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Klasing, Mariko J.; Milionis, Petros

Published in:
Journal of International Economics

DOI:
10.1016/j.jinteco.2013.10.010

Publication date:
2014

Quantifying the Evolution of World Trade, 1870-1949

Mariko J. Klasing* Petros Milionis†

University of Groningen University of Groningen

September 2013

Abstract

The typical narrative regarding the evolution of world trade prior to World War II refers to a secular rise starting around 1870 and a subsequent collapse beginning in 1914. This narrative, however, is based on measures of trade openness that do not fully take into account purchasing power differences across countries. Due to lack of alternative data, the measures employed in the existing literature are typically based on non-PPP-adjusted trade data denominated by PPP-adjusted GDP data. The present paper seeks to resolve this inconsistency by constructing new trade share estimates for 62 countries, representing 90% of world GDP, for the period from 1870 to 1949. Our estimates combine historical import and export figures with non-PPP-adjusted GDP values that we estimate via the "short-cut" method. Our estimates confirm qualitatively the narrative of a dramatic rise and fall of world trade over this period. Yet, they indicate that this rise and fall was quantitatively much more pronounced. We find that trade shares were on average 38% higher than previously documented, while the world's level of trade openness in 1913 was comparable to that in 1974.

Keywords: International Trade, Purchasing Power Differences

JEL Classification: F01, F15, N10, N70.

*Department of Global Economics & Management, Faculty of Economics & Business, University of Groningen, PO Box 800, 9700 AV Groningen, The Netherlands, e-mail address: m.j.klasing@rug.nl.

†Department of Economics, Econometrics & Finance, Faculty of Economics & Business, University of Groningen, PO Box 800, 9700 AV Groningen, The Netherlands, e-mail address: p.milionis@rug.nl.

1 Introduction

Is the recent globalization movement that the world has witnessed a singular experience or does it relate to pre-existing trends that came to a halt by the two world wars and the turbulent interwar period? This question has been raised by various authors who have often compared the post-1950 globalization experience to that of the late 19th and early 20th century, and the backlash that followed it.[1] A precise comparison between these eras, though, requires a careful quantification of how open the world economy was prior to World War II. The present paper offers the first systematic attempt to quantify trade openness for a large number of countries between 1870 and 1949 in the same way that is normally done for the post-war era.

As with the study of any historical period, an assessment of the degree of trade openness for the years from 1870 to 1949 is constrained by the incompleteness of the available data. As a consequence, existing work that has attempted to measure and explain pre-1950 trade shares of different countries has typically been forced to combine available export and import data with the GDP data of Maddison (2001). The former are expressed in current prices and are non-PPP-adjusted –i.e. not adjusted for purchasing power differences across countries; the latter are measured in constant 1990 prices and are PPP-adjusted. While using available information on the evolution of inflation in the United States, the benchmark country, allows for the conversion of the constant-price GDP series of Maddison into corresponding current-price ones, this does not make the GDP and trade data fully comparable. This is because the GDP data are corrected for purchasing power differences across countries, while the trade data are not.[2]

Although the issue of making the data comparable in terms of purchasing power might appear secondary to the necessary correction for inflation, not accounting for it will lead to systematic biases. This is due to the well-known fact that price levels across countries vary systematically with the level of economic development.[3] In particular, it is a well-established fact that during the period 1870-1949 price levels in the great majority of countries were lower than in the United States.[4] This implies that the PPP-adjusted GDP levels of those countries are higher than their corresponding non-PPP-adjusted ones. Hence, when PPP-adjusted GDP data are used instead of non-PPP-adjusted ones to denominate trade flows, the resulting trade shares will appear lower than they actually are.

To correct for this bias, in the present paper we calculate trade shares for the largest-possible number of countries during the years from 1870 to 1949 based on non-PPP-adjusted GDP data

[1] See, for example, the comparisons offerred by Krugman (1995), O'Rourke and Williamson (1999), Estevadeordal, Frantz, and Taylor (2003), Obstfeld and Taylor (2004) and Jacks, Meissner, and Novy (2011)

[2] Examples of authors who have employed data that are not comparable in purchasing power terms include Estevadeordal, Frantz, and Taylor (2003), Lopez-Cordova and Meissner (2003) and Jacks, Meissner, and Novy (2011).

[3] Kravis (1984) and the extensive literature on international comparisons have made this point forcefully.

[4] See Chen, Choi, and Devereux (2008) and the discussion in Section 2.

that we estimate via the "short-cut" method. This method, which was widely used at times when internationally comparable national accounts data were more scarce, enables the prediction of non-PPP-adjusted GDP from PPP-adjusted GDP data and vice versa. Employing this method, which is further explained in Section 2, we obtain estimates of non-PPP-adjusted GDP for the period of interest for 70 countries based on the PPP-adjusted GDP figures of Maddison (2001). Given the availability of historical export and import data from Barbieri, Keshk, and Pollins (2009), this allows for the consistent calculation of trade shares for 62 countries, representing 90% of world GDP.

To assess the quality of our estimated GDP series and the corresponding trade shares, whenever possible, we compare them with actual historical GDP series, as reported in national accounts statistics. For the years prior to 1949, we were able to assemble such series for a small set of 16 countries from various sources, which are listed in the appendix. For this small sample of countries, as we document in Sections 2 and 3, we find that our estimated GDP values are remarkably close to the actual reported ones. Moreover, we also compare our non-PPP-adjusted GDP and trade share estimates with those obtained in case no corrections for purchasing power differences are made. This latter comparison reveals, as expected and explained above, that not correcting for such differences leads to a substantial underestimation of trade openness. Specifically, looking at our sample of 62 countries, we find that trade shares during the period 1870-1949 were on average 38% higher than previously thought.[5]

Having established the quality of our estimated trade shares, in Section 3, we proceed to discuss what they imply for the evolution of world trade prior to World War II. In this context, we first document that overall both the expansion of international trade from 1870 to 1913 as well as its subsequent retreat appear qualitatively similar, yet quantitatively more pronounced compared to what the existing literature has suggested. Specifically, we find that the share of world trade was approximately 18% in 1870, increased to 30% in 1913, collapsed to 10% in 1932, and had just returned to 16% by 1949. This implies that the world's level of trade openness during the height of the first globalization era was comparable to that observed in the mid 1970s. Moreover, tracking the behavior of our trade share estimates across various regions of the globe, we document different regional patterns. In particular we find that the pre-World-War-I trade expansion was greatest among Western European economies and that the trade collapse that followed World War I was strongest in Western Europe and Latin America.

[5] As we further explain in Section 3, this discrepancy differs across countries and time. Specifically, the discrepancy is larger for poorer countries as well as for the years prior to World War I.

2 Estimating Non-PPP-adjusted GDP

2.1 The "Short-Cut" Method

A correct calculation of historical trade shares based on current-price non-PPP-adjusted trade data requires a corresponding set of GDP data expressed in the same units. Such information, however, is currently only scarcely available. As we discuss below and further document in Appendix A.1, we were able to obtain such figures from various sources only for the United States and 16 additional countries.[6]

To avoid this data limitation problem, we employ the "short-cut" method in order to predict non-PPP-adjusted GDP from the available information on PPP-adjusted GDP reported by Maddison (2001). This method has a long tradition in the literature on international comparisons, going back to the work of David (1972) and Kravis, Heston, and Summers (1978), and was recently revived by Prados de la Escosura (2000).[7] Its rationale is to exploit the existence of a fundamental structural relationship between per-capita GDP in PPP-adjusted and non-PPP-adjusted terms, which is stable across countries and time.

The posited relationship arises from the basic fact that the ratio of nominal to real GDP per capita in a given country at any point in time –when each is expressed relative to a benchmark country– reflects the country's general price level vis-à-vis that of the benchmark country. This ratio in turn depends on the relative price levels of the country's traded and non traded goods. The former tends to approach unity with international competition, while the latter depends on the country's relative income level, as the Balassa-Samuelson theorem predicts.[8] As a result, the overall price level of a country –and thus its ratio of nominal to real per-capita GDP– should vary with the country's level of economic development and its degree of exposure to international price competition. Thus, the theorem implies the existence of a direct link between relative PPP-adjusted per-capita GDP and non-PPP-adjusted per-capita GDP.

Denoting with $y_{i,t}^{PPP}$ the current-price value of PPP-adjusted GDP per capita of a country i in period t relative to the benchmark country –which in the context of our analysis we take to be the United States– and with $y_{i,t}^{non-PPP}$ the corresponding current-price value of non-PPP-adjusted GDP per capita, the "short-cut" method posits that,

$$y_{i,t}^{non-PPP} = f(y_{i,t}^{PPP}, PI_{i,t}), \tag{1}$$

with $PI_{i,t}$ being a measure of country i's degree of price isolation from the rest of the world in

[6] These 16 countries consist of Australia, Belgium, Canada, Denmark, Finland, France, Honduras, Japan, Korea, Mexico, the Netherlands, South Africa, Spain, Sweden, Taiwan and the United Kingdom. Information on the sources and the exact length of each country's series is available in Appendices A.1 and A.2 respectively.

[7] Kravis, Heston, and Summers (1978), for example, employed this method to predict PPP-adjusted GDP per capita for more than 100 countries using information from a sample of 16 countries.

[8] See Balassa (1964) and Samuelson (1964).

period t.[9] Assuming this relationship to be approximately log-linear, we parametrize expression (1) as:

$$\ln y_{i,t}^{non-PPP} = \alpha + \beta_1 \ln y_{i,t}^{PPP} + \beta_2 (\ln y_{i,t}^{PPP})^2 + \beta_3 \ln Pop_{i,t} + \beta_4 \ln Area_i + \beta_5 \ln OP_i^{FR} + \varepsilon_{i,t}. \quad (2)$$

In the above equation, the degree of relative price isolation of country i in period t is reflected in its relative population, $Pop_{i,t}$, land area, $Area_i$, and its natural level of openness to trade determined by its geographic characteristics, OP_i^{FR}, as constructed by Frankel and Romer (1999).[10] We further include the squared term of $\ln y_{i,t}^{PPP}$ in our preferred specification in order to capture the presence of non-linearities in the relationship between the two notions of per-capita GDP. As we discuss below and document in Table 1, there is strong evidence favoring the inclusion of this squared term that captures differences in the degree of price dispersion present at different levels of economic development.

2.2 "Short-Cut" Estimation Results

We estimate equation (2) using data on PPP- and non-PPP-adjusted GDP per capita in current prices from Penn World Tables from the period 1950-1990, following Prados de la Escosura (2000). Specifically, we pool all observations in a unique cross-section and perform generalized least squares estimations.[11] The results of our estimations are reported in Table 1.

[Insert Table 1 (Short-Cut Estimation Results) here]

Column 2 of Table 1 reports the estimation results for equation (2), while columns 1 and 3 report the corresponding results if the quadratic term for PPP-adjusted GDP is omitted or if a cubic term is included as well. As the results indicate, both the linear and the quadratic term are statistically significant, while the cubic term is insignificant. The positive coefficients on the income terms indicate that on average more developed countries –i.e. countries with a higher level of PPP-adjusted per-capita GDP relative to the United States– have ceteris paribus also a higher relative level of non-PPP-adjusted income and therefore higher prices, confirming the Balassa-Samuelson theorem. Moreover, the positive coefficient on the second order income term indicates that the degree of relative price dispersion is greater among relatively more developed economies.

The coefficients on the remaining variables imply that, conditional on their relative level of economic development, countries that are compared to the United States bigger, less populous,

[9] We should note here that the basic relationship underlying the "short-cut" method can be also considered with $y_{i,t}^{PPP}$ as the dependent variable. Yet, as Kravis, Heston, and Summers (1978) emphasize, it is more appropriate in terms of causality to interpret equation (1) implying a link from $y_{i,t}^{PPP}$ to $y_{i,t}^{non-PPP}$, as we do.

[10] All three variables are expressed relative to the corresponding values of the U.S..

[11] The advantage of using generalized least squares is that it allows us to account for autocorrelation within panels as well as heteroscedasticity across panels present in the data.

and in terms of geographic characteristics more open to trade tend to have higher levels of non-PPP adjusted income and hence higher price levels. Thus, our results are overall in line with the patterns of international price level differences discussed in Clague (1986) and Kravis and Lipsey (1988). Finally, as the adjusted R-squared coefficients reveal, the simple specification of (2) seems to capture well the variation present in the data.[12]

To ensure, however, that our parametrization of expression (1) fits the data sufficiently well, in column 4 we also report the results from an estimation of a semi-parametric specification where the relative PPP-adjusted income variable is allowed to take a non-parametric form.[13] As the result of the specification test of Haerdle and Mammen (1993) in the bottom of column 4 reveals, the null-hypothesis that the semi-parametric specification does not yield a better fit than our second-order polynomial parametric specification cannot be rejected. Thus, specification (2) constitutes a valid approximation of the non-linear relationship between the logarithms of relative PPP- and non-PPP-adjusted per-capita GDP.

Even though equation (2) seems to be capturing most of the variation in non-PPP-adjusted per-capita GDP across countries and time for the 1950-1990 period, some additional flexibility in the specification may be useful. This is because our ultimate goal is to use the estimated relationship to predict non-PPP-adjusted GDP for the pre-1950 period from the available PPP-adjusted GDP figures of Maddison (2001). With that in mind, in column 5 of Table 1 we allow the estimated relationship between PPP- and non-PPP-adjusted GDP per capita to differ for countries that are at different stages of economic development. Specifically, we include a "Periphery" dummy variable which equals 1 if a country's level of PPP-adjusted GDP per capita in a given year is less than or equal to one half of that of the United States and 0 otherwise. To capture the various ways in which the peripheral status of an economy could matter in this context, we allow the dummy variable to influence both the intercept as well as the coefficients on the two income variables.

As column 5 indicates, the effect of the peripheral status seems to be primarily operating through the slope coefficients. In particular, controlling for their level of PPP-adjusted income and other characteristics, peripheral economies do not seem to have lower prices per se. However, the positive relationship between relative PPP-adjusted and non-PPP-adjusted income as well as the degree of convexity of this relationship appear stronger in peripheral economies. The inclusion of the "Periphery" dummy allows us to capture these effects.

Apart from the level of economic development, the relationship between PPP- and non-PPP-adjusted income is likely to depend also on the state of the world payments system, as has been argued by Prados de la Escosura (2000). This can be easily assessed in the context of our sample

[12] Adjusted R-squared coefficients in the case of GLS can be calculated in multiple ways. Here, the coefficient corresponds to the squared correlation coefficient between the predicted value of $y_i^{non-PPP}$ and its observed value.

[13] This semi-parametric specification is estimated using Robinson's (1988) double residual semiparametric regression estimator.

that encompasses both the more stable –in terms of exchange rate volatility– Bretton Woods era as well as the more turbulent post-1970 era. In column 6, we therefore introduce a second dummy variable labelled "Currency Regime," which takes a value of 1 during the years in which the Bretton Woods monetary system was in place (1946-1971) and a value of 0 otherwise.[14] We also interact this dummy variable with both the first and second order income terms to capture differences in the relationship between PPP- and non-PPP-adjusted GDP across the two regimes.

The results displayed in column 6 indicate differences both in terms of the intercepts and the slopes of our estimated relationship across the two exchange rate regimes. The negative coefficients on the dummy variable and on the interactions with the two income terms indicate that, ceteris paribus, during the Bretton Woods era, relative non-PPP-adjusted income levels were on average lower and the positive relationship between PPP-adjusted and non-PPP-adjusted income weaker. These results appear consistent with the greater relative price stability observed under the Bretton Woods system and justify the inclusion of the "Currency Regime" dummy variable in the specification.

Given the significance of both the "Periphery" and the "Currency Regime" dummies and their corresponding interaction terms with the first and second order income variables, in column 7, we present estimation results when both dummy variables and the corresponding interaction terms are included. As we can see, the estimated coefficients are consistent with those reported in columns 5 and 6 and with the above discussed interpretations. Moreover, as the adjusted R-squared coefficient reveals, this model yields an even better fit of the data than the previously discussed ones.

To assess the quality of the overall fit of this last specification, in column 8, we document once again the estimation results from a semiparametric specification where the level of PPP-adjusted relative per-capita GDP enters the regression in a non-parametric form, while the remaining control variables and interaction terms are identical to the ones reported in column 7. Just as in column 4, the Haerdle and Mammen test statistic reassuringly does not indicate any evidence of a superiority of the semiparametric specification. Therefore, in what follows, we will be focusing on the specification shown in column 7, which is simple, yet flexible enough, in order to make predictions for non-PPP-adjusted GDP prior to 1950.

2.3 Non-PPP-adjusted GDP Estimates, 1870-1949

Having estimated the relationship between non-PPP-adjusted GDP per capita, PPP-adjusted GDP per capita, and other variables capturing each country's degree of price isolation for the period 1950-1990, we now turn to use the estimated coefficients in order to make out-of-sample

[14] Exploiting the fact that not all countries participated in the Bretton Woods system or joined it at the same time, we can further refine this dummy to allow for variation across countries and time. However, given that this refinement does not affect our results, we opted to let the "Currency Regime" dummy only vary across time.

predictions for the preceding eight decades. Before doing so, however, it is important to understand and validate –to the extent possible– the rationale behind this approach. The main underlying assumption here is that the estimated relationship captures well the main determinants of international price differences not only for the 1950-1990 period, but also during the late 19th and early 20th century.

Although this assumption cannot be explicitly tested, we can offer an implicit validation by investigating the stability of the estimated relationship across time. For this purpose we re-estimate our preferred specification, shown in column 7 of Table 1, this time dropping the "Currency Regime" dummy, which only varies across time, and including instead decadal dummy variables. The decadal dummy variables are interacted with all remaining regressors and their statistical significance is then assessed. The results of this estimation are reported in Table 2, which lists for each variable the estimated coefficient in column 1, the corresponding standard error in column 2, and in colum 3 the p-values of the test that the interaction terms of these variables with the decadal dummy varibles are jointly significant.

[Insert Table 2 (Stability of Coefficients) here]

As one can see, the estimation results are not only similar to those shown in Table 1 column 7, but there is strong evidence that the coefficients are stable over time. Specifically, for all regressors, apart from the intercept and the interaction terms with the otherwise insignificant Frankel-Romer trade share, the respective p-values do not lent any support to the hypothesis that the coefficients vary across decades. Moreover, what the estimated values for the decadal dummies indicate is just a lower intercept during the 1950s and 1960s relative to the 1970s and 1980s. This effect is exactly what was originally captured by our "Currency Regime" dummy variable, which in Table 1 was estimated to be negative and which is excluded from the estimated specification in Table 2 because of collinearity.[15] In short, Table 2 provides strong evidence that our preferred specification shown column 7 of Table 1 is flexible enough to capture the main determinants of relative price differences across countries and time, and can thus be used to make out-of-sample predictions.

To make these predictions based on the coefficients estimated in column 7 of Table 1, we have to extend the series for each regressor to cover the period 1870-1949. PPP-adjusted GDP and population data for this earlier period are taken from Maddison (2001). Given that the main explanatory variable in our estimated relationship is relative PPP-adjusted per-capita GDP expressed in current-prices, while Maddison's original GDP figures are expressed in constant 1990 prices, we convert Maddison's per-capita GDP series into corresponding current-price series by

[15] Note that the point estimates of the decadal dummy coefficients for the 1950s and 1960s are -0.136 and -0.10 respectively, which are very similar to the "Currency Regime" dummy coefficient of -0.122 estimated in column 7 of Table 1. Moreover, the hypotheses that the two decadal dummy coefficients are identical to one another and equal to -0.122 cannot be rejected.

inflating them with the U.S. Consumer Price Index.[16] The "Periphery" dummy variable is also extended based on Maddison's per-capita GDP data, while for the extension of the "Currency Regime" dummy variable we follow the rationale of Prados de la Escosura (2000). Specifically, we assign a value of 1 to the classical gold standard period (1870-1913) and the early Bretton Woods years (1946-1949), which were both characterized by fixed exchange rates, and a value of 0 to all remaining years during the world wars and the interwar period. Finally, in the cases of countries that have undergone large areal changes, we adjust the land areas accordingly.

Following this approach, we can construct estimates of non-PPP-adjusted GDP per capita in current prices relative to the United States and implied PPP factors for 70 countries spanning the period from 1870 to 1949.[17] Out of these 70 countries, we are able to obtain complete 80-year-long time series for 59 countries and long series with more than 30 years of observations over the post-1900 period for additional 5 countries.[18] The resulting sample is also representative. It corresponds to more than 90% of world GDP, spans all five continents of the world, and includes countries with various levels of economic development and politico-economic systems.

To provide a sense of the quality of our estimates, in Figure 1, we compare for the case of Great Britain our estimated values of relative non-PPP-adjusted per-capita GDP (solid line) with the actual values (dotted line) obtained from available historical national accounts data. We focus on the case of Britain as an example, since it is the country with the greatest availability of good-quality historical statistics and the only one for which this comparison is possible throughout all years from 1870 to 1949.[19] In addition, Figure 1 also includes the corresponding level of Britain's relative PPP-adjusted per-capita GDP obtained from Maddison's data set (dashed line) in order to give an idea of how the PPP-adjusted and non-PPP-adjusted figures differ in the period of interest. For our estimated series, we also provide the 95% confidence interval.

[Insert Figure 1 (British Relative per-capita GDP) here]

As can be seen from the figure, our estimated GDP series matches closely the actual one. In most years, the actual series falls within the 95% confidence bounds, indicating that our "short-cut" approach does indeed produce reasonable estimates. At the same time, the significant gaps between the relative PPP-adjusted GDP series from Maddison and both non-PPP-adjusted series indicate that the observed close match between our non-PPP-adjusted GDP estimates and the actual ones is not driven by the absence of relative price differences between Britain and the

[16] We use for each year the respective values of a 1990 base-year U.S. CPI constructed from the information provided by Officer and Williamson (2012). The U.S. inflation rate has to be used since Maddison's GDP data are expressed in International Dollars which have the same purchasing power as the U.S. dollar in the United States.

[17] The implied PPP-factor can be calculated by dividing the value of our estimated non-PPP-adjusted GDP per capita with the corresponding PPP-adjusted one.

[18] A detailed list of the countries and years of coverage can be found in Appendix A.2.

[19] As shown in Appendix A.2, Britain and the United States are the only countries for which we have a complete non-PPP-adjusted GDP series as well as exchange rates going back to 1870.

United States over this period. On the contrary, as the figure indicates, the British price level was substantially lower than that of the United States during most years, with the ratio varying over time.[20]

Apart from the case of Britain, a comparison of actual and estimated non-PPP-adjusted per-capita GDP relative to the United States can also be performed for 15 additional countries. These are the countries mentioned in footnote 6, for which historical GDP data are available and which together account for approximately 25% of world GDP based on the estimates of Maddison (2001). For this set of countries, Figure 2 displays the weighted average of each of the three relative per-capita GDP series that were also displayed in the case of Britain, with weights based on each country's aggregate PPP-adjusted GDP. Similar to Figure 1, we can see that our estimated non-PPP-adjusted GDP series matches closely the values obtained from existing historical national accounts statistics, while the PPP-adjusted series based on Maddison's data exceeds the latter substantially.

[Insert Figure 2 (Average Relative per-capita GDP – 16 Countries) here]

These differences become also evident if one calculates the root mean square error (RMSE) of the deviation of our estimated GDP values from the actual ones for this set of 16 countries. This error can then be compared with the corresponding RMSE of the deviation of Maddison's GDP series from the actual ones. Over the entire period, this error is 23% for our estimated series and 45% for Maddison's series. Yet, these errors are substantially lower during the first globalization era –20% for our estimate and 40% for the Maddison series– than during the interwar period –29% and 57% respectively. Taking also into account the relative size of countries and calculating weighted errors, the discrepancy is more striking, with the error being on average 17% for our estimated series and 39% when using Maddison's data.[21]

The noticeable discrepancy between our estimated series and that of Maddison is present because during the time period under investigation almost all of these 16 countries –with the exception of Australia in some years– had lower price levels than the United States. Thus, as expected, our estimates for these 16 countries imply levels of non-PPP-adjusted GDP which are lower than the corresponding PPP-adjusted ones. This pattern is in line with the evidence regarding international price differences presented by Williamson (1995) and Prados de la Escosura (2000) for selected countries and years prior to 1950. It is further corroborated by the information on the living expenses of households in different countries provided by Haines (2006).[22] More-

[20] This confirms the evidence presented by Broadberry (2003) based on time series projections, as well as those of Ward and Devereux (2003) based on direct benchmark estimates.

[21] It should be noted that our estimates of non-PPP-adjusted GDP are not sensitive to the exact 'short-cut ' specification used. As we demonstrate in Appendix A.3, the resulting picture of Figure 2 is virtually unchanged if we construct our GDP estimates based on the specifications presented in columns 5 or 6 of Table 1 instead.

[22] Haines (2006) provides detailed information on living expenses of households in Belgium, France, Germany, Switzerland, the U.K., and the U.S. for the years 1889 and 1890. Based on this information it is possible to

over, the relative price levels implied by our estimated GDP data confirm the broad time-series patterns documented by Chen, Choi, and Devereux (2008) for the 1870-1949 period.

3 World Trade Evolution, 1870-1949

3.1 Calculating Trade Shares

Having constructed estimates for non-PPP-adjusted GDP per capita, we now turn to combine these estimates with the export and import data assembled by Barbieri, Keshk, and Pollins (2009) to calculate trade shares going back to 1870. The trade shares are calculated following the standard practice of summing up for each country the total value of exports and imports in current prices and denominating the sum with our estimate of aggregate non-PPP-adjusted GDP. The latter corresponds to the above estimated value of non-PPP-adjusted GDP per capita multiplied with the respective population figures from Maddison (2001).

The use of the data set of Barbieri, Keshk, and Pollins (2009) is motivated by its comprehensive country and year coverage.[23] Using all the available information, we are able to calculate trade shares for 61 countries in addition to the United States, representing 90% of world GDP. In this set of countries, we have 20 countries for which we are able to track the complete evolution of trade shares for all non-war years as well as a total of 45 countries for which the estimated series span at least 20 years. This greatly increases the available information on historical trade shares compared to the case when only actual GDP data from available historical sources are used. Based on the latter sources, we can construct trade shares for just 14 countries, out of which complete series covering all non-war years can only be calculated for four.[24,25]

To assess the quality of our estimated trade shares, in Figure 3, we display the evolution of Britain's trade share over the period from 1870 to 1949, calculated in three different ways. The solid line corresponds to our estimated trade share, while the dotted line uses instead of our estimated non-PPP-adjusted GDP figures the actual values taken from historical national account statistics. In addition to those two series, the figure also includes the trade share obtained in case the sum of exports and imports is denominated by the total value of PPP-adjusted GDP as reported by Maddison (2001), inflated with the U.S. Consumer Price Index. The latter series

calculate the average annual living expenses of different types of households in the aformentioned countries. In all cases, we found that the living expenses of households in Europe were significantly lower –on average about 60%– than in the U.S..

[23] The data set, which is available on-line through the Correlates of War project (correlatesofwar.org.), includes 7271 observations for aggregate export and import data for the period 1870-1949 for 85 countries. This greatly exceeds the coverage of alternative data sets.

[24] The 14 countries include the 16 countries mentioned above minus Korea and Taiwan for which no trade data are available to match the GDP data from historical national accounts.

[25] The complete list of all countries and years for which trade shares can be constructed based on estimated and actual nominal GDP data is shown in Appendix A.2.

reflects the practice followed by most of the existing literature and is depicted by the dashed line. We add this third series in order to assess the extent to which combining PPP-adjusted GDP data with non-PPP-adjusted trade data would bias the resulting trade shares.

[Insert Figure 3 (British Trade Share) here]

As Figure 3 demonstrates, the common practice of denominating non-PPP-adjusted trade data with PPP-adjusted GDP values leads to a sizeable underestimation of the British trade share prior to 1950 by on average 40%. The resulting discrepancy is substantial, particularly for earlier years, during which the price level of Britain was significantly lower than that of the United States, as discussed in the previous section.[26] In contrast to this, we see that our estimated trade share series matches closely the actual one, mirroring the results we found for our non-PPP-adjusted per-capita GDP series displayed in Figure 1.

Moving beyond the case of Britain, Figure 4 presents the corresponding comparison of the same three trade share series for 13 countries. These are the 14 countries mentioned above, for which we can calculate trade shares based on actual reported non-PPP-adjusted GDP data with the omission of the Netherlands.[27] The displayed series shows the weighted average of the trade shares of all countries, with weights based on each country's aggregate PPP-adjusted level of GDP.

As it was the case in Figure 3, our estimated series matches closely the actual one. Moreover, both exceed significantly the one based on the PPP-adjusted GDP series of Maddison, which shows an underestimation of trade openness by on average 43%. The degree of underestimation varies across years, being on average 48% during the 1870-1913 period and 33% during the 1919-1938 period. A calculation of the corresponding RMSE in this case reveals that our estimated series deviates by on average 24% from the actual series, while the series based on PPP-adjusted GDP deviates by on average 40%.[28] Weighting these deviations with each country's GDP share leads to a RMSE for our estimated series of only 18%, while the corresponding error of the series based on PPP-adjusted GDP is 35%.

[Insert Figure 4 (Average Trade Share – 13 Countries) here]

3.2 Global and Regional Trade Patterns

Having established the quality of our historical trade share estimates, we proceed now to discuss what they imply for the evolution of trade globally as well in different regions of the world

[26] During the 1870-1913 period, the degree of underestimation of the British trade share is 45%; during the 1919-1938 period, it is 28% .

[27] We omit the Netherlands as it constitutes a clear outlier in this small sample of countries with trade shares averaging around 158% of GDP and occasionally reaching values of 300%.

[28] As it was the case in Figure 2, these deviations are substantially smaller during the first globalization era –15% for our estimates and 34% for the series based on PPP-adjusted GDP– than during the interwar period –31% and 48% respectively.

since 1870.[29] This information is displayed in the following three figures. Figure 5 depicts how the share of trade in GDP evolved for the world as a whole. Here, the solid line depicts our estimate of the world trade share, calculated as the sum of total exports and import in current prices of the 62 countries for which data are available denominated by the sum of estimated non-PPP-adjusted GDP of those countries. The dashed line corresponds to the resulting trade share when the same export and import data are denominated with the PPP-adjusted GDP data of Maddison (2001) corrected for U.S. inflation. In addition, Figure 5 also includes the world trade share for the post-1950 period (dotted line) using the trade shares reported in the Penn World Tables for the same set of 62 countries. These shares are weighted by the level of non-PPP-adjusted GDP also obtained from the Penn World Tables, as explained in Appendix A.1. We include this series in order to document how well our estimated pre-1950 series lines up with the conventional post-1950 wisdom regarding the evolution of world trade.

[Insert Figure 5 (World Trade Share) here]

As Figure 5 documents, the evolution of world trade over this long time horizon is characterized by a secular rise during the first globalization era (1870-1913) and a sharp decline during the interwar period (1919-1938). This is followed by the subsequent rebound after World War II and the steady growth ever since. Thus, qualitatively our world trade share series is in line with the narratives offered by Estevadeordal, Frantz, and Taylor (2003) and Jacks, Meissner, and Novy (2011) regarding the pre-World-War-II evolution of trade. Yet, quantitatively our estimated trade shares are much larger than the ones based on PPP-adjusted GDP. Specifically, our estimates suggest that the share of world trade during the first globalization era increased from 18% in 1870 to 30% in 1913, while a calculation that does not fully account for purchasing power differences across countries would reduce these numbers to 12% and 21% respectively. Similarly, during the interwar period, while according to our estimates the share of world trade fell from a pre-war level of 30% down to 13% in 1939, the trade share series based Maddison's GDP data displays a much smaller reduction from 21% to 10%.

On average the magnitude of the discrepancy between the two series is 5.7 percentage points, which corresponds to an underestimation of the global trade share by 38%.[30] It should be noted, though, that this discrepancy differs substantially across countries and time. In particular, it is larger during the first globalization era than during the interwar period –44% versus 30%

[29] Like many of the existing contributions in the literature we take 1870 as the starting point of the first globalization era. This is largely due to the lack of comprehensive trade statistics going back even further in time. In principle, as O'Rourke and Williamson (2002) and Jacks (2005) have pointed out, the beginning of the first globalization era could arguably also be placed 20 to 50 years earlier, pushing its starting point to 1850 or even to 1820.

[30] It is worth mentioning that the discrepancy between the two series would have been even higher had the picture excluded the corresponding figures for the United States, which carries a weight of up to 30% in the global series and for which there is no difference between PPP and non-PPP adjusted GDP.

respectively. It is also larger among less developed economies due to their lower price levels compared to more developed ones –67% versus 30% respectively.[31]

Moreover, the evolution of the world trade share implied by our estimates also links well with the post-1950 series based on Penn World Tables data. According to our estimates, during the late 1940s, world trade fluctuated between 16.5% and 20% of GDP, which is similar to the movements observed in the 1950s, during which the world trade share fluctuated between 18% and 21%. Thus, both our estimated series and the PWT series indicate similar values for the share of international trade in the years following World War II, averaging around 19% of GDP and with a standard deviation of just 1.5 percentage points. Moreover, our historical trade series reveals that the level of trade openness that the world had reached in 1913, at the peak of the first globalization era, was not reached again globally before 1974. This confirms the evidence regarding the rebound of international trade based on manufacturing products and merchandise trade documented by Beenstock and Warburton (1983), Krugman (1995) and O'Rourke and Williamson (1999).

In contrast, the trade share series based on Maddison's GDP data suggests that the value of world trade in the late 1940s was around 13% of world GDP, which seems unreasonably low in light of the trade activity observed during the 1950s and 1960s. Similarly, this series suggests that the share of world trade at its pre-World-War-I peak was equivalent to that observed during the early 1950s, which contradicts the aforementioned evidence. These observations suggest that any calculation of trade shares that does not take into account purchasing power differences across countries may lead to a distorted picture regarding the evolution of world trade prior to 1950 and a significant underestimation of the rise and fall that took place from the start of the first globalization era until the end of World War II.

Looking beyond the global picture, in Figures 6 and 7 the evolution of world trade over the period 1870-1949 is broken down into separate series for six distinct regions of the globe: the European Core, the European Periphery, the European Offshoots, Latin America, Asia, and North Africa and the Middle East.[32] A comparison of the regional series reveals that the rise and fall of world trade was not uniformly experienced across all regions of the world. Trade shares at the start of the first globalization era were highest in Latin America and lowest in Asia. Yet, over the subsequent 40 years the expansion of trade among European Core economies led to their overtaking of Latin American ones and to the former becoming the world's leading region in terms of trade openness. This upward trend was also experienced by the economies of the European Periphery, of North Africa and the Middle East, and to a lesser extent in Asia, while no such trends are visible in the trade shares of the European Offshoots and Latin American economies.

[31] In this calculation, we treat as a less developed economy any economy whose average PPP-adjusted level of GDP per capita over the 1870-1949 period was less than or equal to half of that of the United States.

[32] See Appendix A.2 for a list of countries falling into each of these regions.

[Insert Figure 6 (Regional Trade Shares I) here]
[Insert Figure 7 (Regional Trade Shares II) here]

Following World War I and the subsequent Great Depression, it was again the economies of the European Core that witnessed the greatest implosion of trade. A decline in international trade was also experienced in the European Periphery, in North Africa and the Middle-East, and in Latin American. In all four cases, trade shares on the eve of World War II had dropped to levels even below those prevailing in 1870. This downward trend was, albeit in a less dramatic fashion, also felt by the European Offshoots, while, interestingly, it does not appear to be present in Asia. In the latter case, according to our estimates, there is no evidence of a disruption of the pre-World-War-I trade expansion during the interwar period, but we observe rather a continuation of pre-existing trends.

To enhance the visibility of the displayed series in Figures 6 and 7, we have avoided adding the corresponding inconsistently calculated trade shares shown in Figure 5. Yet, we should mention here that the remarks made above apply also to the regional trade shares. Namely, trade shares based on PPP-adjusted GDP are consistently lower than the ones based on non-PPP-adjusted GDP. Moreover, the degree of underestimation is highest for the poorest regions of the world, which have the lowest price levels compared to the United States.

4 Concluding Remarks

The recent debate regarding the causes and consequences of the increased economic integration that countries and regions of the world are experiencing today has sparked great interest in the globalization trends that existed prior to World War II. This interest stems from the conviction of a growing number of economists and economic historians that shedding light on the various factors that drove the expansion of world trade during the first globalization era (1870-1913) and its backlash during the interwar period (1919-1938) can enhance our understanding of contemporary developments.

A major difficulty in the context of this literature, though, has been the relative scarcity of national accounts data compared to the post-War-World-II period. As a consequence, in order to calculate trade shares prior to 1950, most researchers have combined PPP-adjusted GDP data, such as those of Maddison (2001), with non-PPP-adjusted trade data –an approach which leads to systematic biases.

Contrary to existing work, this paper provides estimates of trade shares based on non-PPP-adjusted GDP data that we estimate via the "short-cut" method. Our estimates indicate that trade shares during the period from 1870 to1949 were on average 38% higher compared to existing accounts and the world's level of openness to trade in 1913 was comparable to that in 1974. This

implies that the rise and fall of world trade that took place over this period was much more pronounced than previously documented.

As a final note, we would like to stress that although in this paper we have focused on analyzing the evolution of world trade between 1870 and 1949, we believe that our contribution extends beyond that. The estimates of non-PPP-adjusted GDP and trade shares that we provide via the "short-cut" method for a large set of countries can provide useful a benchmark for any subsequent research on the matter. Moreover, in the absence of alternative, more comprehensive, historical sources, we believe that our income and trade share estimates can be of great value-added to many researchers interested in this historical period.

Acknowledgements: This paper has benefited from useful comments and suggestions of a co-editor of this journal, three anonymous referees, Jutta Bolt, Robert Inklaar, Tamas Vonyo, Robert Zymek as well as seminar participants at Brown University, Carleton University and the 8th BETA Workshop in Historical Economics.

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A Appendix

A.1 Data Sources

Current-Price Exports and Imports

- For the period 1870-1949, we use the data of Barbieri, Keshk, and Pollins (2009), which are reported in current-price U.S. dollars, converted from national currencies using market exchanges rates. In the case of Norway, we drop the trade figures reported during the years of World War I that show an increase of factor 10-15, given the lack of any historical record justifying this jump.

- For the period 1950-2005, we use the trade shares in current prices reported in the Penn World Tables (Version 7.0). The corresponding trade levels –sums of exports and imports– can be inferred from the shares using the respective current-price non-PPP-adjusted GDP figures. The latter figures, although not directly available in Penn World Tables, can be easily derived, as explained below.

Current-Price PPP-adjusted GDP

- For the period 1870-1949, we use the figures of Maddison (2001), which are reported in constant 1990 International dollars. We fill in gaps in the series by interpolating missing values, assuming a constant annual growth rate. The figures are converted into current-price terms by multiplying them with the 1990-base-year U.S. consumer price index provided by Officer and Williamson (2012).

- For the period 1950-2005, we use the current-price figures from Penn World Tables (Version 7.0). For China we use the "Version 2" series, which is considered more reliable than the officially published data.

Current-Price Non-PPP-adjusted GDP

- For the period 1870-1949, we were able to obtain non-PPP-adjusted GDP figures in current prices for Australia, Belgium, Canada, Denmark, Finland, France, Honduras, Japan, Korea, Mexico, the Netherlands, South Africa, Spain, Sweden, Taiwan, the United Kingdom and the United States. The figures for Belgium, Finland, France, Japan, Korea, the Netherlands, Spain and Sweden are from Smits, Woltjer, and Ma (2009). The figures for Australia, Canada, Denmark, Honduras, Mexico, South Africa, Taiwan and the United Kingdom are from Mitchell (2008). Finally, the series for the U.S. is from Johnston and Williamson (2013). All series are reported in national currencies, which we converted into U.S. dollars. To ensure consistency, we made the conversions based on the same exchange rates that Barbieri, Keshk, and Pollins (2009) used to convert their trade data, which are reported in Barbieri and Keshk (2012). Whenever this was not possible, we used the exchange rate information provided by Officer (2013).

- For the period 1950-2005, we use the implied current-price non-PPP-adjusted GDP figures from Penn World Tables (Version 7.0). These figures are not directly reported, but can be calculated from the available current-price PPP-adjusted ones (cgdp). This is done by

first converting these GDP figures from International dollars into national currencies using the reported PPP factors (ppp) and then from national currencies to U.S. dollars using the available exchange rates (xrat).

Population

- For the period 1870-1949, we use the figures of Maddison (2001), filling in gaps in the series by interpolating missing values, assuming a constant annual growth rate.
- For the period 1950-2005, we use the figures from Penn World Tables (Version 7.0). In the case of Germany, we correct the population series between 1970 and 1990 by replacing the reported figures, which cover the whole of Germany, with those of West Germany. This correction is necessary since the reported per-capita GDP series for this period covers only West Germany, which combined with the larger population figures for the whole of Germany would result in implausibly high values of aggregate GDP before 1990. The population figures for West Germany are from Penn World Tables version 5.6 , the last version that contains East and West Germany as separate countries.

Other Data

Information on the land area of each country are from Gallup, Sachs, and Mellinger (1999), supplemented with information from the CIA World Factbook. Data on the natural level of openness to trade are taken from Frankel and Romer (1999).

A.2 Country and Year Coverage

[Insert Table A1 (Country and Year Coverage) here]

A.3 GDP Estimates from Different Specifications

Our main rationale for employing the "short-cut" method in order to estimate non-PPP-adjusted GDP prior to 1950 relies on the exploitation of the stable structural relationship that exists between per-capita GDP in PPP-adjusted and non-PPP-adjusted terms. The structural nature of this relationship implies that it should not be particularly sensitive to the exact parametrization used. To assess this hypothesis, in Figure A1, we compare our estimated values of non-PPP-adjusted relative GDP per capita for the 16 countries included in Figure 2, which are based on our preferred specification reported in column 7 of Table 1, to alternative estimates based on the simpler specifications reported in columns 5 and 6 of the same table.

[Insert Figure A1 (Average Relative per-capita GDP – Various Specifications) here]

As in Figure 2, all the series displayed in Figure A1 reflect weighted averages, with weights based on each country's aggregate PPP-adjusted level of GDP. The three series corresponding to the specifications shown in columns 5, 6 and 7 of Table 1 are depicted by the three solid lines. The dotted line corresponds to the actual series obtained from historical national accounts statistics, while the dashed line shows the relative PPP-adjusted series based on Maddison's data, corrected for U.S. inflation. The pattern observed in the figure is reassuring. As one can see, all our estimated series match closely the actual values displayed by the dotted line and are very similar to one another. Moreover, as it was also the case in Figure 2, the PPP-adjusted

series differs substantially from the rest, implying much higher relative per-capita GDP ratios than the actual series or any of our estimated ones. This confirms that our GDP and trade share estimates are not sensitive to the exact parametrization of equation (1).

A.4 World Trade Evolution based on Available Historical Data

One potential concern with our conclusions regarding the evolution of world trade since 1870, discussed in Section 3, is that they may be subject to a time-varying margin of error that is higher the further back in time we go. This could be the result of backward projection errors in our non-PPP-adjusted GDP estimates, either generated through the "short-cut" method itself or inherited from the PPP-adjusted GDP figures of Maddison, based on which the estimates were produced. If this is the case, our conclusion that trade shares were substantially higher during the 1870-1913 period compared to previous estimates may be misleading. To ensure that such projection errors are not driving our results, in Figure A2 we reproduce the series of Figure 5 using just the small set of 13 countries for which we can calculate trade shares based on actual GDP data reported in historical national accounts statistics. This is the same set of countries based on which Figure 4 was constructed and for which our estimated trade shares were shown to be similar to the actual ones.

[Insert Figure A2 (World Trade Share without Estimated Data) here]

Focusing on a comparison between the actual trade shares (solid line) with those calculated based on Maddison's PPP-adjusted GDP data (dashed line) for this smaller set of countries, we see qualitatively the same pattern that already emerged from Figure 5. The actual share of world trade in GDP over the period 1870-1949 is substantially higher than what a calculation based on Maddison's PPP-adjusted GDP data would suggest, with the discrepancy being relatively larger during the first globalization era. As world trade collapses following World War I, the two series move closer together, but the discrepancy remains. Moreover, we can compare the actual trade share during the 1870-1949 period with the corresponding share reported in the Penn World Tables for the same set of countries for the post-1950 period (dotted line). Note that the two series link well with one another and present a picture for the evolution of world trade since 1870 that is very much in line with what Figure 5 suggested based on a much larger and more representative sample of countries. Hence, our conclusions regarding the evolution of world trade do not seem to hinge on our use of estimated GDP data.

Table 1: Short-Cut Estimation Results

Dependent Variable: $\ln(y^{non\text{-}PPP})$								
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Estimation Method	**GLS**	**GLS**	**GLS**	**Semiparametric**	**GLS**	**GLS**	**GLS**	**Semiparametric**
$\ln(y^{PPP})$	1.008***	1.355***	1.300***	-	1.058***	1.386***	1.086***	-
	[0.0104]	[0.0289]	[0.0520]		[0.0831]	[0.0293]	[0.0829]	
$\ln(y^{PPP})\text{^}2$		0.0911***	0.0569*	-	-0.459***	0.0933***	-0.454***	-
		[0.00726]	[0.0298]		[0.123]	[0.00747]	[0.121]	
$\ln(y^{PPP})\text{^}3$			-0.00547					
			[0.00476]					
ln(Population)	-0.0307**	-0.0387***	-0.0382***	-0.0356	-0.0389***	-0.0376***	-0.0381***	-0.0356
	[0.0140]	[0.0133]	[0.0129]	[0.0215]	[0.0129]	[0.0119]	[0.0115]	[0.0216]
ln(Area)	0.0678***	0.0630***	0.0628***	0.0954***	0.0599***	0.0650***	0.0621***	0.100***
	[0.0128]	[0.0121]	[0.0119]	[0.0263]	[0.0119]	[0.0110]	[0.0107]	[0.0256]
ln(FR-Trade)	0.0311	0.0218	0.02	0.0764	0.023	0.0266	0.0286	0.0834
	[0.0415]	[0.0436]	[0.0382]	[0.0679]	[0.0380]	[0.0350]	[0.0336]	[0.0669]
Periphery					-0.0804		-0.0653	0.385
					[0.0595]		[0.0579]	[1.443]
Currency Regime						-0.122***	-0.126***	-0.275***
						[0.0192]	[0.0192]	[0.0532]
$\ln(y^{PPP})$ x Periphery					0.249**		0.262***	0.766
					[0.100]		[0.0985]	[3.410]
$\ln(y^{PPP})\text{^}2$ x Periphery					0.543***		0.542***	0.238
					[0.122]		[0.120]	[2.450]
$\ln(y^{PPP})$ x Currency Regime						-0.0598**	-0.0647**	-0.204**
						[0.0257]	[0.0258]	[0.0834]
$\ln(y^{PPP})\text{^}2$ x Currency Regime						-0.00504	-0.00592	-0.0258
						[0.00698]	[0.00699]	[0.0230]
Hardle-Mammen (1993) Test				H0: Quadratic fit not different p-value: 0.26				H0: Quadratic fit not different p-value: 0.21
Countries	123	123	123	123	123	123	123	123
Observations	4,097	4,097	4,097	4,097	4,097	4,097	4,097	4,097
Adjusted R-squared	0.8588	0.8738	0.8752	-	0.8744	0.8751	0.876	-

Notes: *** p<0.01, ** p<0.05, * p<0.1; standard errors in brackets

GLS estimation corrects for heteroskedasticity and serial correlation within panels. Semiparametric estimation corrects for heteroskedasticity.

All variables except for the dummies are relative to those of the United States.

Table 2: Stability of Coefficients

	Dependent Variable: $\ln(y^{non\text{-}PPP})$		
Method	**Coefficient**	**Std. Error**	**p-value**
$\ln(y^{PPP})$	0.993***	[0.120]	(0.565)
$\ln(y^{PPP})$^2	-0.673***	[0.199]	(0.511)
ln(Population)	-0.0418***	[0.012]	(-0.161)
ln(Area)	0.0682***	[0.011]	(0.758)
ln(FR-Trade)	0.0276	[0.034]	(0.006)
Periphery	-0.126	[0.077]	(0.346)
$\ln(y^{PPP})$ x Periphery	0.312**	[0.137]	(0.930)
$\ln(y^{PPP})$^2 x Periphery	0.746***	[0.198]	(0.558)
1950s Dummy	-0.136**	[0.055]	
1960s Dummy	-0.103**	[0.046]	(0.005)
1970s Dummy	0.0161	[0.033]	
Countries	123		
Observations	4,097		
Adjusted R-squared	0.88		

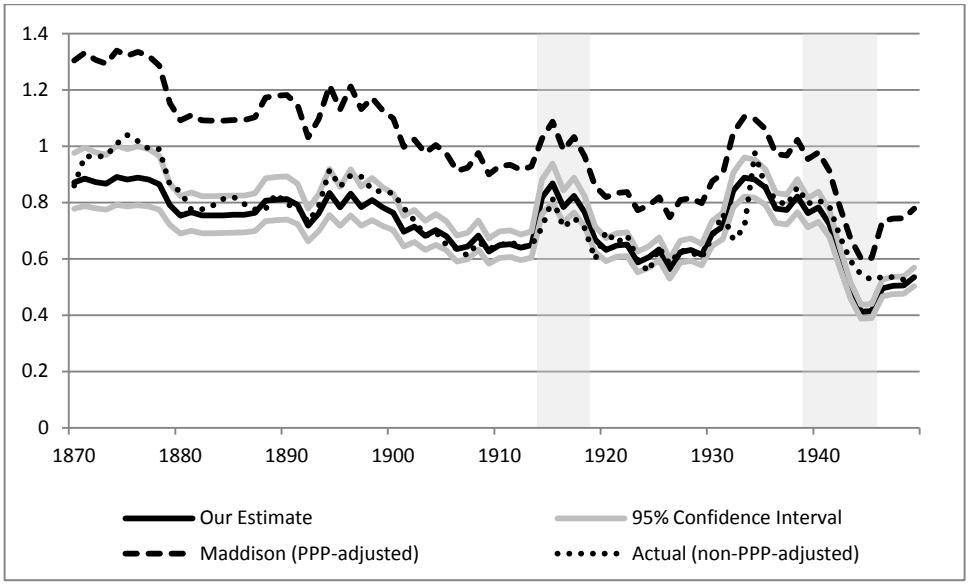
Notes: *** p<0.01, ** p<0.05, * p<0.1; standard errors in brackets;

p-values correspond to the test that the interaction terms of the variable with the decadal dummies are jointly significant.

GLS estimation corrects for heteroskedasticy and serial correlation within panels.

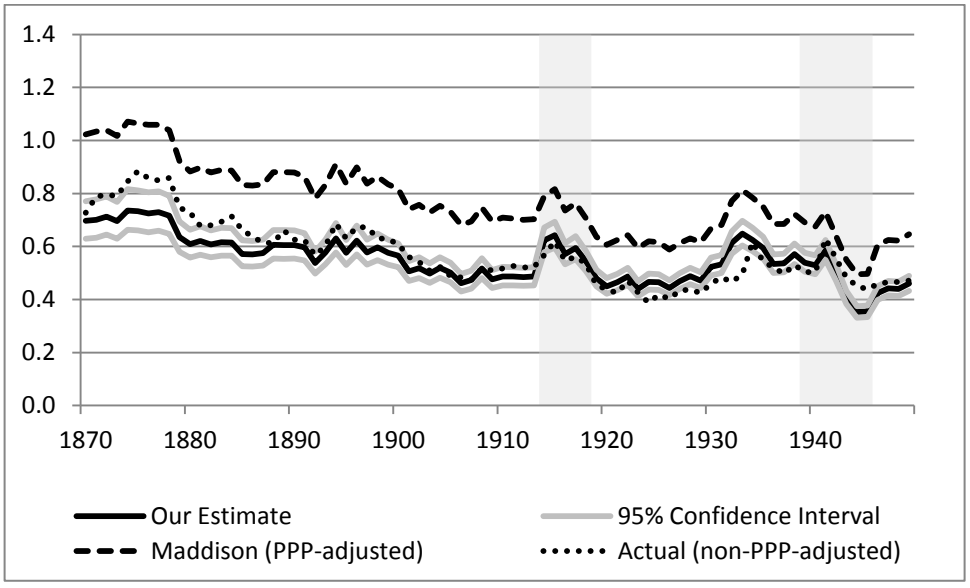
All variables except for the dummies are relative to those of the United States.

Figure 1: British Relative per Capita GDP



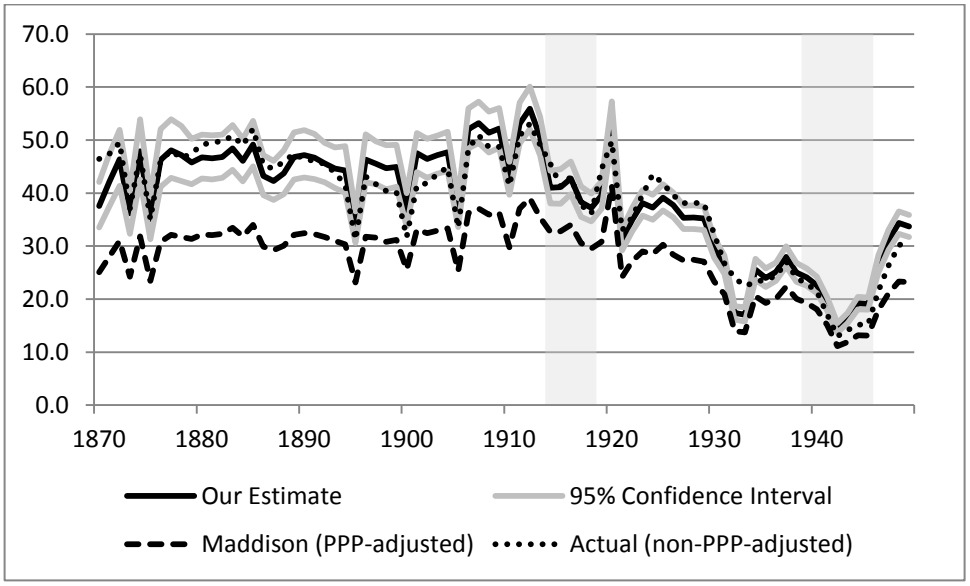
Notes: The figure displays per capita GDP series for Britain relative to that of the United States between 1870 and 1949. The dotted line is based on per capita GDP figures from historical national accounts statistics converted into current-price U.S. dollars at market exchange rates. The dashed line is based on Maddison's per capita GDP estimates in International dollars converted from constant to current prices using the U.S. GDP deflator. The solid black line is based on per capita GDP estimates in current price U.S. dollars obtained via the 'short-cut' method. The solid grey lines corresponds to the upper and lower bounds of the 95% confidence interval associated with our estimated relative GDP series. The shaded areas reflect the years of World War I and II.

Figure 2: Average Relative per Capita GDP - 16 Countries



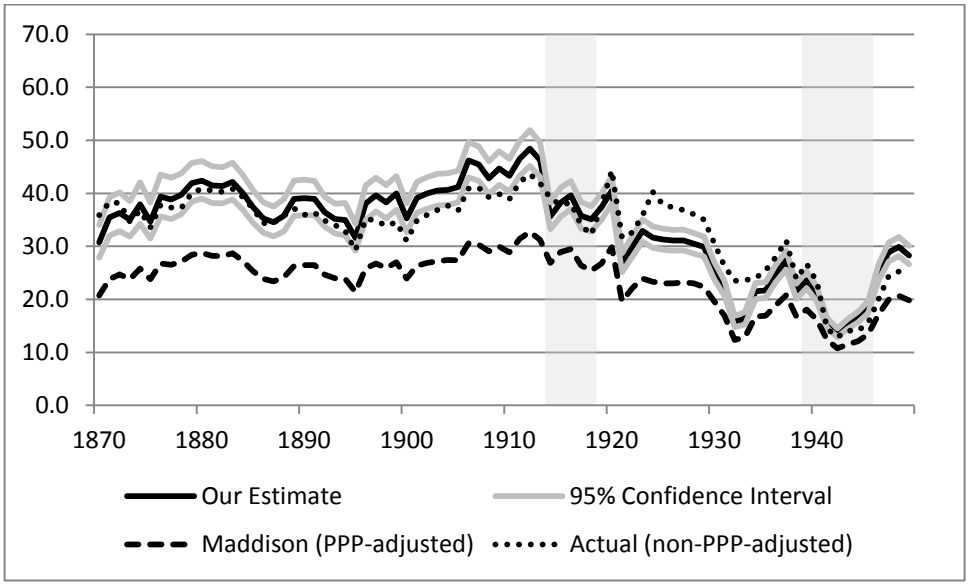
Notes: The figure displays the weighted average level of per capita GDP in 16 countries relative to the United States between 1870 and 1949. The 16 countries include Australia, Belgium, Canada, Denmark, Finland, France, Honduras, Japan, Korea, Mexico, the Netherlands, South Africa, Spain, Sweden, Taiwan and the United Kingdom. Each country's series is weighted with its aggregate level of PPP-adjusted GDP from Maddison. The dotted line is based on per capita GDP figures from historical national accounts statistics converted into current price U.S. dollars at market exchange rates. The dashed line is based on Maddison's per capita GDP estimates in International dollars converted from constant to current prices using the U.S. GDP deflator. The solid black line is based on per capita GDP estimates in current price U.S. dollars obtained via the 'short-cut' method. The solid grey lines correspond to the upper and lower bounds of the 95% confidence interval associated with our estimated relative GDP series. The shaded areas reflect the years of World War I and II.

Figure 3: British Trade Share



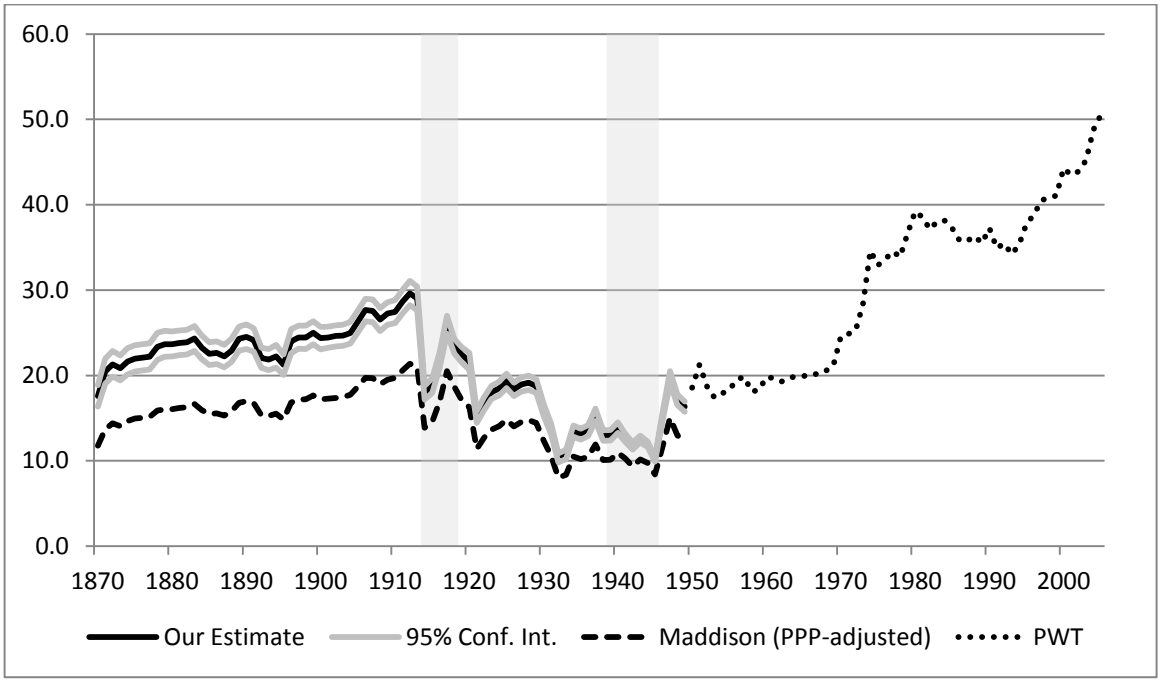
Notes: The figure displays level of exports plus imports in percent of GDP for Britain between 1870 and 1949. Export and import data are in current price U.S. dollars converted at market exchange rates from Barbieri, Keshk, and Pollins (2009) The dotted line uses GDP figures from historical national accounts statistics converted into current price U.S. dollars at market exchange rates to denominates the sum of exports and imports. The dashed line uses Maddison's GDP estimates in International dollars converted from constant to current prices using the U.S. GDP deflator to denominate the sum of exports and imports. The solid black line uses the GDP estimates in current price U.S. dollars obtained via the 'short-cut' method to denominate the sum of exports and imports. The solid grey lines correspond to the upper and lower bounds for the trade share associated with the 95% confidence interval for our GDP estimates. The shaded areas reflect the years of World War I and II.

Figure 4: Average Trade Share - 13 Countries



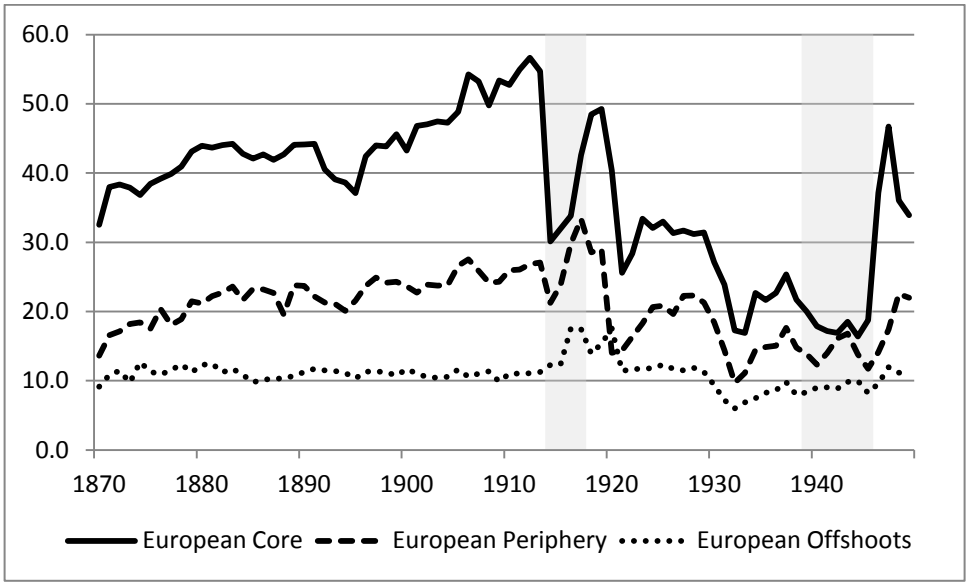
Notes: The figure displays the weighted average of the level of exports plus imports in percent of GDP for 13 countries between 1870 and 1949. The 13 countries include Australia, Belgium, Canada, Denmark, Finland, France, Honduras, Japan, Mexico, South Africa, Spain, Sweden and the United Kingdom. Each country's series is weighted with its aggregate level of PPP-adjusted GDP from Maddison. Export and import data are in current price U.S. dollars converted at market exchange rates from Barbieri, Keshk, and Pollins (2009) The dotted line uses GDP figures from historical national accounts statistics converted into current price U.S. dollars at market exchange rates to denominates the sum of exports and imports. The dashed line uses Maddison's GDP estimates in International dollars converted from constant to current prices using the U.S. GDP deflator to denominate the sum of exports and imports. The solid black line uses the GDP estimates in current price U.S. dollars obtained via the 'short-cut' method to denominate the sum of exports and imports. The solid grey lines correspond to the upper and lower bounds for the trade share associated with the 95% confidence interval for our GDP estimates. The shaded areas reflect the years of World War I and II.

Figure 5: World Trade Share



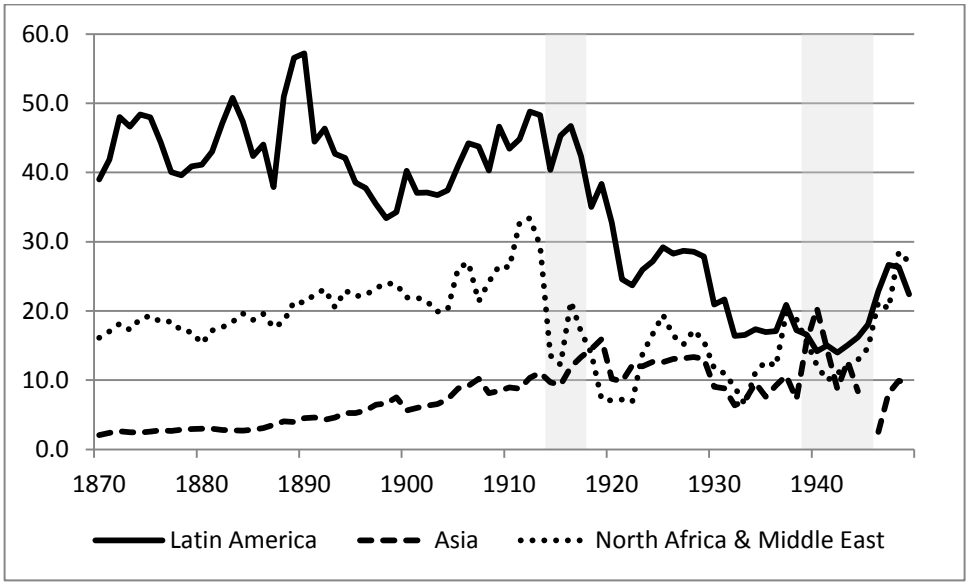
Notes: The figure displays the weighted average of the trade shares of the 62 countries listed in Table A.1 between 1870 and 2005. The dotted line is based on the trade shares reported by Penn World Tables weighted by each country's share of non-PPP-adjusted current-price GDP. The dashed line uses Maddison's GDP estimates in International dollars estimates converted from constant to current prices using the U.S. GDP deflator to denominate the sum of exports and imports. The solid black line uses the GDP estimates in current price U.S. dollars obtained via the 'short-cut' method to denominate the sum of exports and imports. The solid grey lines correspond to the upper and lower bounds for the trade share associated with the 95% confidence interval for our GDP estimates. The shaded areas reflect the years of World War I and II.

Figure 6: Regional Trade Shares I



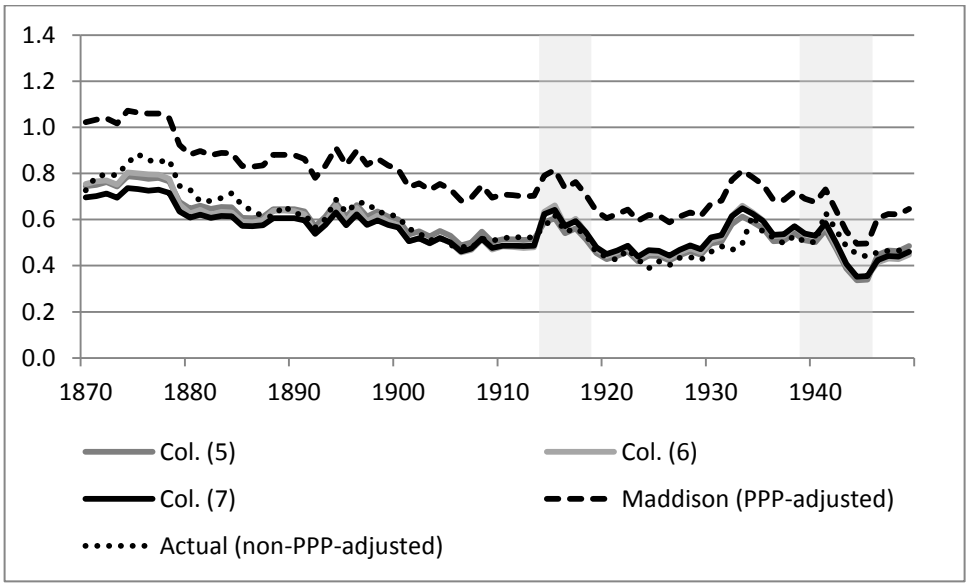
Notes: The figure displays the level of total exports plus imports in percent of total GDP for three different regions of the world between 1870 and 1949. The countries included in each of the three regional series are indicated in Table A1. All series are based on the GDP estimates in current price U.S. dollars obtained via the 'short-cut' method to denominate the sum of exports and imports. The shaded areas reflect the years of World War I and II.

Figure 7: Regional Trade Shares II



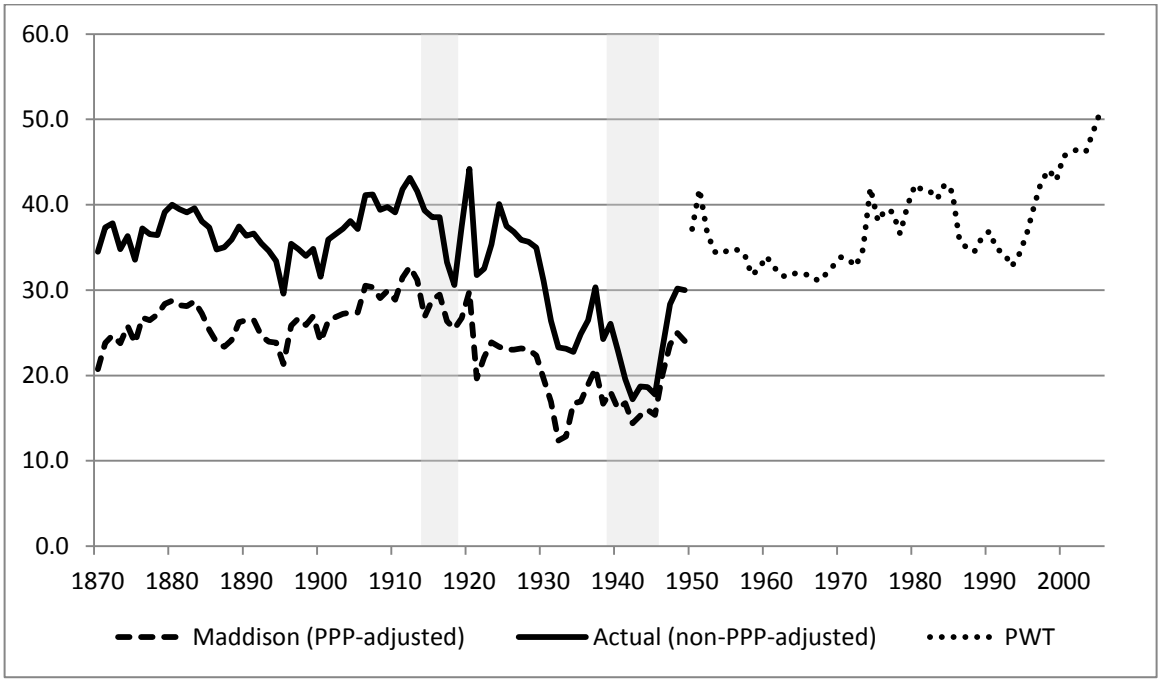
Notes: The figure displays the level of total exports plus imports in percent of total GDP for three different regions of the world between 1870 and 1949. The countries included in each of the three regional series are indicated in Table A1. All series are based on the GDP estimates in current price U.S. dollars obtained via the 'short-cut' method to denominate the sum of exports and imports. The shaded areas reflect the years of World War I and II.

Figure A.1: Average Relative per Capita GDP – Various Specifications



Notes: The figure displays the weighted average level of per capita GDP in 16 countries relative to the United States between 1870 and 1949. The 16 countries are the same as in Figure 2. Each country's series is weighted with its aggregate level of PPP-adjusted GDP from Maddison. The dotted line is based on per capita GDP figures from historical national accounts statistics converted into current price U.S. dollars at market exchange rates. The dashed line is based on Maddison's per capita GDP estimates in International dollars in international dollars converted from constant to current prices using the U.S. GDP deflator. The three solid lines are based on per capita GDP estimates in current price U.S. dollars obtained via the 'short-cut' method using the specification of either column (5), (6) or (7) in Table1. The shaded areas reflect the years of World War I and II.

Figure A.2: World Trade Share without Estimated Data



Notes: The figure displays the weighted average of the trade shares of the 13 countries included in Figure 4 between 1870 and 2005. The dotted line is based on the trade shares reported by Penn World Tables weighted by each country's share of non-PPP-adjusted current-price GDP. The dashed line uses Maddison's GDP estimates in International dollars converted from constant to current prices using the U.S. GDP deflator to denominate the sum of exports and imports. The solid black line uses GDP figures from historical national accounts statistics converted into current price U.S. dollars at market exchange rates to denominate the sum of exports and imports. The shaded areas reflect the years of World War I and II.

Table A.1: Country and Year Coverage

Country	Est. Nominal GDP	Act. Nominal GDP	Est. Trade Share	Act. Trade Share	Region
Algeria	1870-1949				
Argentina	1870-1949		1870-1949		Latin America
Australia	1870-1949	1870-1931	1920-1949	1920-1931	European Offshoots
Austria	1870-1949		1919-1938		European Core
Austria-Hungary	1870-1918		1870-1913		European Core
Belgium	1870-1949	1870-1913 1920-1939 1946-1949	1870-1914 1919-1940 1945-1949	1870-1913 1920-1939 1946-1949	European Core
Bolivia	1945-1949		1945-1949		Latin America
Brazil	1870-1949		1870-1949		Latin America
Bulgaria	1870-1949		1908-1949		European Periphery
Canada	1870-1949	1926-1949	1920-1949	1926-1949	European Offshoots
Chile	1870-1949		1870-1949		Latin America
China	1870-1949		1870-1940 1942-1943 1946-1949		Asia
Colombia	1900-1949		1900-1949		Latin America
Costa Rica	1920-1949		1920-1949		Latin America
Czechoslovakia	1870-1949		1919-1939 1945-1949		European Periphery
Denmark	1870-1949	1870-1940	1870-1940 1945-1949	1870-1940	European Core
Ecuador	1939-1949		1939-1949		Latin America
Egypt	1870-1949		1937-1949		North Africa & Middle East
El Salvador	1920-1949		1920-1949		Latin America
Finland	1870-1949	1920-1945	1919-1949	1920-1945	European Core
France	1870-1949	1870-1913 1920-1938	1870-1917 1920-1942 1944-1949	1870-1913 1920-1938	European Core
Germany	1870-1949		1870-1913 1920-1944		European Core
Ghana	1870-1949				
Greece	1870-1949		1870-1913 1919-1940 1945-1949		European Periphery
Guatemala	1920-1949		1920-1949		Latin America
Haiti	1945-1949		1945-1949		Latin America
Honduras	1920-1949	1925-1949	1920-1949	1925-1949	Latin America
Hongkong	1870-1949				
Hungary	1870-1949		1919-1949		European Periphery
India	1870-1949		1947-1949		Asia
Indonesia	1870-1949				
Iran	1870-1949		1870-1949		North Africa & Middle East
Iraq	1870-1949		1932-1949		North Africa & Middle East
Ireland	1870-1949		1922-1949		European Periphery
Italy	1870-1949		1870-1942 1946-1949		European Periphery
Jamaica	1870-1949				
Japan	1870-1949	1885-1940	1870-1944	1885-1940	Asia
Jordan	1870-1949		1946-1949		North Africa & Middle East

List of Countries (cont.)

Country	Est. Nominal GDP	Act. Nominal GDP	Est. Trade Share	Act. Trade Share	Region
Korea	1870-1949	1911-1940	1888-1905		Asia
Malaysia	1870-1949				
Mexico	1870-1949	1925-1949	1870-1913 1918-1949	1925-1949	Latin America
Morocco	1870-1949		1870-1871 1873 1886-1888, 1891 1893, 1895 1900-1911		North Africa & Middle East
Myanmar	1870-1949		1948-1949		Asia
Nepal	1870-1949		1920-1923		Asia
Netherlands	1870-1949	1870-1913 1921-1939	1870-1913 1915-1940 1946-1949	1870-1913 1921-1939	European Core
New Zealand	1870-1949		1920-1949		European Offshoots
Nicaragua	1920-1949		1920-1949		Latin America
Norway	1870-1949		1905-1913 1919-1940 1945-1949		European Core
Panama	1945-1949		1945-1949		Latin America
Paraguay	1870-1949		1939, 1946-1949		Latin America
Philippines	1870-1949		1946-1949		Asia
Poland	1870-1949		1920-1939 1946-1949		European Periphery
Portugal	1870-1949		1870-1916 1918-1949		European Periphery
Romania	1870-1949		1878-1915 1919-1942 1946-1949		European Periphery
Russia	1870-1949		1870-1916 1919-1939 1945-1949		
Singapore	1870-1949				
South Africa	1870-1949	1920-1949	1920-1949	1920-1949	
Spain	1870-1949	1870-1940	1870-1949	1870-1940	European Periphery
Sri Lanka	1870-1949		1948-1949		Asia
Sweden	1870-1949	1870-1913 1915-1949	1870-1949	1870-1913 1915-1949	European Core
Switzerland	1870-1949		1870-1949		European Core
Syria	1870-1949		1946-1949		North Africa & Middle East
Taiwan	1870-1949	1903-1938			
Thailand	1870-1949		1887-1888 1890-1939 1946-1949		Asia
Tunisia	1870-1949		1876-1879		North Africa & Middle East
Turkey	1870-1949		1870-1913 1919-1949		North Africa & Middle East
United Kingdom	1870-1949	1870-1949	1870-1949	1870-1949	European Core
Uruguay	1870-1949		1882-1949		Latin America
U.S.A.	1870-1949	1870-1949	1870-1949	1870-1949	European Offshoots
Venezuela	1870-1949		1870-1949		Latin America
Yugoslavia	1870-1949		1878-1912 1920-1940 1945-1949		European Periphery