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Globalization and Underdevelopment in the pre-Modern Third World

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Abstract

A large GDP per capita gap appeared between the industrial core and the poor periphery between 1810 and 1940, the periphery producing, increasingly, primary products. The terms of trade facing the periphery also underwent a secular boom then bust, peaking sometime between the 1870s and World War I. These terms of trade trends appear to have been exogenous to the periphery, and their secular peak varied according to the country's main export product. Additionally, the terms of trade facing the periphery exhibited relatively high volatility. This lecture argues that these correlations are causal, that secular growth and volatility in the terms of trade had asymmetric effects on economic growth in core and periphery. On the upswing, the secular rise in its terms of trade had powerful de-industrialization effects in the periphery which suppressed growth. Over the full cycle 1810-1940, terms of trade volatility suppressed growth in the periphery as well. Before 1870, "deep" fundamentals probably accounted for a third of the growth gap between core and periphery, while terms of trade experience probably accounted for two thirds. After 1870, these proportions were about reversed.

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The First Big Fact:
Secular Terms of Trade Boom and Bust in the Periphery 1810-1940

This lecture defines the core as northwest Europe and their overseas settlements, regions where the industrial revolution spread as the 19th century unfolded. The periphery includes the rest – industrially-lagging Europe to the east and south of the core, the Middle East, Africa, Asia and Latin America. The pre-modern era is defined as the first global century, about 1810 to World War I, plus the anti-global, autarkic interwar, from 1913 to 1940.

The economic impact of the core on the periphery had its source in two forces which arose during the first global century. The first was a world-wide transport revolution that served to integrate world commodity markets (O'Rourke and Williamson 1999: Ch. 3; Mohammed and Williamson 2004; Williamson 2006a: Chs. 2 and 3) . It caused a boom in trade between core and periphery, created commodity price convergence for tradable goods between all world markets, and contributed to a rise in every country's external terms of trade, including the periphery, indeed, especially in the periphery. The second force came from the derived demand for industrial intermediates, like cotton, rubber and metals, which soared as manufacturing production led the way in the core. Thus, as core economies raised their industrial output shares, manufacturing output growth raced ahead of GDP growth. Rapid productivity growth lowered the cost and price of manufactures, and by so doing generated a soaring derived demand for raw materials in the core. This event was reinforced by accelerating income per capita growth and a high income elasticity of demand for luxury consumption goods, like meat, tea, and coffee. Since industrialization was driven by unbalanced productivity advance favoring manufacturing relative to agriculture and other natural-resource based activities, the

relative price of manufactures fell everywhere, especially in the periphery where they were imported. The world transport revolution made it possible for the distant periphery to supply this booming demand for primary products in the core. Both forces produced positive, powerful and sustained terms of trade shocks in the periphery, raising the relative price of primary products, and through an epoch which stretched over as much as seventy or eighty years or, for some, a full century. Factor supply responses in the periphery facilitated these external demand shocks, carried by south-south migrations from labor abundant to labor scarce regions within the periphery and by financial capital flows from the core to those same regions.

Eventually these two forces abated. First, the rate of decline in real transport costs along sea lanes slowed down, approaching a late 20th century steady state (Mohammed and Williamson 2004). Furthermore, railroads completed their penetration of interior markets. Second, the rate of growth of manufacturing slowed down in the core as the transition to industrial maturity was completed. As these pro-global forces abated, the resulting slow down in primary product demand growth was reinforced by resource-saving innovations in the industrial core, induced, in large part, by those high and rising primary product prices during the 19th century terms of trade secular upswing. Thus, the secular terms of trade boom in the periphery faded, eventually turning into a secular bust. Exactly when and where the boom turned to bust depended on who specialized in which export commodity, but the periphery peak ranged between the 1870s and World War I.

This 130-year cycle in the periphery terms of trade is illustrated in Figure 1 by Latin American experience. The region's terms of trade[1] underwent a steady increase from the 1810s to the early 1890s, and the improvement was especially dramatic during the first four decades: the annual rate of increase was 1.3 percent per annum between the starting half-decade 1815-19 and the concluding half-decade 1890-94, equivalent to about a tripling over the 75 years; and the rate between 1815-19 and 1855-59 was even larger, 2.05 percent per annum. Furthermore, that increase is probably understated since it fails to take account of the likely increase in the quality of traded manufactures relative to primary products. Based on the estimates underlying Figure 1 (the dashed line), the quality-adjusted terms of trade may have grown at a little more than 2.2 percent per annum between 1815-19 and 1855-59, and at a little more than 1.4 percent per annum between 1815-19 and 1890-94.

Nor was Latin American experience with that secular upswing unusual. Figure 2 documents that the increase was even bigger in Egypt, the Ottoman Empire (Turkey) and Indonesia.[2] What went up then came down with a crash, as the periphery terms of trade fell to World War II. As it turns out, the size of that crash has been overstated to the extent that manufactured commodities underwent much faster quality improvement than primary products. Once again, the dashed line in Figure 1 illustrates the point by use of Latin America: since relative quality gains are typically ignored in estimates of trade trends, and since they favor manufacturing, the quality-adjusted price of manufactures must have fallen by more than the unadjusted series documents, enough to have removed

[1] There are eight countries underlying the regional series, all of which achieved political independence early in the 130-year terms of trade cycle: Argentina, Brazil, Chile, Colombia, Cuba, Mexico, Peru and Uruguay.

[2] The boom was more modest in India (Clingingsmith and Williamson 2005), but it was about the same in the Mideast after 1839, and even more dramatic in Japan after 1858 and the gunboat-forced opening up.

some of the terms of trade crash. Exactly how much of the crash would be removed with better quality adjustments is unclear, but this new adjusted series still documents a secular cycle over the 130 years.

The Second Big Fact:
De-industrialization in the Periphery 1810-1913

Whether during boom or bust, technological advance and human capital accumulation were so modest in the periphery that the living standard gap between it and the core surged to levels that were vastly wider at the end of the cycle than when it started almost a century and a half before. Whether the modest rates of technological advance and human capital accumulation in the periphery were caused at least partly by globalization-induced de-industrialization forces has, of course, been a central issue in growth and development debate since it all started. While the causality has been debated heatedly, the periphery de-industrialization and globalization correlation has not.

Table 1 uses Paul Bairoch's data to show that while 1800 per capita levels of industrialization were only about 1.3 times higher in the European core than in the Asian and Latin American periphery, they were 22.5 times higher in 1913. Furthermore, the table also shows that it was not simply a matter of slower Third World industrialization over the century, since powerful de-industrialization forces were at work. The per capita industrialization index in the periphery fell by 75 percent between 1800 and 1913. This secular de-industrialization was complete by World War I, corresponding to the secular terms of trade peak. I do not think this is a spurious correlation. Furthermore, note that the positive correlation between low initial industrialization levels and low per capita

income a half century or more later is confirmed in Figure 3 for 1820-1950.[3] Correlations between current industrialization and future growth yield the same results for the period covering the secular terms of trade boom in the periphery: when GDP per capita growth between 1820 and 1870 is regressed on the Bairoch industrialization index in 1800, the estimated β coefficient is +0.0013 with a t-statistic of 2.13.

The Agenda

Between 1810 and 1940, the periphery obeyed laws of motion that economists delight in exploring. The long run secular terms of trade boom and bust was generated in response to two of the most profound technological shocks the world had yet seen – in manufacturing and transportation, shocks exogenous to the periphery if not the core. Elsewhere, I have assessed the implications of this secular cycle in terms of trade on income distribution (Williamson 2002, 2006a), and then asked how trade policy responded to it in periphery regions with and without autonomy (Coatsworth and Williamson 2004a, b; Williamson 2006a, 2006b). Here I document these laws of motion in the periphery and assess their growth consequences. An improvement in the periphery's terms of trade implied a fall in the relative price if imported manufactures, which implied, in turn, de-industrialization forces. Were these big enough to diminish overall growth in the periphery?

Figures 1 and 2 illustrate that the terms of trade facing the poor periphery also recorded tremendous volatility over the 130 years between 1810 and 1940, and it was

[3] Figure 3 expresses both variables in logs. The GDP per capita data are taken from Maddison (2002) and the industrialization index from Bairoch (1982). Thus, GDP per capita in 1820 is correlated on the industrialization index in 1750, 1870 on 1800, 1913 on 1860 and 1950 on 1913.

primary product price instability doing almost all of the work. Indeed, the terms of trade facing the core was much more stable than it was in the periphery. What impact did that additional price volatility have on long run growth performance in the periphery? Did it diminish long run growth there?

Prebisch, Singer and the Terms of Trade Debate

Debate over trends in the terms of trade between primary products and manufactures, their causes and their impact has dominated the growth and development literature for almost two centuries. Classical economists claimed that the relative price of primary commodities should improve over time, since land and other natural resources were in inelastic supply while capital and labor were not. As we shall see, the experience over the half century or so before 1870 proved them right: the relative price of manufactures underwent a spectacular decline, while that of primary products soared. In the early 1950s, however, Hans Singer and Raúl Prebisch challenged the classical view, asserting that the terms of trade of the primary-product-producing Third World had deteriorated since the late 19th century. Indeed, Prebisch calculated that only 63 percent of the finished manufactures which could be bought with a given quantity of primary products in the 1860s could be purchased in the 1930s. Prebisch and Singer also projected that it would continue to deteriorate across the late 20th century as long as the Third World specialized in primary products. It turned out that their projection has not been confirmed by late 20th century experience, but my interest lies instead with the 130

years between 1810 and 1940, when the new economic order came to be firmly established.

This important part of the development literature has its shortcomings. While faster technological progress in manufacturing may have caused the price of manufactures to fall relative to primary products over most of the 19th century, and while the 19th century world transport revolution reinforced those forces by lowering import prices and raising export prices in periphery markets, Prebisch and Singer elected to stress the 20th century downside of this secular cycle. Furthermore, while the secular upswing of the terms of trade should have caused de-industrialization -- something of which another part of the literature has made much -- Prebisch, Singer and their followers ignored this de-industrialization inference. By so doing, they also ignored a symmetric corollary: on the downside, the secular terms of trade deterioration also implied a long run stimulus to import-competing industry in the periphery, what might be called re-industrialization. Prebisch ignored this possibility, and stressed instead the short run economic damage to a periphery so committed to primary product exports.

The main weakness of this literature, however, is that Prebisch, Singer, and others dealt with the relative price of some generic or representative primary product in world markets, not with the terms of trade facing any given country in the poor periphery. Nor did they assess the economic impact on the poor periphery. Rather, they assumed it.

How to Assess the Impact of Secular Terms of Trade Trends on the Pre-Modern Periphery

New data confirm that the terms of trade (unadjusted for quality change) fell everywhere in the periphery between the 1870s or 1890s and the 1930s, consistent with the Prebisch-Singer calculation based on commodity prices in core markets rather than (as in this Lecture) on prices in periphery locations. This secular decline in the terms of trade in what we now call the Third World is confirmed by the large 21-country periphery sample underlying Figure 4: for Asia and the Middle East,[4] the fall from its 1870s peak to its 1930s trough was 29 percent; for Latin America, the fall from its 1885-1895 peak to its 1930s trough was 40 percent. As we have seen, this secular decline was used to support the move towards Third World autarky in the 1940s, 1950s and 1960s, a highly interventionist industrialization strategy which eventually came to be called import substitution industrialization (ISI). While Singer also advocated this anti-global ISI strategy, he noted that if the post-1950 relative price of primary products ever did improve, it would reduce industrialization incentives in the periphery (Singer 1950: 482). Thus, while a post-1950 improvement in the primary product exporter's terms of trade might augment incomes in the short run, a good thing, Singer thought it was also likely to suppress industrialization in the long run, a bad thing. No one seemed to pay much attention to Singer's aside at that time, including Singer himself.

Many modern economists have reached Singer's conclusion, but for different reasons. Some have argued that resources are a "curse" to development, such that while an improvement in the terms of trade facing primary product exporters would increase

[4] There are ten countries in our Asia sample: Burma, Ceylon, China, Egypt, Indonesia, Japan, the Philippines, Siam and Turkey (the Ottoman Empire).

the value of the resource base being exploited, poor growth would result. Jeffrey Sachs and Andrew Warner (2001) have confirmed the correlation, but economists have not yet agreed on how the "resource curse" works. Some argue that resource abundant poor countries have undeveloped property rights such that terms of trade booms get translated into capital flight (a transfer of rents for safe keeping in rich countries: Tornell and Velasco 1992). Others make the case for growth-suppressing rent-seeking (Krueger 1974; Murphy, Shleifer and Vishny 1993; Baland and Francois 2000) and to growth-distorting government policy (Tornell and Lane 1999). Still others favor crowding-out and Dutch disease, a position this Lecture also favors. Initiated first by Bob Gregory (1976), Max Corden (1981, 1984) and Corden and Peter Neary (1982), a huge literature has developed over the past twenty-five years which has examined how manufacturing in modern economies has been affected by the discovery of tradable natural resources or by an increase in their price.

While the name "Dutch disease" is taken from the impact of natural gas exploitation on the Dutch economy in the 1970s, the most extensive applications have been to Third World economies which specialize in primary products. Since it is the modern Third World that draws most of the Dutch disease attention,[5] what about its application to de-industrialization and underdevelopment in the periphery over the 130 years before the post-1950 modern Third World experience?

Others have argued for the more benign classical view where an increase in the price of the primary product export raises the expected rate of return on investment in

[5] There are some exceptions where the Sachs-Warner correlation has also been found in the more distant past. For example, my earlier work with Yael Hadass (Hadass and Williamson 2003) found that for a small sample of primary product exporters between 1870 and World War I poor growth *did* ensue following the terms of trade improvement, lending some limited support to resource curse or de-industrialization theories. For a second example, Mauricio Drelichman (2005) has recently reported support for the resource curse and Dutch disease hypotheses in 16th century Spain when it absorbed huge inflows of American silver.

that sector, thus augmenting accumulation and growth economy-wide. Using a cross-country panel of 40 countries from 1970 to 1991, Enrique Mendoza (1997) did indeed find that an increase in the growth rate of the terms of trade by 1 percent raised the growth rate of consumption by 0.2 percent, although most of the developing countries in his sample were exporting labor-intensive manufactures by the end of the period, not primary products.[6] Still, Michael Bleaney and David Greenaway (2001) used Mendoza's model to analyze sub-Saharan Africa between 1980 and 1995, where primary product exports still dominated (at least up to the early 1990s: see below), finding that both GDP per capita growth and investment increased as the terms of trade improved.

The Prebisch-Singer primary-product-terms-of-trade-deterioration thesis has not survived the half century since they wrote: fifty years later, we now think that structural breaks, serially correlated residuals, and unit roots may explain the 20th century (unadjusted) terms of trade patterns we see, or that proper quality-adjustment might further erase any deterioration (Lipsey 1994). Thus, Enzo Grilli and Maw Cheng Yang (1988) analyzed 20th century commodity price data and found evidence of periodic structural breaks, but no trend. Bleaney and Greenaway (1993) contested this finding, but were able to document only a modest downward trend. Furthermore, and to repeat, most of the periphery was little damaged by this modest secular deterioration since by the 1990s the majority had shifted out of primary-product exports and in to labor-intensive manufacture exports. Thus, the Prebisch-Singer secular deterioration hypothesis, and its implied negative impact, can be rejected from today's vantage point. It is *not* clear, however, that it should be rejected from the vantage point of 1950 when Singer and

[6] Industrial manufactures have been a rapidly rising share of Third World output and exports, as we shall see below.

Prebisch were looking backward to the 1870s. Nor has the modern literature yet measured the impact that the terms of trade secular deterioration had on long run GDP per capita growth in the periphery. And if we had the answer, we could then use it to help assess data-scarce terms of trade boom period before the 1870s, when the great divergence between center and periphery development levels appeared.

The jury is still out. What we need is a larger sample of periphery countries, and we need it for the period that motivated the Prebisch-Singer debate in the first place. It has proven difficult to construct the necessary data base for the pre-1870 epoch, but we *have* done it for the post-1870 epoch. So, when the terms of trade of primary products deteriorated between 1870 and 1940, what was its economic impact on the periphery? The answer will hinge on two additional questions: When and where in the periphery did the terms of trade deteriorate, and by how much? When and where it *did* deteriorate, and thus when and where the relative price of import competing manufactures rose, was the positive long run GDP growth stimulated by induced industrialization enough to overcome the negative short run effect? An unconditional, crude correlation offers promise for the de-industrialization, Dutch disease hypothesis. When the 1870-1939 secular trend in the terms of trade is plotted against 1939 income per head, an unconditional positive correlation emerges (Blattman, Hwang and Williamson forthcoming, Figure 2). As noted above, these correlations are reminiscent of what Carlos Diaz-Alejandro (1984) called the commodity lottery. He argued that each country's exportable resources were determined in large part by geography (plus the previous century's experience with global market integration), and that differences in subsequent

economic development were a consequence of the economic, political and institutional attributes of each commodity.

How to Assess the Impact of Terms of Trade Volatility on the Pre-Modern Periphery

Until the last three decades or so, most countries in the periphery specialized in the export of just a handful of commodities. In the 1920s, for example, the top two exports were 82 percent of all exports from the average Third World country, while they were 12 percent in the industrial core even two decades earlier. Furthermore, some of these commodities had prices which were a lot more volatile than others, and those countries with the greater volatility grew more slowly relative to the industrial leaders and relative to other primary product exporters. That is, when income per head in 1939 is plotted against terms of trade volatility for 35 countries between 1870 and 1939,[7] an unconditional negative correlation appears between terms of trade volatility[8] and subsequent level of development, for both the world as a whole and for the primary product-specialized countries in the periphery (Blattman, Hwang and Williamson, forthcoming, Figure 1).

What accounts for this correlation? Did exogenous price volatility of each primary product generate internal instability, reduced investment, and diminished economic growth? Observers regularly point to terms of trade shocks as a key source of macroeconomic instability in commodity-specialized countries, but they pay far less

[7] The World War I years are omitted. The 35 countries are listed in Table 2.

[8] Volatility is measured as the standard deviation of departures from a slow-moving trend, and that trend is calculated using a Hodrick-Prescott filter.

attention to the long run growth implications of such instability.[9] Most theories stress the investment channel in looking for connections between terms of trade instability and growth. Indeed, the development literature offers an abundance of microeconomic evidence linking income volatility to lower investment in both physical and human capital. Households imperfectly protected from risk change their income-generating activities in the face of income volatility, diversifying towards low-risk alternatives with lower average returns (Dercon 2004; Fafchamps 2004), as well as to lower levels of investment (Rosenweig and Wolpin 1993). Furthermore, severe cuts in health and education follow negative shocks to household income in poor countries—cuts that disproportionately affect children and hence long term human capital accumulation (Jensen 2000; Jacoby and Skoufias 1997; Frankenburg et al. 1999; Thomas et al. 2004).

Poor households find it difficult to smooth their expenditures in the face of shocks because they are rationed in credit and insurance markets, so they lower investment and take fewer risks with what remains. Poor firms find it difficult to smooth net returns on their assets, so they lower investment and take fewer risks with what remains. Perhaps most importantly, poor governments whose revenue sources are mainly volatile customs duties (Coatsworth and Williamson 2004b; Williamson 2006b) and which also find it difficult to borrow at cheap rates locally and internationally, cannot without serious difficulty smooth public investment in and expenditure on long run infrastructure and education in the face of terms of trade shocks.[10] Lower public investment ensues, and growth rates fall. Garey and Valerie Ramey (1995) examined the macroeconomic

[9] For important exceptions, see Mendoza (1997), Deaton and Miller (1996), Kose and Reizman (2001), Bleaney and Greenway (2001), and Hadass and Williamson (2003).
[10] While greater volatility increases the need for international borrowing to help smooth domestic consumption, Catão and Kapur (2004) have shown recently that volatility constrained the ability to borrow between 1970 and 2001. It seems likely that the same was true between 1870 and 1901, a century earlier.

volatility and growth correlation using data from 92 developing and developed economies between 1962 and 1985. They found government spending and macroeconomic volatility to be inversely related, and that countries with higher volatility had lower mean growth.

In short, theory informs us that higher volatility in the terms of trade should reduce investment and growth in the presence of risk aversion. In addition, the less-risky investment that does take place will also be low-return. Modern evidence seems to be consistent with the theory. What is true of the modern era was probably even *more* true of the 1870-1940 when undeveloped financial institutions and a limited tax base made it even harder for poor households, poor firms and poor governments to smooth expenditures. And, in turn, what was true of 1870-1940 must have been even more true of 1810-1870, and for the same reasons.

Making the Assessment: The Impact of Periphery Terms of Trade Trend and Volatility 1870-1939

The 35 countries in the historical sample[11] that Chris Blattman, Jason Hwang and I used recently to explore these issues are listed in Table 2: 14 are in the core and 21 are in the periphery, although the results are robust to every plausible core-periphery allocation explored. Table 2 documents several economic attributes of these countries at mid-point in the 130-year stretch: GDP per capita, the dominance of primary products in total exports, export concentration, export shares in GDP, and financial maturity. The

[11] This sample covered about 90 percent of world population in 1900, and an even bigger share of world GDP and trade. See Table 2 for a listing for the 9 European core countries, their 3 rich overseas offshoots, 21 poor periphery countries, and 2 on the margin.

poor periphery in Asia and Latin America had only a third the GDP per capita of the four industrial leaders in the core, it had much greater primary product specialization (95 versus 45 percent of total exports), it had much more intensive export concentration (seven times the industrial leaders), it had vastly less financial maturity, but about the same level of openness (export shares were about 7 percent in the poor periphery versus 10 percent in the industrial core).

The impact of secular change and volatility in the terms of trade are presented in Table 3. The results are displayed for the full seven decades (1870-1939), although it has been shown elsewhere that the two sub-periods -- the first global century from 1870 to 1909 and the interwar autarchic disaster from 1920 to 1939 – exhibit the same behavior.[12] The World War I decade is omitted throughout. The results are also reported separately for the core and periphery, making it possible to test for the presence of asymmetry between them. Asymmetry is predicted by the following reasoning. Consider secular impact first. To the extent that the periphery specializes in primary products, and to the extent that industry is a carrier of development, then positive price shocks reinforce specialization in the periphery and cause de-industrialization there, offsetting the short run income gains yielded by the initial terms of trade improvement. However, there is no such offset in the core, but rather there is a reinforcement, since specialization in industrial products is strengthened there by an improvement in the terms of trade. Thus, the prediction is that while a secular terms of trade improvement unambiguously raises growth rates in the industrial core, it does not do so in the periphery. I expect the same

[12] The periphery consists of 21 countries. Data exist for every country and every decade, except for one country-decade observation, yielding a sample of 125 (=21x6-1). There are a few more missing observations from the interwar core, leaving 79 observations instead of the 84 (=14x6) that would be available in a complete dataset. The full data base is described in Blattman, Hwang, and Williamson (forthcoming).

asymmetry with respect to terms of trade volatility to the extent that "insurance" is cheaper and more widely available in the core. For example, to the extent that core governments have a much wider range of tax sources, their tax revenues should be more stable in response to terms of trade shocks than should be true of periphery governments which rely instead on tariffs and export taxes (Williamson 2006b). The induced macro-instability should have suppressed accumulation in risk adverse periphery countries: poor governments should have invested less in their infrastructure; poor parents should have invested less in the education of themselves and their children; and poor firms should have invested less in new products and new technologies.

To see whether the terms of trade impact was contingent upon the level of export dependence, we added a term interacting TOT Trend Growth with export share of GDP. The motivation, of course was that more export-oriented countries seemed likely to respond more forcefully to external shocks. Export shares were taken from the first year of the decade to avoid problems of endogeneity. In any case, the key results were not greatly influence by this complication, so Table 3 ignores it in order to make things simple here. Finally, Table 3 also reports estimates with and without control variables representing other long run growth "fundamentals" like (log) initial GDP per capita, lagged population growth and the prevalence of schooling. I favor the results with the controls, so I will focus on cols. (2), (4), (6) and (8) in what follows.

The top half of Table 3 reports the regression estimates and hypothesis testing for the terms of trade effects. The bottom half reports the quantitative and economic importance of these terms of trade effects. Thus, the bottom half shows the sample means and standard deviations of the independent variables. Their marginal impact is, of course,

measured as the predicted change in output growth from a marginal increase in the independent variable. That is, for both terms of trade trend growth and volatility, the marginal impact is just the reported coefficient estimate. However, the last rows of Table 3 show the predicted change in output from a one-standard-deviation increase in either the growth or volatility of the terms of trade, thus showing how a plausible change in either independent variable would have influenced output. The word "plausible" applies to the years covered by the sample, namely 1870-1939. The change may not be quite so plausible when applied outside the sample, namely before 1870, when the terms of trade for primary products soared. I will return to this issue below.

Columns (2) and (4) strongly support the asymmetry hypothesis. Greater secular improvements in the terms of trade were significantly and positively associated with long run output growth in the core, but not in the periphery. While the core benefited greatly from a small but positive secular improvement in its terms of trade, positive improvement in the periphery—when it made a rare appearance after 1870—did not translate in to more growth, but less. Greater volatility had a significant negative influence on income growth in the periphery, but not in the core.

Although not reported here, the main findings continue to receive strong support for the years between 1870 and World War I. Secular improvements in the terms of trade raised long run output growth in the core, but not in the periphery, while greater volatility diminished growth in the periphery, but not in the core. The interwar years involve a much smaller sample and, as a result, the standard errors are large and the statistical significance is low, but the point estimates are generally consistent with those found for 1870-1913. It seems reasonable, therefore, to conclude that the same forces were at work

during the three or four decades before and after World War I. Still, strong support for the asymmetry hypothesis is especially welcome for the years between 1870 and World War I, since that result will reinforce the plausibility of exploring its implications for the years before 1870.

The economic effects were very big. A one-standard-deviation increase in TOT Trend Growth was associated with a 0.64 percentage point increase in the average annual growth rate of per capita GDP in the core -- a big number given that the average annual per capita growth rate in the core was just 1.59 percent. The economic effect of TOT Volatility in the periphery was even bigger: a one-standard-deviation increase lowered output growth by nearly 0.39 percentage points, a big number given that the average GDP per capita growth rate in the periphery was just 1.05 percent per annum.[13]

More generally, these magnitudes suggest that terms of trade shocks were an important force behind the big divergence in income levels between core and periphery, a core-periphery gap that started to open up so dramatically in the early 19th century (Pritchett 1997). The gap in GDP per capita gowth rates between core and periphery was 0.54 percentage points in our sample (1.59 – 1.05). If the periphery had experienced the same terms of trade volatility as the core, its price volatility would have been reduced by 1.98 (δ=[8.80 - 6.82]=+1.98), adding 0.16 percentage points to GDP per capita growth rates there ([β=-0.08]x[δ=-1.98] = +0.16). This alone erases about a third of the output per capita growth gap (0.16/.54=0.3). If, in addition, the core had experienced the same secular deterioration in its terms of trade that the periphery did (-0.28), instead of the observed positive 0.3 percent per annum growth rate (δ=[-0.28-(+)0.30]=-0.58), this

[13] To repeat, these magnitudes are very similar with and without the export share interaction term.

would have reduced output growth in the core by 0.37 percentage points ([β=+0.63]x[δ=-0.58] = -0.37). Combined, these two counterfactuals would have eliminated nearly the entire gap in growth rates between core and periphery (0.16+0.37=0.53). These results are robust to the use of alternative periphery allocations, terms of trade growth and volatility measures, and time period.[14] However, they are <u>not</u> robust to assumptions about estimated quality improvements in manufactures. Recall that Lipsey (1964: 19) concluded that quality improvements in traded manufactured goods was too slow to influence short run terms of trade instability, so our volatility inferences should remain unaffected. Quality improvements did, however, influence secular change in the terms of trade, as we see in Figure 1: while the unadjusted terms of trade in the core rose by 0.30 percent per annum between 1870 and 1939, the quality-adjusted terms of trade did not rise at all according to these estimates (0.30-0.33=-0.03). Thus, secular movements in the terms of trade appear to have contributed very little to the growth gap between core and periphery *after* 1870. What about *before* 1870? While there is no evidence supporting a secular rise in the periphery's terms of trade between 1870 and 1939 (Figures 1 and 4), the unadjusted terms of trade soared upwards *before* 1870 (Figures 1 and 2). Furthermore, since quality improvements in traded manufactures were much smaller before 1870, the adjusted and unadjusted terms of trade booms were pretty much the same magnitude (Figure 1). Thus, my guess is that the secular boom in the periphery's terms of trade accounted for the de-industrialization observed there across the 19th century (Table 1) and for much of its slower growth before 1870.

[14] See the appendix tables in Blattman, Hwang and Williamson (forthcoming).

What accounts for the asymmetric effects of terms of trade growth between core and periphery over the seven decades 1870 to 1940? The core benefited from a secular increase in its terms of trade since it reinforced comparative advantage there, helped stimulate industrialization, thus augmenting growth-induced spillovers. Dynamic effects reinforced static effects. The fact that the periphery, in contrast, did not benefit when the terms of trade rose over the long-term, or suffer when it fell, appears to support de-industrialization and resource curse effects. Dynamic loses offset static gains. I believe that the place to look for the source of dynamic asymmetry between secular impact on core and periphery is de-industrialization.

But what accounts for the asymmetric effects of terms of trade *volatility* between core and periphery after 1870? To illustrate the impact of terms of trade volatility in the periphery, consider that per capita income in Canada grew faster than in Indonesia by about 1 percent per annum. The difference in terms of trade volatility between the two countries was just under one half of one standard deviation. The estimates in Table 3 imply that if, through better luck in the commodity lottery, Indonesia had experienced Canada's much lower terms of trade volatility, it would have grown faster by about 0.3 percentage points, reducing the growth rate gap between them by a third. So, exactly what kind of insurance did the industrial core take out that allowed it to escape the damaging consequences of terms of trade instability, insurance that was not, apparently, available to primary product exporters in the periphery? Did the industrial core simply have better-developed institutions, policies and tax mechanisms by which to insure against adverse shocks?

Volatility, Accumulation Inferences and Backward Projections to 1815

The empirical results for 1870-1939 suggest that the secular trend in the periphery's terms of trade probably made no positive contribution to economic growth there since there was no long run secular improvement in the terms of trade. In contrast, the secular rise in the periphery's terms of trade up before the 1870s or 1890s was spectacular, inviting the inference that it had a powerful dampening effect on economic growth there and that its source was de-industrialization. Furthermore, the most plausible channel through which de-industrialization had its impact was through diminished human and physical capital accumulation.

What about the negative impact of export price and terms of trade volatility? Once again, while the data are not adequate to estimate the impact of pre-1870 volatility on growth performance, we can use the 1870-1939 parameter estimates to project that impact backwards given the pre-1870 terms of trade volatility experience. One only has to assume that the pre-1870 impact multipliers were equal to or greater than those estimated for post-1870, an assumption which seems plausible to me. Thus, I use the same Hodrick-Prescott filter to remove the trend from the pre-1870 terms of trade time series reported for various periphery regions, leaving the volatility portion for analysis.[15]

I have collected pre-1870 terms of trade time series for the following seven regions in the poor periphery: Egypt, India, Indonesia, Latin America, the Mideast, Spain

[15] I am grateful to Jason Hwang for decomposing growth and volatility from my new 1810-1870 terms of trade series. We use the same procedure for the pre-1870 data as that which was applied to the post-1870 data.

and the Ottoman Empire (Turkey).[16] What follows immediately below are volatility statistics measured by the standard deviation from trend, where, of course, bigger standard deviations imply greater terms of trade volatility:

Indonesia 1820-1870	3.81
Latin America 1820-1870	5.18
Spain 1815-1870	7.95
Turkey 1815-1870	9.24
Mideast 1839-1870	19.82
India 1815-1870	23.09
Egypt 1820-1870	31.45
1815-1870 average	14.39
1870-1939 average	8.80
UK 1815-1870	6.45

The terms of trade volatility in the poor periphery was much greater before 1870 (14.39) than after (8.8) – more than half again as large -- implying that it played an even bigger role in contributing to the core-periphery growth rate gap before 1870. If the GDP per capita growth gap between core and periphery before 1870 was anything like it was after, terms of trade volatility must have explained two thirds of the growth gap. To be more confident about this inference, we need to compare periphery with core. Recall from Table 3 that the periphery-core volatility difference was +1.98 between 1870 and 1939. If we take the UK to represent the core before 1870, then its relative terms of trade stability (6.45 for the UK before 1870 versus 8.80 for the core after 1870) implies an even bigger volatility difference between core and periphery before 1870 than after, compared to what the raw volatility statistics for the periphery suggest. Thus, if the periphery had experienced the same terms of trade volatility as did the United Kingdom, volatility there

[16] The series for Japan starts too late, 1858, for the volatility analysis. There are other time series which I hope to add in the near future, including Portugal 1842-1870 and Italy 1815-1870 from the south European periphery. New potential candidates from Asia might be China and the Philippines, as well as some from the east European periphery.

would have been reduced by 7.94 (δ=[14.39-6.45]=+7.94), adding a huge 0.63 percentage points to average GDP per capita growth rates there ([β=-0.08]x[δ=-7.94] = +0.64).

While the volatility differences between core and periphery before and after 1870 are large, the differences *between* regions within the periphery are even larger. Indonesia and Latin America had relatively stable terms of trade (compared to the periphery average *and* to the United Kingdom), so poor growth performance cannot be laid at the feet of terms of trade volatility in that region. Egypt, India and the Mideast, on the other hand, had immense volatility, and their growth must have suffered greatly as a consequence. Spain and Turkey lay somewhere in between with volatility figures (7.95 and 9.24) close to the post-1870 periphery average (8.80), but still higher than the pre-1870 United Kingdom figure (6.45) and the post-1870 core average (6.82).

Terms of trade volatility in the periphery must have significantly suppressed long run growth there before 1870, helping contribute to the rising GDP per capita gap between it and the core. As we suggested above, it seems likely that the key channel of impact was through suppressed accumulation rates. Indeed, when one channel of terms of trade impact is investigated—the flow of investment funds from Britain—it appears that capital inflows 1870-1939 were negatively influenced by terms of trade volatility in the periphery, but not in the core (Blattman, Hwang and Williamson forthcoming).

Are the magnitudes driving the econometric result in Table 3 plausible? That is, how much would accumulation rates and investment rates have to have fallen in the poor periphery to account for the estimated impact of terms of trade volatility on growth? The econometric estimates in Table 3 argue that terms of trade volatility 1870-1939 lowered per capita GDP growth in the periphery by 0.7 percentage points (-0.7=8.8x-0.08) or by

almost 0.2 percentage points more than the core (-0.16=[8.80-6.82]x-0.08). Assuming a Cobb-Douglas production function, the capital-output ratio (K/Y) to be constant at 3, capital's share (α) to be 0.3, and letting I = δK, the change in the rate of per capita GDP growth in percentage points (Δy*) is

$$\Delta y^* = \alpha\Delta(I/K) = \alpha\Delta([I/Y][Y/K]) = [\alpha/(K/Y)]\Delta[I/Y]$$

$$= 0.3/3\Delta[I/Y] = 0.1\ \Delta[I/Y]$$

$$\text{or } \Delta[I/Y] = \Delta y^*/0.1.$$

This implies that the net investment share need only have fallen by about 2 percentage points (-.16/0.1 = -1.6) to reproduce the econometric estimate of terms of trade volatility on growth, that is from 7 to 5 percent. This seems like a plausible range to me, and it is close to a third of W. Arthur Lewis's famous dictum that the key to development in the poor periphery was to increase the net investment rate there from 5 to 12 percent (Lewis 1954: 155).[17] Two thirds for fundamentals like culture, geography and institutions, and one third for terms of trade volatility seems about right to me for the years after 1870, but these figures were probably reversed for the years before 1870 – one third for the "deep" growth fundamentals, and two thirds for terms of trade volatility.

Does the Past Inform the Future?

Should we expect the same volatility and secular growth effects for the post-1970 decades? I doubt it: the effect has probably vanished as the old economic order has vanished. For all developing countries, manufactures rose from only 17.4 percent of

[17] Recall that Sir Arthur made that statement in 1954 long before Third World investment rates two or three times that 12 percent became so common. His observation was based on 19th century (slow population growth) experience, and that's what we are trying to explain here as well.

commodity exports in 1970 to 64.3 percent by 1994 (Figure 5) and it is even bigger now. Today, most of the Third World is labor abundant and natural resource scarce so that they specialize in labor-intensive manufactures. Thus, a fall in the relative price of primary products helps foster its rate of industrialization. The classic image of Third World specialization in primary products has been obsolescing recently, and fast (see Martin 2003; Lindert and Williamson 2003: 249), a major event that Arthur Lewis saw coming 40 years ago (Lewis 1965: 9; 1978: 36). Even sub-Saharan Africa is shifting out of mineral and agricultural exports and in to manufactures, although it only became apparent in the early 1990s. The share of manufactures in total exports there was only 12 or 13 percent in 1991, while it was almost 50 percent in 1998 (Martin 2003: Figure 6).

A new economic order emerged over the two centuries between the British industrial revolution and the 1970s, one in which the core increasingly specialized in manufactures and the periphery increasingly specialized in primary products. This new economic order had asymmetric volatility and secular growth implications such that the terms of trade exacerbated the growing GDP per capita gap between core and periphery. The impact seems to have been very big. World globalization did indeed help drive a wedge between the west and the rest.

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Table 1
Per Capita Levels of Industrialization 1750-1953

	1750	1800	1860	1913	1953
European Core	8	8	17	45	90
Asian and Latin American Periphery	7	6	4	2	5
Ratio Core/Periphery	1.1	1.3	4.3	22.5	18

Source: Bairoch (1982), Table 4, p. 281. The European core contains: Austria-Hungary, Belgium, France, Germany, Italy, Russia, Spain, Sweden, Switzerland, United Kingdom. The Asian and Latin American periphery contains: China, India (plus Pakistan in 1953), Brazil and Mexico.

Table 2
Profile of the Core and Periphery 1870-90

	1870-1889				1890
	GDP per capita	Primary Products as % of Exports	Top 2 Exports as % of Top 5 Exports	Exports as % of GDP	Financial Maturity Index
PERIPHERY					
European "Frontier" Offshoots					
Australia	4,442	97	98	15	0
Canada	1,822	95	96	12	0
New Zealand	3,668	99	100	16	0
	3,311	97	98	15	0.0
Latin America					
Argentina	1,676	100	87	15	0
Brazil	755	100	86	17	0
Chile	1,185	99	100	22	0
Colombia	1,113	99	100	4	0
Cuba	1,647	80	*a*	49	0
Mexico	835	100	99	4	0
Peru	497	99	74	24	0
Uruguay	1,676	100	74	22	2
	1,173	97	89	20	0.3
Asia & the Middle East					
Burma	628	91	100	14	na
Ceylon	730	98	100	11	0
China	565	98	73	1	7
Egypt	369	93	100	29	0
India	660	98	55	4	11
Indonesia	581	91	.	3	2
Japan	800	71	100	1	2
Philippines	955	96	81	5	0
Siam	751	99	100	2	0
Turkey	831	99	50	6	0
	834	92	83	4	2.4
CORE					
Industrial Leaders					
France	2,119	43	*b: 6*	13	75
Germany	2,184	38	*a*	9	50
UK	3,598	12	*b: 12*	14	100
US	2,952	86	*b: 18*	6	23
	2,713	45	12	10	62.0
European Industrial Latecomers					
Austria/AH	1,108	35	*b: 10*	9	20
Denmark	2,105	96	*b: 42*	14	7
Italy	1,516	87	*b: 26*	6	20
Norway	1,446	90	a	13	5
Sweden	1,875	85	*a*	9	7
	1,610	79	26	10	11.8
European Periphery					
Greece	1,343	94	*a*	7	0
Portugal	1,151	96	75	6	9
Russia/USSR	976	97	79	4	9
Serbia	852	96	73	6	0
Spain	1,588	73	64	5	14
	1,182	91	73	5	6.4

Sources: For all but note b in the first four columns, Blattman, Hwang and Williamson (forthcoming), Table 1. The last column offers an index of the use of a country's currency in financial markets across the globe -- 100 being the most frequent and 0 the least, and it is from Flandreau and Jobst (2005), Appendix Table 1.
a: No data available for this period. b: Top export share in 1900, Hanson (1980: 39).

Table 3
GDP Per Capita Growth and the Terms of Trade, 1870-1939

Dependent variable: Decadal average GDP per capita growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Periphery		**Core**		**Periphery**		**Core**	
	TOT decomposed into growth and volatility				TOT not decomposed			
TOT Growth[a]	0.05	0.05	0.34	0.63	0.13	0.13	0.35	0.57
	[0.124]	[0.119]	[0.199]	[0.251]**	[0.090]	[0.084]	[0.149]**	[0.149]***
TOT Volatility[b]	-0.08	-0.08	0.09	0.02				
	[0.036]**	[0.033]**	[0.051]	[0.058]				
Observations	167	167	32	32	167	167	32	32
R-squared	0.28	0.35	0.5	0.74	0.28	0.35	0.51	0.8
Decade Dummies	Y	Y	Y	Y	Y	Y	Y	Y
Country Dummies	Y	Y	Y	Y	Y	Y	Y	Y
Controls[c]	N	Y	N	Y	N	Y	N	Y
Summary Statistics:								
GDP Growth	1.05	1.05	1.59	1.59	1.05	1.05	1.59	1.59
	[1.66]	[1.66]	[1.28]	[1.28]	[1.66]	[1.66]	[1.28]	[1.28]
TOT Growth	-0.28	-0.28	0.30	0.30	-0.45	-0.45	0.32	0.32
	[1.46]	[1.46]	[1.02]	[1.02]	[2.20]	[2.20]	[1.49]	[1.49]
TOT Volatility	8.80	8.80	6.82	6.82	.	.	.	.
	[5.17]	[5.17]	[4.86]	[4.86]	.	.	.	.
Impact on GDP Per Capita Growth:[d]								
TOT Growth	0.08	0.07	0.35	0.64	0.28	0.28	0.53	0.85
TOT Volatility	-0.41	-0.39	0.42	0.11				

*Robust standard errors in brackets: * significant at 10%; ** significant at 5%; *** significant at 1%*

[a] *When not decomposed, TOT Growth is the decadal average growth rate in terms of trade. When decomposed into trend and volatility, TOT Growth*

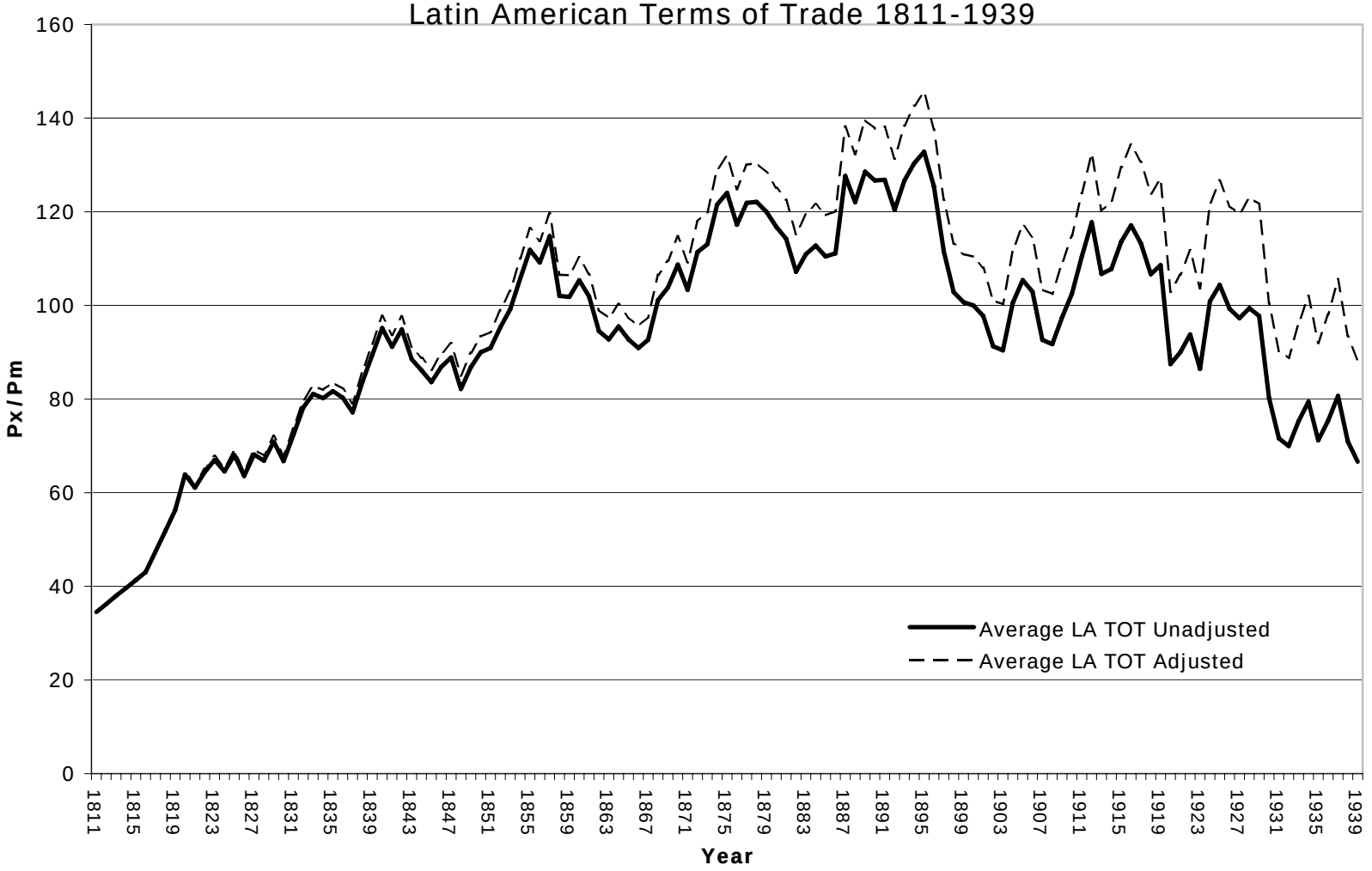
[b] *TOT Volatility is the decadal standard deviation of departures from a Hodrick-Prescott filter trend.*

[c] *Controls include ln(Initial GDP per capita), lagged population growth, and the fraction of the population with primary schooling.*

[d] *Calculates the percentage point impact of a one standard deviation change in the TOT variable on annual GDP growth rates.*

Source: Blattman, Hwang and Williamson (forthcoming), Table 3.

Figure 1
Latin American Terms of Trade 1811-1939



Source: Unadjusted--Coatsworth and Williamson (2004a); Adjusted--Williamson (2005, Appendix 1).

Figure 2
Terms of Trade Comparisons on the Up-Side:
The Periphery 1820-1860, 1828=100

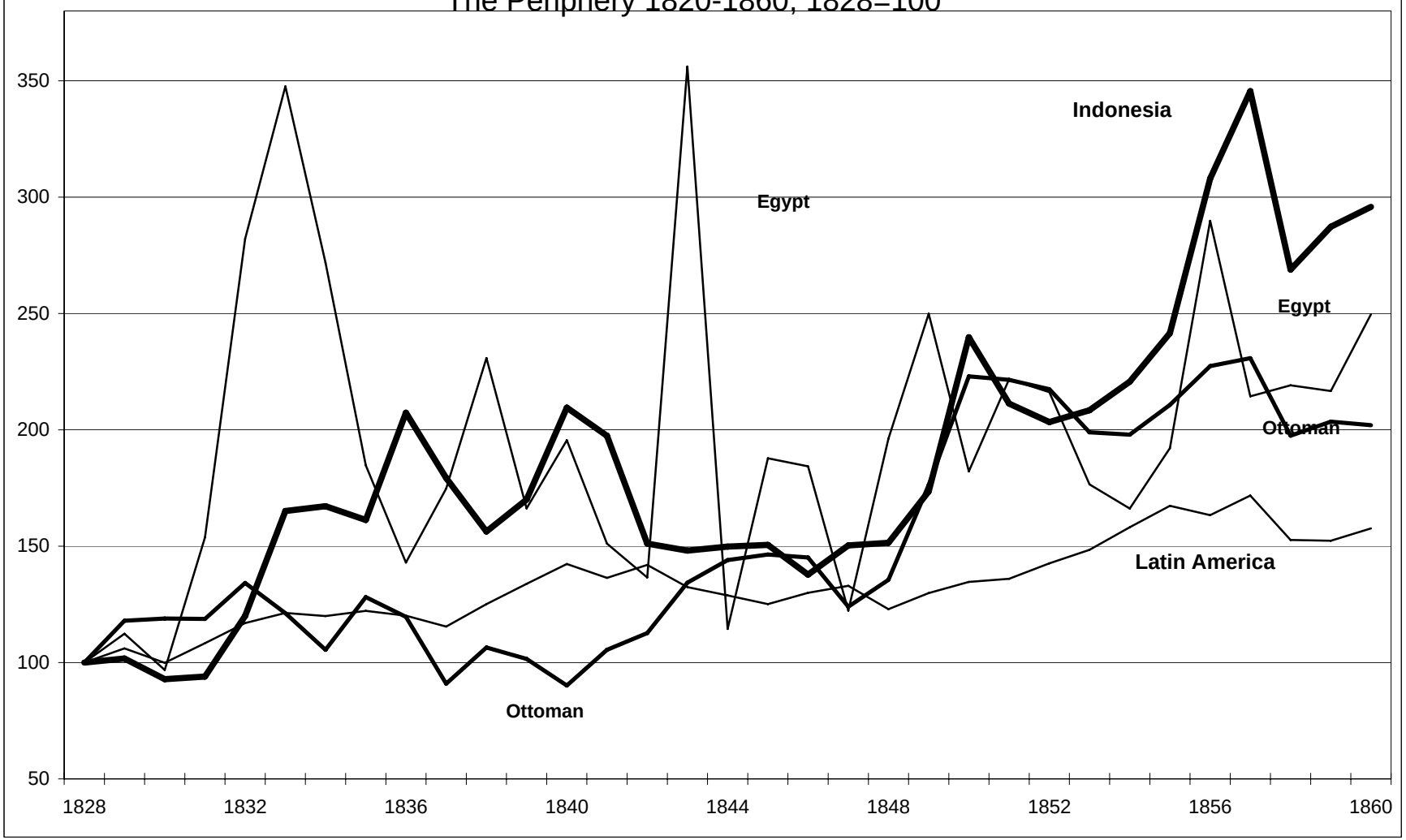


Figure 3
Current GDP per capita 1820-1950 and Industrialization Levels 50 or 70 Years Before

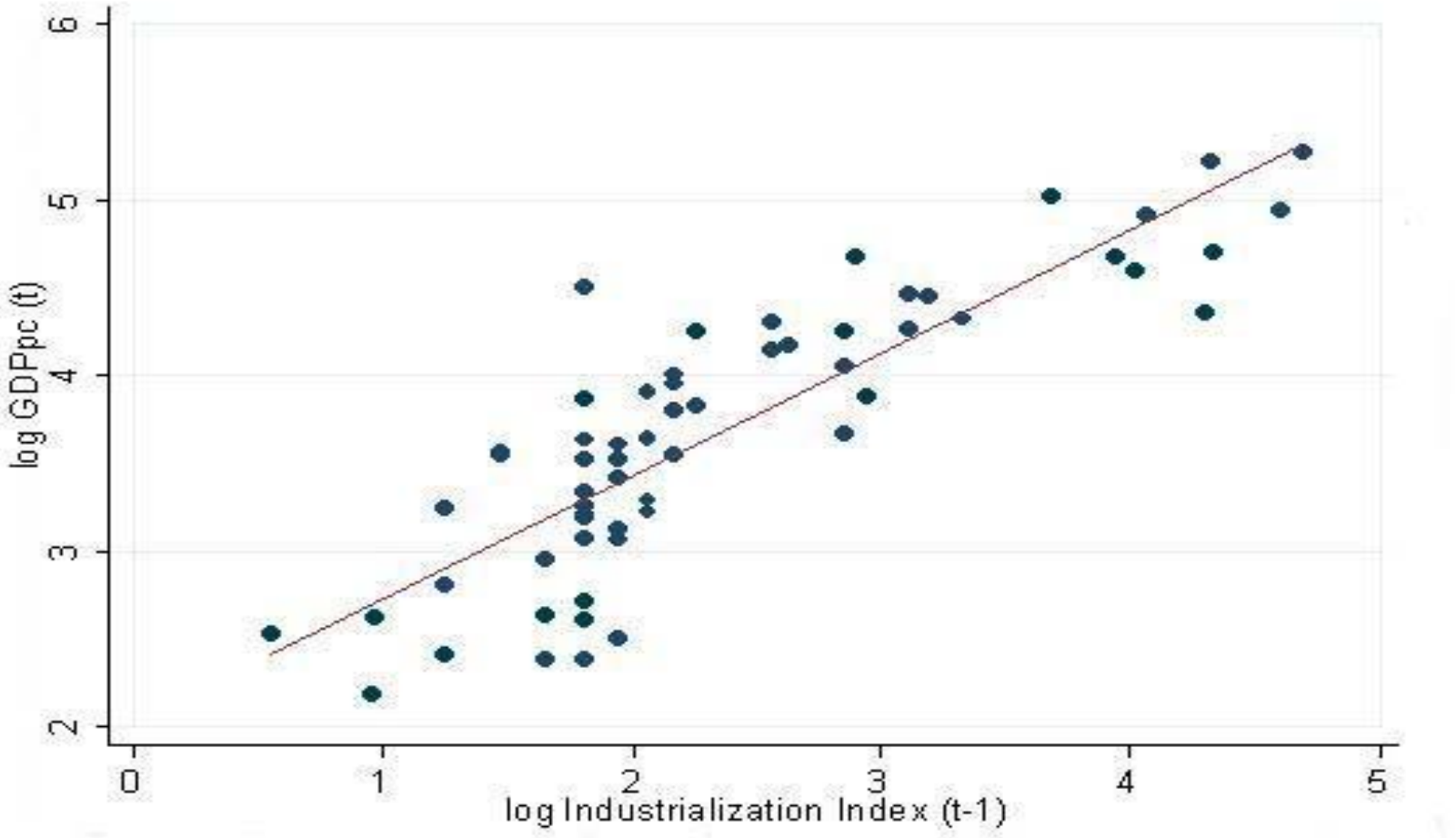


Figure 4 Trends in the Terms of Trade by Region

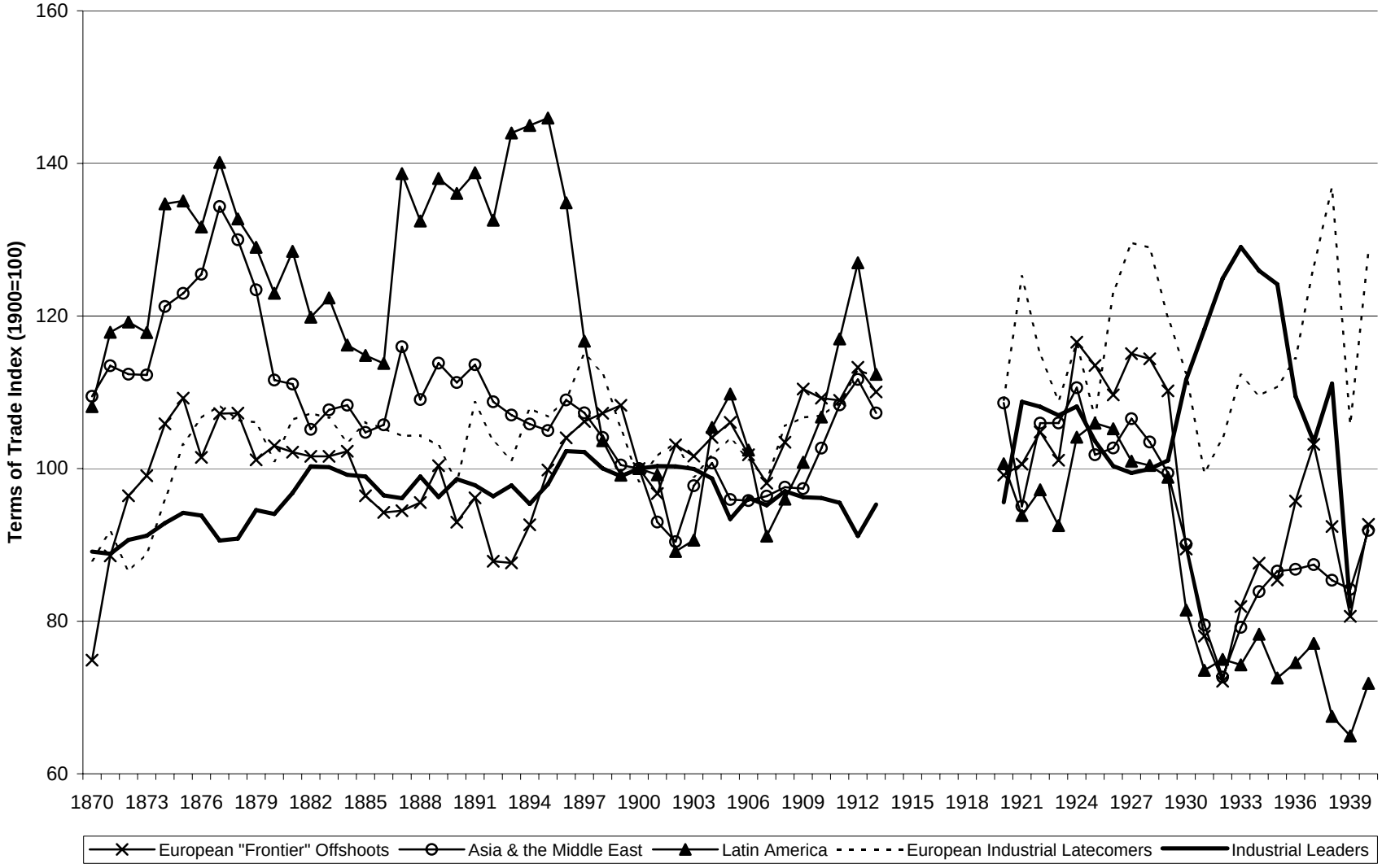
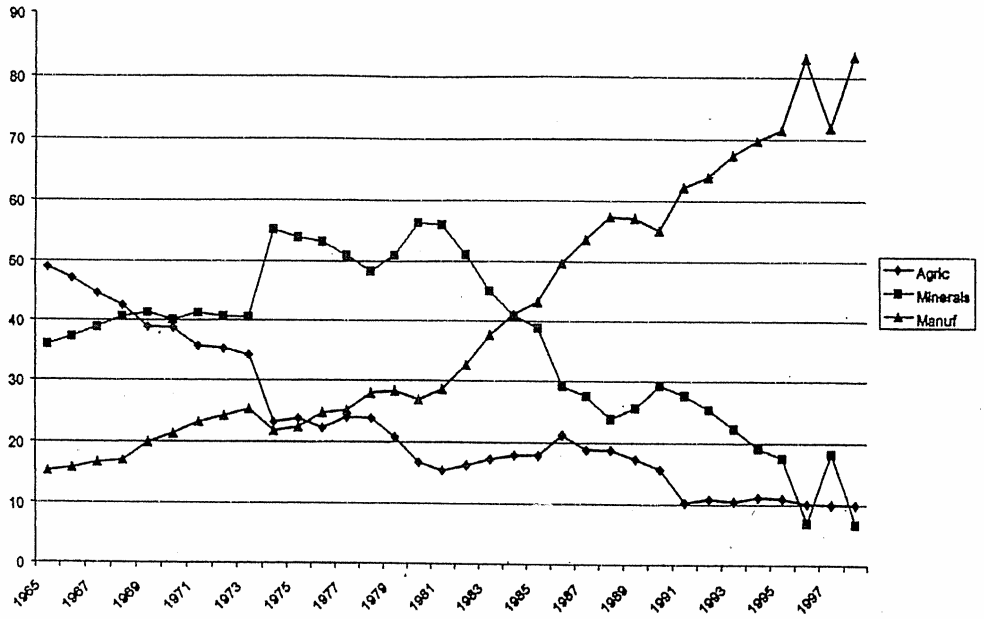


Figure 5

Composition of Commodity Exports from Developing Countries 1965-1998 (%)



Source: Martin (2003), Figure 3, p. 194.