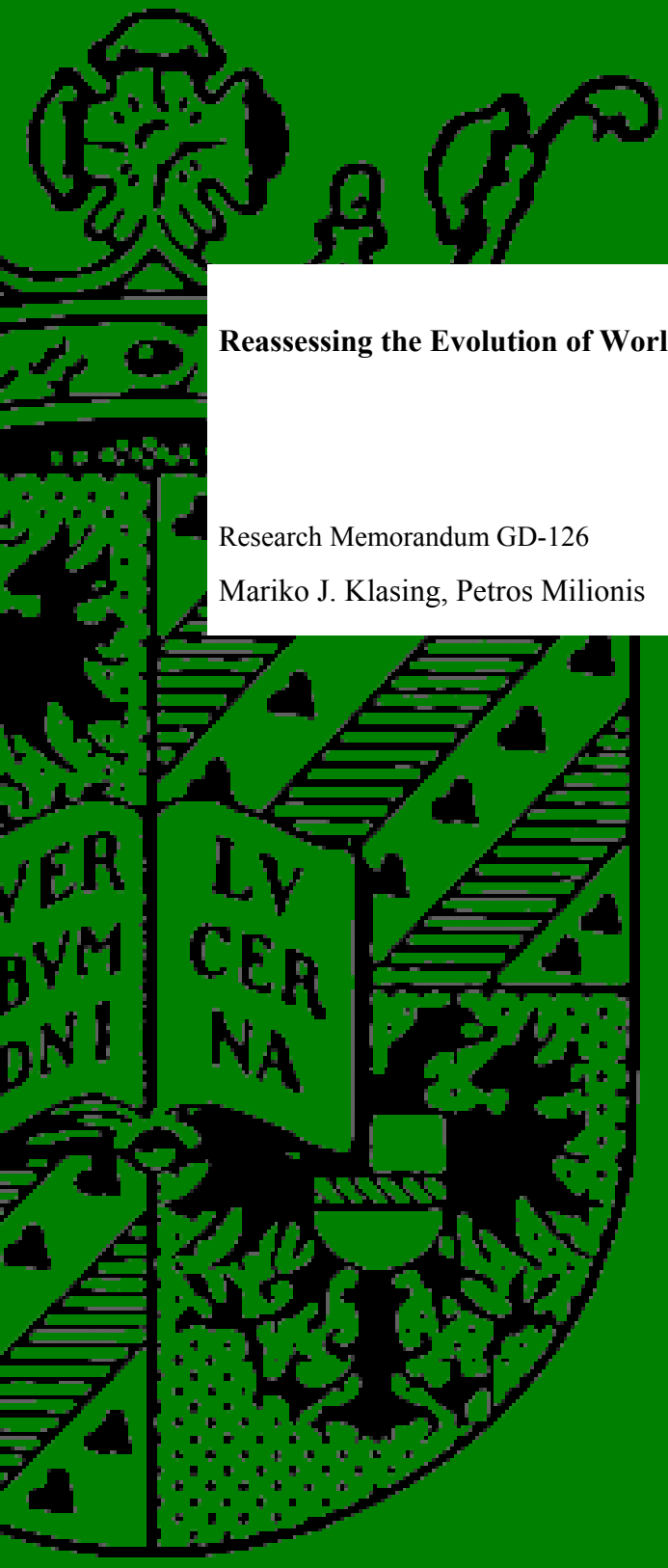
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Reassessing the Evolution of World Trade, 1870-1949

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RESEARCH MEMORANDUM

Reassessing the Evolution of World Trade, 1870-1949

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Abstract

The typical narrative regarding the evolution of world trade prior to World War II refers to a secular rise that started around 1870 and a subsequent collapse that began in 1914. This narrative, though, is based on measures of trade openness that do not fully take into account purchasing power differences across countries, as in the literature non-PPP-adjusted trade data are typically denominated by PPP-adjusted GDP data. The present paper seeks to resolve this inconsistency by constructing new trade share estimates for 51 countries spanning the period from 1870 to 1949 by combining historical import and export data with non-PPP-adjusted GDP values that we estimate via the "short-cut" method. Our estimates indicate a much more pronounced rise and fall of world trade over this period with trade shares being on average 32% higher than previously documented and the world's level of openness to trade in 1913 being comparable to that in 1974. In addition, performing a similar correction for purchasing power differences in the context of standard gravity regressions for the 1870-1939 period we find that the existing literature has overestimated the importance of income movements during this period relative to tariffs changes and the evolution of the gold standard.

Keywords: International Trade, Purchasing Power Differences

JEL Classification: F01, F15, N10, N70.

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1 Introduction

We live in a globalized world. Yet, to what extent is the recent globalization movement that the world has witnessed since the 1950s a singular experience? A precise answer to such a question requires a careful quantification of how open the world economy was prior to World War II. The present paper is the first to attempt to consistently measure trade openness for a large number of countries during the period from 1870 to 1949. Based on that, we then seek to reassess the determinants of international economic integration, as it evolved over this period.

Our choice to focus on the eight decades prior to 1950 is neither accidental nor without precedent. In the recent years a growing number of international economists and economic historians has turned to the study of this period that comprises the years of World War I and II, the turbulent interwar era as well as the pre-war Belle Époche.[1] Particularly this last period -often referred to as the first globalization era- has attracted a lot of attention, as it very much resembles today's world in terms of international trade as well as capital flows.[2]

However, as with the study of any historical period, existing work that has attempted to assess and analyze the degree of openness of different economies and the world as a whole during the pre-World-War-II period has been constrained by the incompleteness of the available data. As a consequence, when measuring trade shares researchers were typically forced to combine nominal, namely non-PPP-adjusted, export and import data with real, namely PPP-adjusted, GDP values such as those of Maddison (2001).[3,4] Trade shares calculated in this fashion, though, are subject to systematic biases given the well-known fact that relative price differences across countries vary systematically with the level of economic development.[5]

To avoid such biases in the present paper we construct trade shares for the largest-possible set of countries spanning the period from 1870 to 1949 based on non-PPP-adjusted GDP values. These values are estimated via the "short-cut" method, a method which enables the prediction of nominal from real income values and vice versa, as we explain in Section 2. Following this method, which was widely used at the time when internationally comparable national account data were more scarce, we can obtain estimates for non-PPP-adjusted GDP for the period of interest for 68 countries based on the PPP-adjusted GDP figures of Maddison (2001). Given the available export and import data, this allows for the consistent measurement of trade shares for 51 countries.

To assess the quality of our estimated nominal income and implied trade share data, we

[1] See for example the work of O'Rourke and Williamson (1999), Estevadeordal, Frantz, and Taylor (2003), Jacks, Meissner, and Novy (2010), Schularick and Solomou (2011) and the references therein.

[2] See for example the comparisons made by Krugman (1995) and Obstfeld and Taylor (2004).

[3] Following the language of the international comparison literature, we will often use the term "real" to refer to PPP-adjusted measures and the term "nominal" to non-PPP-adjusted ones.

[4] Examples of cases were nominal trade data were combined with real income data can be found in Estevadeordal, Frantz, and Taylor (2003), Lopez-Cordova and Meissner (2003) and Jacks, Meissner, and Novy (2011).

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

compare them with the corresponding ones that we were able to obtain from existing historical sources for a small set of 16 countries for the years prior to 1949. For those limited cases, as we document in Sections 2 and 3, we find our estimated values to be remarkably close to the actual ones. Moreover, we also compare our non-PPP-adjusted GDP and trade share estimates with those obtained in the case where no correction for purchasing power differences is made. This latter comparison reveals that, as one would expect, not correcting for such differences leads to a substantial underestimation of trade shares for most countries.[6]

Having established the quality of our estimated trade shares, in Section 3, we then turn to discuss what they imply for the evolution of world trade prior to World War II. In this context we first document how overall both the expansion of international trade over the 1870-1913 period as well as its collapse between 1919 and 1939 was much more pronounced than what the existing literature has suggested. Specifically we find that trade shares during the period 1870-1949 were on average 32% higher than what previous research had established, implying that the extent of international trade during the height of the first globalization era was comparable to that observed during the mid 1970s. In addition, tracking the behavior of our trade share estimates across different regions of the globe, we observe different regional patterns with the Western European economies driving the pre-World-War-I trade expansion and these economies together with those of Latin America accounting for most of the subsequent retreat.

Extending our analysis beyond the discussion of global and regional trade patterns that prevailed prior to World War II, in Section 4 we also pursue a gravity approach to shed more light on the determinants of international trade flows going back to 1870. In this respect we follow closely the work of Eichengreen and Irwin (1995), Irwin and Terviö (2002), Estevadeordal, Frantz, and Taylor (2003), Lopez-Cordova and Meissner (2003), Jacks, Meissner, and Novy (2010) and others who have employed gravity models to analyze historical bilateral trade flows. Yet, in contrast to most existing contributions, we estimate our gravity specification combining non-PPP-adjusted bilateral trade data with our estimated non-PPP-adjusted income data instead of PPP-adjusted ones.

Focusing on the role of income growth, tariffs and the gold standard in influencing trade flows between countries, we consider their predictive power in the context of the gravity model and the relative importance of each in explaining the evolution of bilateral trade flows over time. In this context we show how the common approach of employing PPP-adjusted GDP data instead of non-PPP-adjusted ones leads to a systematic overestimation of the effect of income growth and an underestimation of that of tariffs and the gold standard. Yet, as we demonstrate in a counterfactual analysis based on our gravity estimation results, pair-specific income movements still explain most of the observed growth in bilateral trade during the first globalization era.

[6] This is due to imports and exports being divided with PPP-adjusted income values that are higher than their corresponding non-PPP-adjusted counterparts.

Contrary, though, during the interwar period the collapse of bilateral trade flows was primarily the result of the global trend towards trade disintegration.

2 Estimating Nominal GDP

2.1 The "Short-Cut" Method

A correct calculation of historical trade shares based on nominal trade data requires a corresponding set of nominal, namely non-PPP-adjusted, GDP values. Such information, though, is currently only scarcely available. To avoid this data limitation problem, we employ the "short-cut" method in order to estimate nominal GDP in current prices for the largest possible set of countries and time-periods based on the available information on real, namely PPP-adjusted, GDP. This method has a long tradition in the literature on international comparison 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 nominal and real GDP in per capita 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 base country- reflects the country's general price level vis-à-vis that of the base country. This 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 so its ratio of nominal to real per capita GDP - should vary with the country's level of development and degree of openness. This implies the existence of a direct relationship between relative nominal and real GDP per capita.

Denoting with y_i^{PPP} the level of PPP-adjusted GDP per capita of a country i relative to the base country -which for the context of our analysis we take to be the United States- and $y_i^{non-PPP}$ the corresponding level of non-PPP-adjusted GDP per capita, the "short-cut" method posits that,

$$y_i^{non-PPP} = f(y_i^{PPP}, PI_i), \tag{1}$$

with PI_i being a measure of country i's degree of price isolation from the rest of the world.[9]

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

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

[9] We should note here that the basic relationship (1) underlying the "short-cut" method can also be considered with y_i^{PPP} being the dependent variable as in Prados de la Escosura (2000). Yet, as Kravis, Heston, and Summers (1978) emphasize it is more appropriate -in terms of causality- to treat, as we do, $y_i^{non-PPP}$ as the dependent variable.

Assuming this relationship to be approximately log-linear we can rewrite expression (1) as:

$$\ln y_i^{non-PPP} = \alpha + \beta_1 \ln y_i^{PPP} + \beta_2 (\ln y_i^{PPP})^2 + \beta_3 \ln Pop_i + \beta_4 \ln Area_i + \beta_5 \ln OP_i^{FR} + \varepsilon_i. \quad (2)$$

In the above equation the degree of price isolation of a country i relative to rest of world is reflected in terms of its population, Pop_i, 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] The squared term of $\ln y_i^{PPP}$ is included to capture potential non-linearities in the relationship between real and nominal income.

We estimate equation (2) using data on PPP- and non-PPP-adjusted GDP per capita in current prices from Penn World Tables for the period 1950-1990, as suggested by Prados de la Escosura (2000).[11] Information on population levels is also taken from Penn World Tables, while information on the area of each country was collected from the CIA World Factbook. We perform this estimation using three different estimation techniques, OLS, GLS and RLS, and pooling all observations in a unique cross-section.[12] The estimation results are reported in Table 1. Columns (1) to (3) show the results for the baseline specification reflected in equation (2) for each of the three estimation techniques. As it can be seen from the first three columns of Table 1, the three techniques do not lead to substantially different coefficients for PPP-adjusted GDP per capita, its squared term and the other variables. Yet, the GLS estimation leads to greater standard errors which indicates the presence of heteroscedasticity or autocorrelation in the data. Moreover, the robust least squares estimation do not reveal any extreme outliers in the data. For these reasons, we are subsequently focusing on GLS estimates.

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

To make our regression specification more flexible, in column (4) 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. To do so 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 50% 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 of PPP-adjusted GDP

[10] All three variables are expressed relative to the corresponding value for the U.S..

[11] Prados de la Escosura (2000) argues that international price level differences observed during the period 1950-1990 provide a good approximation of the corresponding differences in the 19th century and early 20th century. This may seem at first as a rather heroic assumption. Yet, both the results obtained by him as well as our results reported below, seem to attest to that assumption.

[12] The advantage of generalized over ordinary least squares is that it allows to account for potential autocorrelation within panels as well as heteroscedasticity across panels. Robust least squares, on the other hand, limit the weight of outliers by assigning more weight to observations with a smaller error term and omitting extreme outliers with a Cook's D statistic greater than one.

per capita. As the results of column (4) indicate, this effect seems to be primarily operating through the slope coefficients.

In column (5) we introduce an additional dummy variable to account for the fact that the 1950-1990 period used for the estimation of equation (2) encompasses both the more stable -in terms of exchange rate volatility- Bretton Woods era as well as the more turbulent post-1970 era. This "Currency Regime" dummy, which we also interact with the income terms, allows to separate the two eras and capture differences in the relationship between PPP- and non-PPP-adjusted GDP across the two regimes. As the results of column (5) indicate, the nature of the relationship seems to indeed vary with the exchange rate regime.

Finally, in column (6) we add both the "Periphery" and the "Currency Regime" dummies to allow for both variation across different levels of economic development and exchange rate regimes in our estimated relationship between PPP- and non-PPP-adjusted GDP. We also include all the corresponding interaction terms with $\ln y^{PPP}$ and $(\ln y^{PPP})^2$ apart from the interaction of the squared income term with the currency regime dummy, which was shown to be insignificant in column (5). This specification generates the best possible fit for the data,[13] while the resulting estimation results appear to be very much in line with those of columns (3), (4) and (5).

2.2 Nominal GDP Estimates, 1870-1949

Having estimated the relationship between PPP-adjusted and non-PPP-adjusted GDP per capita relative to the United States for the period 1950-1990, we now use it to make out-of-sample predictions. Specifically, we employ this relationship in order to predict non-PPP-adjusted GDP for the period 1870-1949 for which we lack comprehensive data.

To make these predictions we use the estimated coefficients of column (6) combined with the PPP-adjusted GDP per capita data provided by Maddison (2001), expressed in current prices.[14] This source is also used to obtain population figures for this earlier time period and to extend our "Periphery" dummy variable accordingly. For the "Currency Regime" dummy we follow Prados de la Escosura (2000) and assign to the classical gold standard period (1870-1913) the same value as during the Bretton Woods era, as both regimes essentially imposed fixed exchange rates. The remaining years during the world wars and the interwar period are treated as equivalent in terms of the currency regime to the post-1970 period. Finally, in cases where there have been areal changes we adjust the area of each country accordingly.[15]

[13] We assess the specification fit based on the adjusted R-squared coefficients, which in the case of GLS can be calculated in multiple ways. Here it corresponds to the squared correlation coefficient between the predicted value of $y_i^{non-PPP}$ and its observed value.

[14] Maddison's GDP figures are expressed in constant 1990 prices. These are converted in current price terms to make them comparable to the Penn World Tables current price GDP series that was used for the estimation of equation (2). This conversion is done by multiplying the original figures with a 1990-base year U.S. Consumer Price Index, taken from Measuring Worth (www.measuringworth.com/uscpi).

[15] Such adjustments are necessary for Austria and Hungary prior to 1918 as well as for Korea prior to 1948.

Following this approach, we can construct estimates for nominal GDP per capita in current prices relative to the United States and implied PPP-factors for a set of 68 countries spanning the period from 1870 to 1949.[16] Out of these 68 countries, we are able to obtain complete 80-year time series for 57 countries and long series with more than 30 years of observations covering the post-1900 period for additional 6 countries.[17] The resulting sample is also quite representative as it spans all five continents of the world and represents countries of differing levels of economic development and political-economic systems.

To provide a sense of the quality of our estimates, in Figure 1 we compare our estimated values of relative non-PPP-adjusted GDP per capita for the case of Great Britain with the actual values obtained from available historical national accounts data. We chose 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 in all years from 1870 to 1949.[18] In addition, Figure 1 also includes the corresponding level of per capita GDP of Britain relative to the United Stated in PPP-adjusted terms based on Maddison's data in order to give an idea of how the PPP-adjusted and non-PPP-adjusted figures differ in the period of interest.

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

As it can be seen from the figure, our estimated nominal GDP series matches very closely the actual one, indicating that our approach based on the "short-cut" method does indeed generate reasonable estimates. Moreover, as the significant gap between the relative PPP-adjusted GDP series from Maddison and the non-PPP-adjusted series indicates, this 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 U.S.. In fact, as it is clearly visible in the figure, the British price level was substantially lower than that of the U.S. during all the years from 1870 to 1949, although this gap fell over time as British prices converged to American ones.

Apart from the case of Britain, this comparison of actual and estimated nominal GDP per capita can be performed for a few more countries for which historical nominal GDP time series are available. Based on information provided by Mitchell (2008) as well as by Smits, Woltjer, and Ma (2009), we were able to obtain such series for the period prior to 1949 for 16 countries -excluding the U.S..[19] Figure 2 displays the weighted average of each of the three relative GDP series for this set of 16 countries with weights based on each country's aggregate PPP-adjusted

For all other countries the analysis is conducted based on their contemporary borders.

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

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

[18] As stated in the Appendix Britain and the United States are the only countries for which we have a complete nominal GDP series as well as exchange rates going back to 1870.

[19] A list of these countries and the years of data coverage can be found in the appendix. Conversion to U.S. dollars was made based on information provide in the Correlates of War Trade Data Set .

level of GDP. Similar to the case of Britain, we can see that our estimated non-PPP-adjusted GDP series matches very closely the values obtained from existing historical national accounts statistics, while the PPP-adjusted series based on Maddison's data differs substantially.

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

This discrepancy is also evident if the root mean square errors (RMSE) for the deviation of our estimated nominal GDP values from the actual ones is calculated for these 16 countries. This can be then compared to the corresponding RMSE of the deviation of Maddison's real GDP series from the actual nominal series. This error is 22% for our estimated series and 44% for Maddison's series.[20] Taking also into account the relative size of countries and calculating weighted errors, the discrepancy is even more striking with the error being on average only 16% for our estimated series and 38% for the Maddison series.

3 World Trade Evolution, 1870-1949

Having constructed estimates for nominal GDP per capita for a large number of countries, we now turn to combine these estimates with the nominal export and import data assembled by Barbieri, Keshk, and Pollins (2009) to calculate trade shares going back to 1870.[21] When doing so, we follow the standard practice of summing up for each country the total value of exports and imports and dividing this value with our estimate of aggregate nominal GDP. This corresponds to the above estimated value of non-PPP-adjusted GDP per capita multiplied by the respective population figures from Maddison (2001).

Based on the available trade data and our nominal GDP estimates, we are able to calculate trade shares for 51 countries, in addition to the U.S.. Among this set of countries, we have 24 countries for which we are able to track the complete evolution of trade shares for all non-war years -1870-1913 and 1920-1938- as well as a total of 43 countries for which our estimated trade shares series span more than 20 years. This greatly increases the available information on historical trade shares compared to the case were only non-estimated nominal 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 six.[22]

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, using three possible measures. The blue

[20] These errors are substantially lower during the First Globalization Era (20% for our estimate and 39% for the Maddison series) than during the interwar period (26% and 57% respectively.)

[21] The data are available on-line through the Correlates of War project: http://correlatesofwar.org.

[22] The complete list of all countries and years for which trade shares can be constructed based on estimated and actual GDP data is available in the Appendix.

line corresponds to our estimated trade share, while the red line uses instead of our estimated non-PPP-adjusted GDP figures the actual values taken from the available historical sources. In addition to those two measures, we also provide the trade share that would result if one would simply divide the sum of exports and imports by the total value of PPP-adjusted GDP reported by Maddison (2001) inflated with the U.S. Consumer Price Index. This is the practice followed by most of the existing literature and the series obtained this way is depicted by the green line. We add this third measure in order to see the extent to which combining PPP-adjusted GDP data with non-PPP-adjusted trade data would bias the implied trade shares.

[Insert Figure 3 (British Trade Share) here]

As Figure 3 demonstrates, the common practice of denominating nominal trade data with real GDP leads to a sizeable underestimation of the British trade share prior to 1950. 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. In stark contrast to this, we see that our estimated trade share series matches closely the actual one, as it was the case with our nominal GDP estimates in Figure 1.

Moving beyond the case of Britain, Figure 4 presents the corresponding comparison in terms of trade shares for the 13 countries for which non-estimated nominal GDP data are available.[23] The displayed series is a weighted average of the trade shares of all countries with weights based on each country's fraction in the sum of the 13 countries' GDP. As it was the case in Figure 3, our estimated series matches closely the actual one, while both exceed greatly the one based on the PPP-adjusted GDP series of Maddison.[24] Moreover, a calculation of the corresponding root mean square errors reveals that our estimated series on average deviates by only 23% from the actual series, while the series based on PPP-adjusted GDP deviates in average by 39% from the actual series.[25] Weighting these deviations with each country's share of aggregate GDP, leads to a RMSE for our estimated series of only 17%, while the corresponding error of the series based on PPP-adjusted GDP is 35%.

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

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 as across different regions of the world. This information is displayed in the following two figures. First of all, Figure 5

[23] In this figure we omit the Netherlands, which constitutes a clear outlier with an implied trade share in non-war years during the period 1870-1939 averaging around 158% and occasionally reaching values of 300%.

[24] This is due to the fact that during the time period under investigation all countries of the world -with the exception of Australia in some years- had, according to our estimates, lower price levels than the United States.

[25] As it was the case with our estimated nominal GDP values, these deviations are substantially smaller during the first globalization era (14% for our estimates and 33% for the series based on PPP-adjusted GDP) than during the interwar period (30% and 48% respectively.)

depicts how the share of international trade in terms of GDP evolved for the world as a whole. Here again, the blue line depicts our estimate that denominates the existing nominal trade data with our estimated nominal GDP series, while the green line corresponds to the one obtained if the real GDP data of Maddison (2001) are used instead. Both series are based on trade shares from the same 51 countries mentioned above weighted by each countries share in total GDP. In addition, Figure 5 also includes the equivalent world trade share series for the post-1950 period using information on the trade shares for the same set of 51 countries reported in the Penn World Tables and weighted correspondingly. We include this series in order to document how well our estimated pre-1950 global trade share series lines up with the conventional post-1950 wisdom regarding world trade.

[Insert Figure 5 (World Trade Share) here]

As Figure 5 documents, our estimated world trade share series, the blue line, is characterized by a secular rise during the first globalization era (1870-1913) and a sharp subsequent decline during the interwar period (1919-1939). Thus, qualitatively our series appears in line with the narrative offered by Estevadeordal, Frantz, and Taylor (2003) as well as Jacks, Meissner, and Novy (2011) regarding the pre-World-War-II evolution of world trade.[26] Yet, quantitatively our estimated trade shares are much larger than the incorrectly calculated one, depicted by the green line, that one would obtain by dividing the nominal trade data with real GDP. Specifically, our estimates suggest that the share of world trade increased from 18% in 1870 to 32% during the first globalization era, while an incorrect calculation that does not fully account for purchasing power differences across countries would reduce these numbers to 14% and 23% respectively. Similarly, during the interwar period, while according to our estimates the share of world trade fell from a pre-war level of 32% down to 11% in 1939, the incorrect trade share series displays a much smaller reduction from 23% to 10%. Regarding the magnitude of the discrepancy between the two series, this on average appears to be about 5.5 percentage points, which corresponds to an underestimation of the global trade share by 24%. It should be stressed, though, that this discrepancy is greater during the first globalization era than during the interwar period -6.5 versus 3.4 percentage points- due to the relative price convergence that took place over time.[27]

Moreover, the evolution of the world trade share implied by our estimates appears also to connect well with the post-1950 series based on Penn World Tables data. According to our

[26] Like many of the existing contributions in the literature, we take 1870 as the starting point of the first globalization era. This is partial due to the lack of comprehensive trade statistics that go back even further in time. In principle, as O'Rourke and Williamson (2002) and Jacks (2005) have pointed out the first globalization era could potentially be extended by another 20 to 50 years by taking its starting point to be 1850 or even to 1820.

[27] It should be noted that the discrepancy between the two series would be 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.

estimates, during the late 1940s world trade fluctuated in a band between 17.5% and 20.5% of GDP, which is very similar to the movements observed in the 1950s and 1960s during which the world trade share fluctuated between 18.5 and 21.5%. Thus, both our estimated series and the PWT series indicate that international trade was very stable during the first 25 years after World War II, averaging at a level of 19.5% of GDP and with a standard deviation of just 1 percentage point. Moreover, our historical trade series reveals that the level of trade openness that the world 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 presented by Beenstock and Warburton (1983), Krugman (1995) and O'Rourke and Williamson (1999).

In contrast, the incorrectly calculated series suggests that the value of world trade in the late 1940s was around 14% 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 earlier 1950s, which contradicts the aforementioned evidence. These observations suggest that an incorrect calculation of trade shares, which does not take into account relative price differences across countries, may lead to a distorted picture regarding the evolution of world trade prior to 1950 and a profound underestimation of the rise and fall that took place from the first globalization era to the end of World War II.

Looking beyond the global picture, in Figure 6 the evolution of world trade over the period 1870-1949 is broken down into separate series for four key regions of the globe: the European core, the European periphery, Latin America and Asia.[28] A comparison of the regional series reveals that the rise and fall of world trade that occurred from 1870 to 1939 was not uniformly experienced across all regions of the world. While in terms of levels, trade shares at the start of the first globalization era were highest in Latin America and lowest in Asia, over this 40-year period, though, the European core economies overtook the Latin American ones, in which the share of international trade remained fairly constant. This upward trend was also experienced by the economies of the European periphery and of Asia, but to a lesser extent.

[Insert Figure 6 (Regional Trade Shares) here]

Following the first World War and the subsequent Great Depression it was again the European core economies that witnessed the greatest implosion of trade. Yet, during this period the experience of Latin American and European peripheral economies was not different, as trade shares dropped to levels that were even lower than those prevailing during the first globalization era. Interestingly, though, this downward trend was not shared by the Asian economies, which

[28] See the Appendix for a list of countries falling into each of the above mentioned regions.

-according to our estimates- did not witness a disruption of the pre-World-War-I trade expansion during the interwar period but rather a continuation of pre-existing trends.

In Figure 6 we have avoided adding the corresponding incorrectly calculated trade shares that were shown in Figure 5 in order to not overcrowd the diagram. Yet, we should mention here that the same remarks as those made above apply also for all the regional trade shares series. Thus, trade shares based on a PPP-adjusted income measure are consistently lower than the "true" ones based on non-PPP-adjusted GDP. Moreover, the degree of underestimation is highest for the poorest regions of the world, which had the lowest relative price levels compared to the United States.

4 Determinants of Bilateral Trade Flows, 1870-1939

In addition to our discussion of the evolution of national, regional and global shares of international trade from 1870 to 1949, in the present paper we also seek to investigate more carefully what determined these trade flows across countries over this period. We embark on this investigation in order to assess the extent to which an analysis of trade flows based on real income values and nominal trade data, which is the approach followed by most of the existing literature, would lead to incorrect inferences regarding the determinants of trade during this important historical period.

4.1 Gravity Regression Results

To analyze trade flows across countries we pursue a gravity approach, which by now has become standard in the empirical literature on international trade. According to this approach, the level of trade between two economies is assumed to be driven by the size of as well as the degree of inward and outward resistance exhibited by each economy.[29] The former is typically captured by each economy's aggregate level of GDP, while the latter reflects various types of barriers to international trade. In the historical context of the first globalization era and the interwar period the two main factors influencing the strength of these barriers were the extent of tariff protection and the participation in the gold standard. In this respect we follow the work of Estevadeordal, Frantz, and Taylor (2003), Jacks, Meissner, and Novy (2011) and others who have analyzed bilateral trade flows during these periods based on a gravity framework. Specifically, we estimate the following regression specification:

$$\ln(Trade_{ijt}) = \alpha + \beta_Y \ln(Y_{it}Y_{jt}) + \beta_T \ln(1 + \frac{t_{it} + t_{jt}}{2}) + \beta_G Gold_{ijt} + \delta_{ij} + \tau_t + \varepsilon_{ijt}. \qquad (3)$$

[29] See Anderson and van Wincoop (2003) for more details.

$Trade_{ijt}$ refers to the sum of trade flows between two countries i and j at time t, Y_{it} and Y_{jt} denote aggregate GDP in the two countries, t_{it} and t_{jt} correspond to the average tariff rate in the two countries,[30] while $Gold_{ijt}$ is a dummy variable equaling one if both countries i and j were on the gold standard at time t. The term δ_{ij} denotes a pair fixed effect capturing any time-invariant pair-specific factors, such as the distance between two countries, the existence of a common border or the presence of a common language, that could influence the extent of trade between countries i and j.[31] Finally, τ_t denotes a time fixed effect capturing general time-varying trends, such as the change in world income or the available technology.[32]

Both our trade flows and aggregate GDP variables are expressed in current prices, with the former being taken from Barbieri, Keshk, and Pollins (2009) and the latter being estimated as discussed in Section 2. The average tariff data are from Clemens and Williamson (2004) and updated with the information provided by Schularick and Solomou (2011),[33] while the coding of the gold standard variable is based on the information provided by Officer (2008).[34] We focus our analysis on the role of income, tariffs and the gold standard in determining trade between countries during the period from 1870 to 1939, as these are the variables that have attracted most of the attention in the literature. An important difference, though, between our approach and that of the existing literature is that we estimate the above specification using non-PPP-adjusted income and trade data. Thus, do not combine PPP-adjusted income data with non-PPP-adjusted trade flows, which -as we show below- would tend to bias the estimated coefficients.[35]

We estimate equation (3) separately for the first globalization era (1870-1913) and the interwar period (1919-1938) using an unbalanced panel of countries. In the former period this includes 202

[30] Given that available tariff data for the period of interest only provide information on average tariff rates per country, we use the mean of the prevailing average tariff rates in the two countries to proxy for the actual bilateral tariff rate which is not observed.

[31] We also considered an alternative specification with country fixed effects instead of pair fixed effects. Such a specification has the advantage of allowing us to explicitly control for the effect of key time-invariant pair-specific characteristics such as distance, shared border or common language. Given, though, that the results of this alternative specification are not substantially different and given the more parsimonious nature of a specification with pair fixed effects, we chose not to present any results based on this alternative specification, which may be subject to biases due to unobserved heterogeneity across pairs.

[32] Our specification does not explicitly account for transportation costs due to a lack of data at the country or pair level. Yet, the inclusion of pair fixed effects, which among others account for the distance between two countries, and the inclusion of time fixed effects, which among others reflect the state of technology, implicitly allows us to do so. This is because, as discussed in Estevadeordal, Frantz, and Taylor (2003), distance and technology were the two main factors driving the evolution of transportation costs. Alternatively, we also considered a specification which includes distance-decade interaction terms to explicitly account for the changing importance of distance-related transportation costs. This, however, did not lead to qualitatively different results compared to specification (3) and for this reason we do not present more details.

[33] We would like to explicitly thank Michael Clemens, Moritz Schularick, Solomos Solomou, and Jeffrey Williamson for being kind enough to share their data with us.

[34] This information is available on-line at eh.net/encyclopedia/article/officer.gold.standard and we would also like to thank Lawrence Officer for kindly providing us with the data tables included in the article.

[35] As we explain below, though, we do compare our results with those obtained when PPP-adjusted income data are used instead to give an indication regarding the nature of the alleged bias.

distinct country pairs and in the latter 296.[36] The results of this estimation based on OLS are reported in Table 2. The left panel of the table displays the results for the 1870-1913 period, and the right one for the 1919-1938 period. In each panel we compare the estimated coefficients with those obtained if the PPP-adjusted GDP data of Maddison (2001) inflated with the U.S. CPI are used instead of our estimated non-PPP-adjusted GDP values. The regressions displayed in each of the two panels are estimated as two seemingly unrelated equations, using robust estimators of the simultaneous variance-covariance matrix. At the bottom of each panel, we report for each of the two periods the corresponding p-values for the tests of the equality of the coefficients on income, tariffs and the gold standard.

[Insert Table 2 (Gravity Regressions - Full Sample) here]

Overall the results displayed in Table 2 confirm the importance of income levels, tariffs rates and gold standard membership as important determinants of bilateral trade flows. In both periods the coefficients of all three variables are statistically significant and have the expected signs. Higher income levels in either country led to increased bilateral trade, while greater tariff protection had the opposite effect. Moreover, bilateral trade between countries was promoted through adherence to the gold standard.[37] We should note, however, that the low p-values of the tests of equality for the coefficients on each regressor at the bottom of each panel imply that the estimated coefficients on all three variables statistically differ depending on the type of GDP measure used in the estimation. Specifically, we see that the effect of income tends to be overestimated, while the effect of tariffs and the gold standard tend to be underestimated if a PPP-adjusted income measure is used instead of a non-PPP-adjusted one. The intuition for this bias is simple and stems from the fact that the relative dispersion of PPP-adjusted income is much lower than that of non-PPP-adjusted income, as the latter encompasses not only the dispersion in living standards but also that in price levels.

An important caveat to the above interpretation of the estimation results in Table 2 is that they may be subject to endogeneity biases. A likely source of such bias is the gold standard dummy, as Estevadeordal, Frantz, and Taylor (2003) and Meissner (2005) have argued that pre-existing trade linkages between countries influenced the adoption of the gold standard. Thus, to ensure that our results are not driven by this type of endogeneity we follow Estevadeordal, Frantz, and Taylor (2003) and instrument the *Gold* dummy variable with the product of the logarithm of each partner country's average distance from all countries participating in the gold standard in any given period. The results of this instrumental-variable estimation are displayed

[36] The unbalanced nature of the panel has little effects on the estimation results. Even when we re-estimate our specification in a balanced panel which includes 50 pairs during the pre-1913 period and 97 pairs during the interwar period the results are qualitatively unchanged.

[37] In this respect our findings confirm those of Estevadeordal, Frantz, and Taylor (2003), Lopez-Cordova and Meissner (2003) and Jacks and Pendakur (2010).

in Table 3 for both sub-periods.[38] In either case the instrumentation strategy does not lead to qualitatively different results, although the point estimates of the income coefficients are lower than the corresponding OLS estimates while those for tariffs and the gold standard higher.[39] Moreover, as in Table 2, when a PPP-adjusted GDP measure is used instead of a non-PPP-adjusted one we still observe an overestimation of the effect of income and an underestimation of those of tariffs and the gold standard.

[Insert Table 3 (Gravity Regressions - IV Results) here]

An additional concern regarding our findings above of a relative underestimation of the effects of tariffs and the gold standard and an overestimation of the effect of income is that this may be due to the fact that our nominal GDP data are estimated. To test that this is not the case, we re-estimate our main specification (3) using only the country-pairs for which actual nominal GDP data are available from historical sources. The results from these regressions are reported in the two panels of Table 4. In each panel the first column reports the estimated coefficients obtained with our estimated nominal GDP data, the second column those based on the real income data of Maddison (2001) and the third column those when non-estimated nominal GDP data are used.[40] To ease comparisons between the results of each column we have kept the sample constant across all three specifications, using the information from just 26 country-pairs in the first subperiod and 55 pairs in the second.

[Insert Table 4 (Gravity Regressions - Restricted Sample) here]

This restriction to a substantially smaller sample obviously implies greater standard errors and lower statistical significance. Yet, the results of Table 4 appear to be generally in line with the findings from Tables 2 and 3. Income levels have a strong positive effect on bilateral trade flows, which effect, however, tends to be overestimated when real GDP values are used instead of nominal ones. The participation in the gold standard has a significantly positive effect on trade flows and its magnitude tends to be underestimated when real GDP values are employed. Finally, tariffs have a statistically significant negative effect at least during the interwar period, which again tends to be underestimated in the gravity regressions based real GDP data.[41] Furthermore, even in this restricted sample, a comparison of the regression coefficients between columns (1) and (2) as well as (2) and (3) in both panels reveals that they are statistically different from

[38] As following World War I all countries except for El Salvador had abandoned the use of gold until 1921, we are forced in the second subperiod to restrict our estimation to the years from 1921 to 1938.

[39] To faciliate the comparison with the OLS estimates, the last part of the panel shows the correponding OLS results for this reduced sample.

[40] The sources for these data are discussed in Section 2.

[41] We suspect that the insignificance of the average tariff variable during the first globalization era is driven by the fact that we only have information on 26 pairs during this time period and the calculated average tariffs variable is essentially based on tariff information from just 8 countries.

one another, as the low p-values in the bottom of the table indicate. This confirms that the overestimation of the income effect and the underestimation of the tariff and gold-standard effects in gravity regressions where nominal trade data are combined with real instead of nominal GDP is not an artifact of the estimated nature of our nominal GDP data.

4.2 Relative Contributions of Income Growth, Tariffs and the Gold Standard in the Rise and Fall of Trade

Having established the importance of income growth, tariff rates and the expansion of the gold standard in determining bilateral trade flows during the period from 1870 to 1939, we now turn to an assessment of the relative importance of these three factors in comparison to common global trends. We perform this assessment separately for each subperiod based on the coefficients estimated in column 1 of panels 1 and 2 in Table 2. Thus, we use the estimation results based on non-PPP-adjusted income values to avoid the potential biases discussed above.

In order to assess the relative importance of income growth, tariff rate changes, participation in the gold standard as well as common global trends for trade we perform a counterfactual analysis in the spirit of Baier and Bergstrand (2001) and Estevadeordal, Frantz, and Taylor (2003). We calculate the counterfactual trade levels that would have resulted between any two pair of countries i and j if only one of the four factors had changed over time and the other variables had remained constant. Specifically, suppose that the variable of interest x had changed by the amount Δx_{t-1} between periods t and $t-1$. Then, if β_x is the coefficient of variable x derived from the gravity model, the counterfactual level of trade in period t would be:

$$\text{Trade}_{ijt}^{C} = \exp[\beta_x \Delta x_{t-1}] \cdot \text{Trade}_{ijt}.$$

To assess the role of common global trends, which among other things capture the extent and importance of changes in the transportation technology, we rely on the estimated year fixed effects from each specification. This is because the fixed effects capture how different trade flows are ceteris paribus in a given year compared to the initial year. Thus, with τ_t being the estimate of the time fixed effect in period t, the corresponding counterfactual level of trade in period t would be

$$\text{Trade}_{ijt}^{C} = \exp[-\tau_t] \cdot \text{Trade}_{ijt}.$$

We calculate the relative contributions of each of the three pair-specific variables, income, tariffs and the gold standard, based on the average per-pair change observed over the whole two periods 1870-1913 and 1919-1939. These contributions for each pair are then weighted by the share of the joined GDP of the pair relative to the rest of the world. As for the time fixed effect,

since we are interested in the contribution of global trends over the whole course of each of these two periods, we use the values of the fixed effects in the final years of each period - i.e. the values in 1913 and 1938 - in our calculations.

On average, during the first globalization era the product of nominal incomes grew by 3.8% per year, implying that the typical country experienced an annual GDP growth rate of 1.9% during this period. During the interwar period, the corresponding growth rate was 3.3%. As for our average tariff measure, on average the per-pair tariff rate fell by 0.05 percentage points per year during the first globalization era and rose by 0.03 percentage points during the interwar period. Finally, our gold standard dummy - which essentially reflects the fraction of pairs being on gold at a given time - on average increased by 1.5 percentage points per year during the first globalization era and fell by 0.55 percentage points during the interwar period.

Looking at these two periods as a whole the following trends should be noted. During the first globalization era the level of non-PPP-adjusted GDP per country grew on average by approximately 80%, tariffs fell by 2.3 percentage points and the participation in the gold standard increased by 65 percentage points.[42] During the interwar period the corresponding income growth rate was on average 33.5%. At the same time, average tariffs increased by 11 percentage points and adherence to the gold standard declined by 0.6 percentage points.[43] Finally, the value of the fixed effects indicating the globally experienced changes in the log-level of bilateral trade over the two periods of interest is 0.67 in 1913 and -0.82 and 1939.

[Insert Table 5 (Counterfactual Analysis) here]

Table 5 above reports the results of this counterfactual analysis. Given the income coefficients reported in Table 2, the cumulative growth performance of the world economy implies that income growth contributed approximately 64% to trade growth during the first globalization era and about 33% during the interwar period. To be more precise, the value of 64.2% for income during the pre-1913 period implies that trade would have been 64.2% lower than it actually was in 1913 had income not increased between 1870 and 1913. Similarly for tariffs, we have that their fall contributed approximately 4% to trade growth during the first globalization era and their rise during the interwar period alone led to a 16% fall in world trade. Regarding the contribution of the gold standard our gravity regression results imply that its expansion during the first globalization era contributed to a 10% increase in world trade, while its disintegration during the interwar period played only a minor role for the evolution of bilateral trade relative to that of income growth and tariff spikes. Finally, the values of the fixed effects imply that

[42] This means that if hypothetically in 1870 there were no pair of countries trading with one another whose currencies where both fixed to gold, by 1913 65% of all sample pairs were jointly on the gold standard.

[43] This low observed change in the gold standard variable is due to the fact that no expansion of the gold standard took place during the interwar period. Most countries reintroduced the gold standard in the mid and late 1920s and abandoned it again by the mid 1930s.

common global trends contributed 49% to trade growth during the first globalization era, and would have led to a 128% decline in trade during the interwar period had not other factors, such as income growth, counterbalanced this effect.

Viewed from the perspective of the literature our findings for the first globalization era are line with those of Estevadeordal, Frantz, and Taylor (2003) and Jacks, Meissner, and Novy (2010) who attribute approximately 60% of pre-World-War-I trade expansion to income growth. They also confirm the relative unimportance of tariff movements during that period in comparison to global trends such as the decline in transportation costs. Moreover, similar to Lopez-Cordova and Meissner (2003) we also find a relatively small contribution of the gold standard expansion of approximately 10%. Regarding the interwar period, our estimated contributions of income growth and tariff movements are close to those of Estevadeordal, Frantz, and Taylor (2003), who find the former to be approximately 34% and the latter 22%. Yet, we find the disintegration of the gold standard that took place over this period to be substantially less important than existing studies and attribute the sharp fall of world trade that took place over the interwar period mostly to adverse global trends.[44]

5 Concluding Remarks

The recent debate regarding the causes and the consequences of the increased economic integration that countries and regions of the world are experiencing today has triggered an increased 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 (1919-1939) can enhance our understanding of contemporary developments.

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

Contrary to existing work, this paper provides estimates of trade shares based on non-PPP-adjusted GDP values which we estimate via the short-cut method. Our estimates indicate that trade shares during the 1870-1949 period were on average 32% higher compared to existing

[44] Our finding of the relative unimportance of the evolution of the gold standard during the interwar period for trade is due to our choice of 1919 as the starting year. This is because the disintegration of the gold standard took place primarily during World War I, at the end of which almost no country adhered to the gold standard. Had we performed a similar analysis starting in 1913, this would have led to a much greater role of the gold standard for trade.

accounts and the world's level of openness to trade in 1913 had been 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.

Furthermore, employing our nominal GDP estimates in standard gravity regressions, we reassess the determinants of bilateral trade flows during this time period and the relative importance of income growth, tariff movements and the evolution of the gold standard. Our approach differs from existing work that has performed such estimations using PPP-adjusted income even though the available trade data are expressed in nominal terms. In this context we find that the existing literature has tended to overemphasize the role of income movements relative to tariffs changes and the evolution of the gold standard.

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 and its determinants, 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 benchmarks for any subsequent research on the matter. Moreover, in the absence of alternative more comprehensive historical sources, we believe that our estimates of nominal income and trade shares can be of great value-added to many researchers interested in this historical period.

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Table 1: Short-Cut Estimation Results

	Dependent Variable: Log of Relative non-PPP per capita GDP					
	(1)	(2)	(3)	(4)	(5)	(6)
Estimation Method	**OLS**	**RLS**	**GLS**	**GLS**	**GLS**	**GLS**
$\ln(y^{PPP})$	1.446***	1.321***	1.356***	1.058***	1.328***	1.026***
	[0.0194]	[0.0164]	[0.0289]	[0.0831]	[0.0321]	[0.0833]
$\ln(y^{PPP})$^2	0.114***	0.0721***	0.0911***	-0.459***	0.0877***	-0.457***
	[0.00481]	[0.00405]	[0.00726]	[0.123]	[0.00834]	[0.123]
ln(Population)	-0.0351***	-0.0299***	-0.0390***	-0.0391***	-0.0372***	-0.0374***
	[0.00632]	[0.00532]	[0.0133]	[0.0129]	[0.0120]	[0.0117]
ln(Area)	0.102***	0.0895***	0.0627***	0.0596***	0.0656***	0.0624***
	[0.00629]	[0.00530]	[0.0121]	[0.0119]	[0.0111]	[0.0108]
ln(FR-Trade)	0.0708***	0.0754***	0.0208	0.0221	0.0282	0.0299
	[0.0181]	[0.0152]	[0.0392]	[0.0380]	[0.0354]	[0.0342]
$\ln(y^{PPP})$ x Periphery				0.249**		0.272***
				[0.100]		[0.0991]
$\ln(y^{PPP})$^2 x Periphery				0.544***		0.542***
				[0.122]		[0.122]
$\ln(y^{PPP})$ x Currency Regime					0.0553**	0.0355***
					[0.0258]	[0.00756]
$\ln(y^{PPP})$^2 x Currency Regime					0.0059	
					[0.00701]	
Periphery				-0.0806		-0.0659
				[0.0595]		[0.0583]
Currency Regime					0.0722***	0.0639***
					[0.0194]	[0.0157]
Observations	4097	4097	4097	4097	4097	4097
Adj. R-squared	0.880	0.769	0.878	0.879	0.879	0.880

Notes: All variables except from dummies are relative to those of the United States; standard errors in brackets.

*** significant at the 1% level; ** significant at the 5% level; * significant at the 10% level.

Figure 1: British Relative per Capita GDP

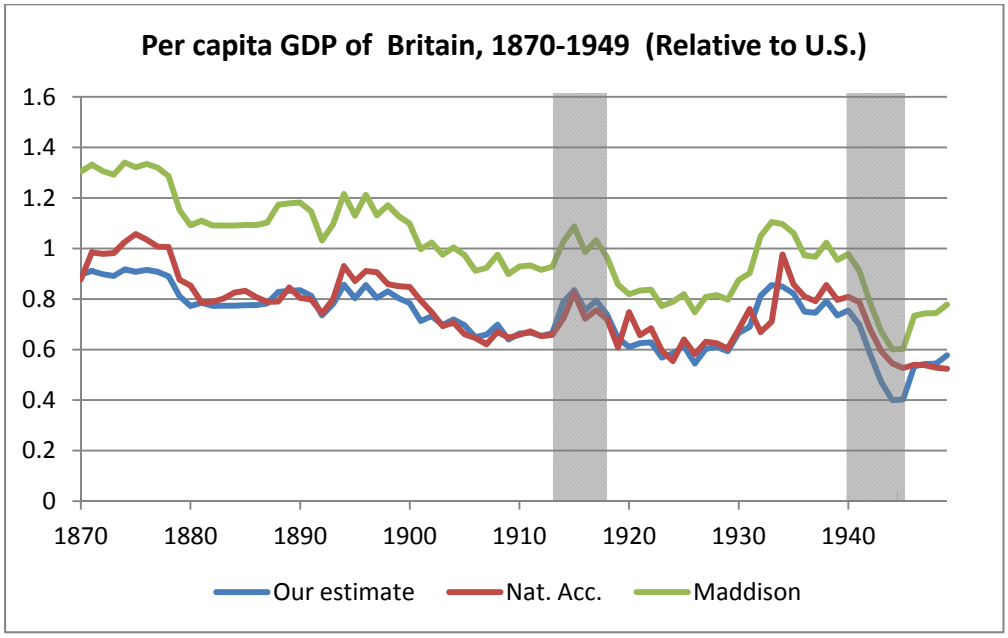


Figure 2: Average Relative per Capita GDP - 16 Countries

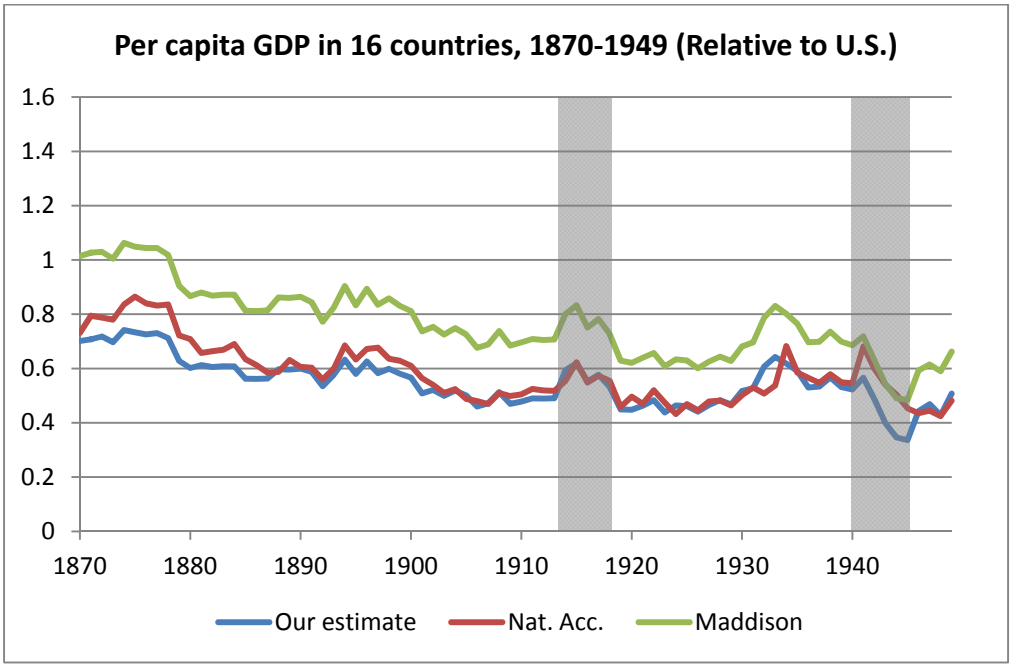


Figure 3: British Trade Share

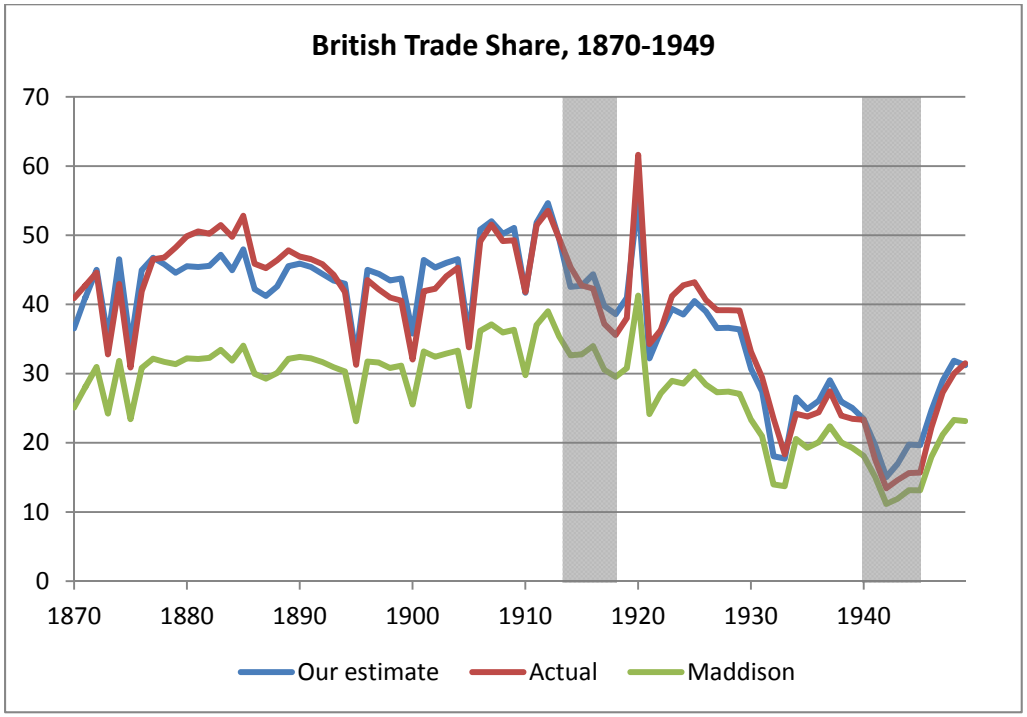


Figure 4: Average Trade Share - 13 Countries

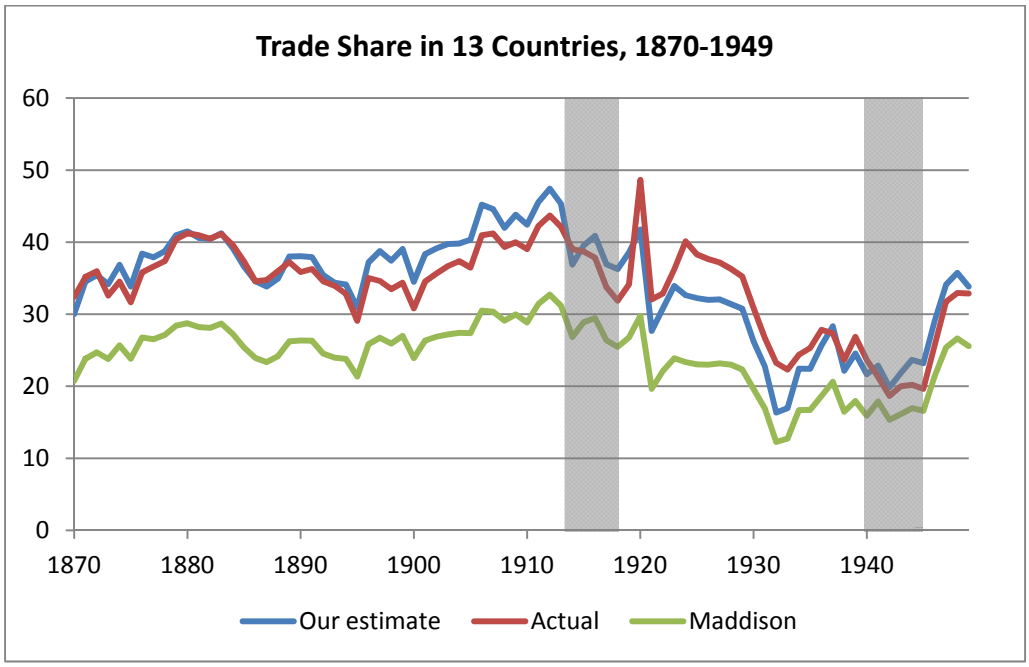


Figure 5: World Trade Share

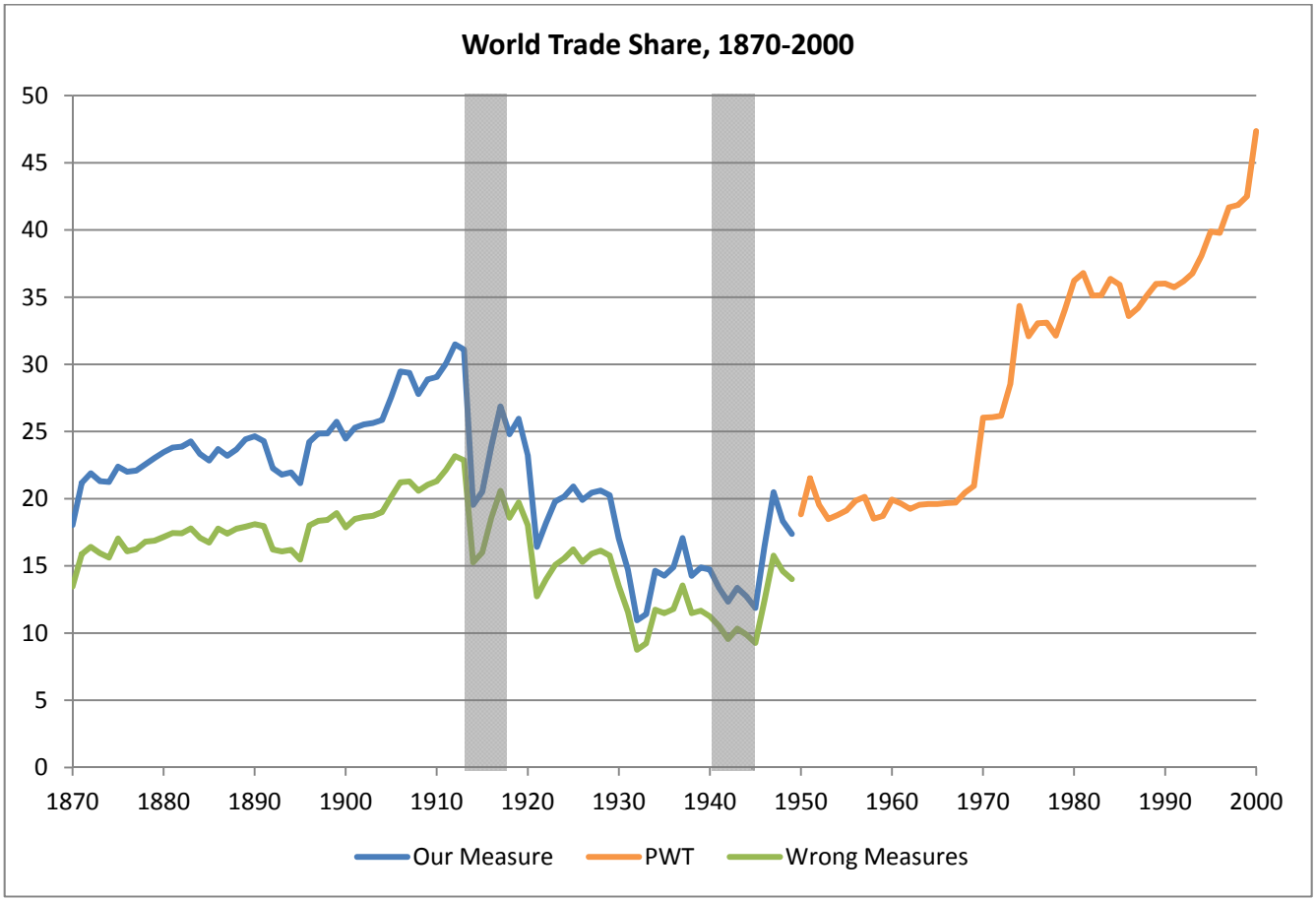


Figure 6: Regional Trade Shares

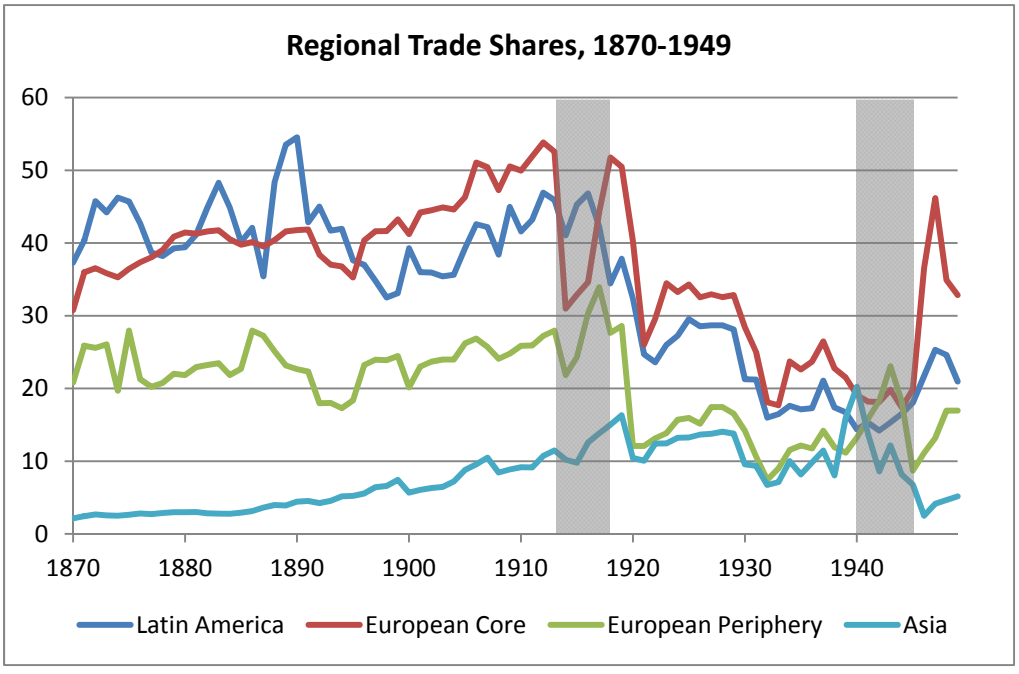


Table 2: Gravity Regressions – Full Sample

	Dependent Variable: Log of Bilateral Trade Flow (non-PPP)			
	1870-1913		1919-1938	
	(1a)	(1b)	(2a)	(2b)
Income Measure	**Estimated**	**Maddison**	**Estimated**	**Maddison**
Income	0.637***	0.708***	0.603**	0.658***
	[0.0511]	[0.0555]	[0.0692]	[0.0876]
Tariffs	-1.754***	-1.687***	-1.288932***	-1.262***
	[0.480]	[0.4808]	[0.337]	[0.339]
Gold	0.163***	0.160***	0.0758**	0.0725**
	[0.0295]	[0.0294]	[0.0332]	[0.0334]
Test for equality of coefficients (p-value)	Income: 0.0000 Tariffs: 0.0035 Gold: 0.0049		Income: 0.0266 Tariffs: 0.0565 Gold: 0.0473	
Obs.	4964	4964	3853	3853
Adj. R-squared	0.8905	0.8907	0.9387	0.9384

Notes: OLS estimation results with pair and year fixed effects, not reported; robust standard errors in brackets.

*** significant at the 1% level; ** significant at the 5% level; * significant at the 10% level.

Table 3: Gravity Regressions – IV Results

	Dependent Variable: Log of bilateral nominal (non-PPP) trade flow					
Estimation Method	**2SLS**		**2SLS**		**OLS**	
	1870-1913		**1921-1938**		**1921-1938**	
	(1a)	**(1b)**	**(2a)**	**(2b)**	**(2a)**	**(2b)**
Income Measure	**Estimated**	**Maddison**	**Estimated**	**Maddison**	**Estimated**	**Maddison**
Income	0.294**	0.363**	0.828***	1.132***	0.678***	0.756***
	[0.153]	[0.172]	[0.138]	[0.233]	[0.0733]	[0.0926]
Tariffs	-5.797***	-5.431***	-1.209***	-1.147***	-1.288***	-1.255***
	[1.740]	[1.806]	[0.367]	[0.393]	[0.356]	[0.358]
Gold	1.452***	1.349**	-0.654	-1.0938[a]	0.0749**	0.0701**
	[0.517]	[0.539]	[0.625]	[0.692]	[0.0349]	[0.0350]
1st Stage F-Stat.	18.825	16.204	26.789	23.849	-	-
Adj. R-squared	-	-	-	-	0.9392	0.9389
Obs.	4964	4964	3726	3726	3726	3726

2SLS estimation results with pair and year fixed effects, not reported; "Gold" instrumented by the sum of the natural logarithms of the average distance of each country from all other countries on the gold standard; the reported first-stage F-statistic is the partial F-statistic testing the significance of the excluded instrument in the corresponding first-stage regression; included; robust standard errors in brackets.
*** significant at the 1% level; ** significant at the 5% level; * significant at the 10% level.

Table 4: Gravity Regressions – Restricted Sample

	Dependent Variable: Log of bilateral trade flow (non-PPP)					
	1870-1913			1919-1938		
	(1a)	(1b)	(1c)	(2a)	(2b)	(2c)
GDP Measure	**Estimated**	**Maddison**	**Actual**	**Estimated**	**Maddison**	**Actual**
Income	1.411***	1.706***	1.108***	1.0278***	1.397***	0.0484
	[0.201]	[0.222]	[0.157]	[0.0863]	[0.117]	[0.0552]
Tariffs	0.817	2.372	-1.0631	-2.380***	-2.194***	-4.0330***
	[1.708]	[1.793]	[1.405]	[0.771]	[0.756]	[0.853]
Gold	0.252***	0.237***	0.313***	0.0679*	0.0640*	0.119***
	[0.0769]	[0.0766]	[0.0788]	[0.0387]	[0.0386]	[0.0425]
Test for equality of coefficients (p-value)	Income: 0.0000	Income: 0.0000		Income: 0.0000	Income: 0.0000	
	Tariffs: 0.0000	Tariffs: 0.0000		Tariffs: 0.0063	Tariffs: 0.0001	
	Gold: 0.0140	Gold: 0.0012		Gold: 0.2173	Gold: 0.0053	
Obs.	937	937	937	628	628	628
Adj. R-squared	0.8868	0.8882	0.8858	0.9781	0.9782	0.9742

Notes: OLS estimation results with pair and year fixed effects, not reported; robust standard errors in brackets.

*** significant at the 1% level; ** significant at the 5% level; * significant at the 10% level.

Table 5: Counterfactual Analysis

	Total change in Trade explained by Gravity Model	
Contributions of	**1870-1913**	**1919-1938**
Income	64.2%	33.1%
Tariffs	3.9%	-15.5%
Gold Standard	10.0%	-0.045%
Global Trends	48.7%	-128.0%

Appendix: List of Countries

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	
Austria	1870-1949		1870-1913, 1919-1938		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				
Brazil	1870-1949		1870-1949		Latin America
Bulgaria	1870-1949		1908-1917, 1919-1949		European Periphery
Canada	1870-1949	1926-1949	1920-1949	1926-1949	
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		
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, 1920-1949	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				
Honduras	1920-1949	1925-1949	1920-1949	1925-1949	Latin America
Hong Kong	1870-1949				
Hungary	1870-1949		1870-1913, 1919-1949		European Periphery
India	1870-1949				
Indonesia	1870-1949				
Iran	1870-1949		1870-1949		Asia
Iraq	1870-1949		1932-1949		Asia
Ireland	1870-1949		1922-1949		European Core
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				

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		1870-1911		
Myanmar	1870-1949				
Nepal	1870-1949		1920-1923		Asia
Netherlands	1870-1949	1870-1913, 1921-1939	1870-1913, 1915-1949	1870-1913, 1921-1939	European Core
New Zealand	1870-1949		1920-1949		
Nicaragua	1920-1949		1920-1949		Latin America
Norway	1870-1949		1905-1913, 1919-1940 1945-1949		European Core
Panama	1945-1949				
Paraguay	1870-1949		1939, 1946-1949		Latin America
Philippines	1870-1949				
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
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				
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				
Taiwan	1870-1949	1903-1938			
Thailand	1870-1949		1887-1939, 1946-1949		Asia
Tunisia	1870-1949		1876-1879		
Turkey	1870-1949		1870-1913, 1919-1949		
United Kingdom	1870-1949	1870-1949	1870-1949	1870-1949	European Core
Uruguay	1870-1949		1882-1949		Latin America
Venezuela	1870-1949		1870-1949		Latin America
Yugoslavia	1870-1949		1878-1912, 1920-1940. 1945-1949		European Periphery