)	—	-0.26	-0.25	—
Austria[1]	0.35(76)	0.50(76)	0.64(77)	0.35(74)	-0.36	-0.31	-0.15
Italy[m]	0.34(77)	0.44(77)	0.45(76)	0.34(77)	-0.26	-0.28	0.00
Spain[n]	0.33(75)	0.42(79)	0.40(77)	0.31(7S)	-0.24	-0.19	0.06
Finland[o]	0.27(79)	0.44(77)	0.37(20)	0.35(76)	-0.49	-0.32	-0.26
Greece[p]	0.26(20)	0.35(22)	0.28(21)	0.26(79)	-0.30	-0.07	0.00
Hungary[0,]	0.23(27)	0.36(27)	0.38(19)	—	-0.45	-0.50	—
Portugal[r]	0.22(22)	0.37(20)	0.23(25)	0.25(20)	-0.52	-0.04	-0.13
Bulgaria[p]	0.21(23)	0.29(23)	0.27(23)	0.24(27)	-0.32	-0.25	-0.13
Russia[s]	0.17(24)	0.24(25)	0.28(27)	0.24(27)	-0.34	-0.50	-0.34
Japan	0.13(25)	0.27(24)	0.24(24)	—	-0.73	-0.61	—

Notes: *Countries from areas of new settlement are arbitrarily assumed to be among the top 5 richest nations in column IV to make its ranking comparable to cols. I-III.
** CPL=(NGDP/XR)/(NGDP/PPP)=PPP/XR, where NGDP is GDP expressed in national currency and PPP and XR are purchasing power parity and trading exchange rates. Comparative price levels are computed for the relevant geographical definitions in each column.

Sources: Column [I], trading exchange rates, League of Nations (1924-26).
Column [III], Maddison (1995), 1990 US$.
Column [IV], Bairoch (1989), 1960 US$. National estimates for cols. I and II are, whenever possible, defined as GDP at market prices per head and come from the following sources otherwise from Mitchell (1992, 1993, 1994):

a Balke and Gordon (1989).
b Urquhart (1986).
c Rankin (1992).
d GDP levels for Britain have been obtained by deducting Ireland's estimate by O Grada (1994) from Feinstein (1972) figures for the UK (expenditure side). For the UK as a whole, cols. I and II have values of 0.72 and 0.71, respectively. Col. IV (Bairoch) uses UK definition.In turn, col. Ill (Maddison), considers post-1921 UK (Great Britain and Northern Ireland). Corresponding values can be computed for cols. I and II by substracting data

for the Republic of Ireland (see below) from Feinstein's figures for 1913 UK (Britain and Ireland), and the outcome is 0.74 and 0.72, respectively.

e Cortes Conde (1997), for 1914.

f Toutain (1997).

g HorUngs (1997).

h Hoffmann (1965), NNP at market prices upwardly adjusted to obtain GDP with the ratio GDP/NNP for 1950. If NNP is used, cols. I and II are 0.50 and 0.59, respectively.

i Smits, Horlings and van Zanden (1997). GDP estimates from the income side. The authors (pp. 44-45) consider the expenditure series more reliable than the output or income ones but point out that the expenditure levels for 1913 are too low. When an average of the three GDP estimates is considered, values for cols. I and II are 0.46 and 0.51, respectively.

j Krantz (1997).

k 6 Grada (1994), data for all Ireland. Kennedy's (1994) ratio for the Republic of Ireland has been applied to all Ireland's figures, and the resulting values for cols. I and II are 0.39 and 0.52.

1 Schultze 1997 for Imperial (Habsburg) Austria. Modern (Republic of) Austria's level can be derived with Good (1994) ratio (1.35), and the values for cols. I and II are 0.47 and 0.58. Col. Ill (Maddison) considers Modern Austria; with the same method and data.the level would fall to 0.41 for Imperial Austria. In col. IV (Bairoch), Austria-Hungary is the relevant definition.

m Rossi, Sorgato & Toniolo (1993).

n Prados de la Escosura (1997).

o Hjerppe(1994).

p Clark (1957).

q Eckstein (1955) data for the treaty of Trianon (1919) Hungary.

r I prefered Batista, Martins, Pinheiro and Reis (1996)'s provisional estimates of real output, reflated with Portugal's wholesale price index (Mata and Valeriol 994: 279-280), to both Justino (1987) and Nunes, Mata & Valerio (1989), who for cols. I and II cast values of 0.18 and 0.33, and 0.39 and 0.42, respectively.

s Gregory (1981) for Imperial Russia.

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