GROWTH, DISTRIBUTION AND DEMOGRAPHY: SOME LESSONS FROM HISTORY

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Growth, Distribution and Demography: Some Lessons from History

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ABSTRACT

If we have learned anything from the recent outpouring of empirical growth equations, it is that life is far too complex to expect "unconditional" convergence among all countries and at all times. This fact motivates two questions. First, why has it taken economists so long to learn the same lesson from the Kuznets Curve debate? No economist should expect an "unconditional" Kuznets Curve to emerge from the growth experience of all countries and at all times. The industrial revolutionary forces thought to have an impact on inequality can be offset or reinforced by demography, skill supply and globalization. This paper assesses the role of globalization and demography via mass migrations. Second, why has it taken economists so long to learn that demography influences growth? When treated properly, demography can be shown to have a significant impact on GDP per capita growth. The answers to these two questions are sought by looking at inequality and growth experience in the Old World, the New World, and Asia over the last century and a half.

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Setting the Agenda

We have learned much about the growth of nations from the recent empirical assessments coming from economists like Moses Abramovitz, Robert Barro and Jeffrey Sachs. One lesson is that life is far too complex to expect unconditional convergence to be documented by their growth equations. The fact that poor countries do not always grow faster than rich does not necessarily imply a rejection of catching-up. After all, powerful catching-up forces may be hidden by equally powerful, offsetting forces. Indeed, when the growth equation is properly conditioned, it seems like the forces of catching-up are always confirmed. But unambiguous convergence only appears when the growth equation with initial income is augmented to include globalization, public policy, institutional quality, schooling, natural resource endowment and economic geography. This essay uses history to see whether demography should be added to this list.

It did not take us very long to learn this "conditionality" lesson about growth. Why, then, does it take us so long to learn the same lesson about the Kuznets Curve? Indeed, why would any scholar expect an unconditional Kuznets Curve to be generated by all countries and all epochs as nations pass through the long transition from agrarian poverty to industrial affluence? Why would any scholar reject the Kuznets Curve simply because she failed to see it in the unconditional correlation between inequality and economic development? It is a-historical in the extreme, yet historians do it all the time. It is also bad economics, yet economists do it all the time. It is doubly bad economic history, yet it has been the lingua franca of economic historians ever since Simon Kuznets gave his Presidential Address to the American Economic Association more than forty years ago. The fact is that inequality can be driven by technology, globalization, education supply and demography, to name just the big four that have emerged from debates over recent inequality trends in the United States. This essay uses history to see how and when demography and globalization can have an impact on inequality.

We shall deal, then, with two issues: the extent to which the growth of nations and the distribution of

income has been conditioned by demography in the past.

The Growth of Nations: How Might Demography Matter?

Let us start with the demographic transition, and a reminder that we are talking about a transition, not a steady state. One would think that such a reminder would be unnecessary, but economists have been confused about the distinction for some time. Figure 1 offers a stylized view of the transition. Mortality decline -- especially infant and child mortality decline -- marks the beginning of this stylized demographic transition, and fertility decline eventually follows with a lag, generating the rising rates of population growth plotted in the lower panel of Figure 1. Peak rates of population growth appear in the middle of the transition when the gap between leading mortality decline and lagging fertility decline is the largest. Standard stuff? Standard only if we persist in thinking about aggregate population growth and ignore the most important aspect of the demographic transition. That is, the age structure of the population moves through three stages: one with an enormous bulge of dependent children; one with an enormous bulge of economically active adults; and one with a bulge of elderly (how enormous depends on survivor rates at old age). These age distribution dynamics over the transition are drawn in the lower panel of Figure 1 as the share of the population working. Note that the share of the population working or economically active reaches a peak long after aggregate population growth reaches its peak. This fact has been forgotten in the literature, and it matters.

We have models that make explicit predictions about growth as the economy passes through these three stages. As the adult population bulges in the middle stage of fast growth, neoclassical theory predicts that investment demand booms -- to equip the new entrants to the labor force, to get them to work, and to house them as they form families. The long swing literature in the 1950s and 1960s gave this response a label

-- "population sensitive investment, and traced these investment demand connections at length (Abramovitz 1961; Easterlin 1968). Labor economics predicts a rise in participation rates, events which raise labor inputs per person and thus augment GDP per capita growth. Life cycle models predict more private savings, and in historical epochs where domestic savings was a constriant on accumulation, GDP per capita growth should have quickened as increasingly favorable demographic conditions released the constraint. Finally, public finance predicts bigger tax revenues and more public savings. It also implies fewer paupers to support by transfers, and thus fewer distortionary, and growth-reducing, taxes needed to generate the revenues for the transfers (Alesina and Perotti 1994). Thus, the middle stage of the transition should be one of fast GDP per capita growth. In contrast, the first and last stages should be ones of high dependency and slow growth.

A plausible story, but where is the historical evidence which confirms that these potential demographic-growth connections have had a big quantitative bite?

Did Demography Influence the East Asian Miracle?

Let me begin with the most spectacular example of late 20th century growth, East Asia. How much of that growth miracle has been driven by a demographic transition which started in the 1940s and 1950s, and reached magnitudes which far surpass anything in the 19th century? Before about 1970, per capita income growth in East Asia must have been suppressed by large youth dependency burdens and small working-age adult shares: there were relatively few workers and savers, and the growth performance was relatively poor. Since about 1970, per capita income growth must have been promoted by small dependency burdens and large working-age adult shares: there were relatively many workers and savers. Demography is about to become a burden again in East Asia, this time due to a rising elderly share. By the year 2025, East Asia will have completed a three-stage demographic transition which started shortly after World War II. We have witnessed the middle or "miracle" stage over the last quarter century or so.

These demographic effects are offsetting across all three stages and thus the impact of demography tends to disappear in long run correlations, as Figure 2 from Allen Kelley's 1988 Journal of Economic Literature review article clearly shows. I believe this is the wrong way to look at the demographic-growth connection: in effect, it assumes a stable age distribution and labor participation rate, an assumption consistent with steady state thinking, but inconsistent with transition thinking. Over twenty-five or thirty years -- that is, within one of these three stages -- the demographic-growth connection can be very powerful. I believe this is the right way to look at the connection, as a transition.

My collaboration with David Bloom (Bloom and Williamson 1997a,b) has shown that East Asia's demographic transition can account for 1.5 to 2 percentage points of the 6.1 percent annual per capita income growth since 1970. Let me make this assertion more elegant by appealing to the stylized description of the East Asian miracle in Figure 3. This is only a simplified approximation of complex reality, but it captures the central features of postwar East Asian growth well enough. Assume that the long-run sustainable growth rate in Asia is about 2 percent per annum (which is what Asia achieved 1938-1970: Maddison 1995). The actual GDP per capita growth rate in East Asia between 1970 and 1995 was about 6.1 percent per annum, a figure that exceeded the assumed sustainable rate by about 4.1 percentage points. It follows that demography accounted for a quarter to a third of rapid East Asian growth (1.5 or 2 divided by 6.1), a result which ranks demography as the number one cause of East Asian growth. It also follows that demography accounted for a third to a half of the "miracle" in East Asia (1.5 or 2 divided by 4.1), an even bigger share. Furthermore, it appears that changing demographic conditions might have accounted for even higher proportions of the trend acceleration from low growth rates prior to 1970 to the 6.1 percent per annum rate afterwards. This latter assertion is reinforced by the evidence that stage one demographic burdens had a negative impact on growth prior to 1970. Whether they will have a negative impact on growth over the next quarter century is uncertain, but the transition to old age and stage three will certainly slow growth rates down sharply.

Where do I get the 1.5 to 2 percentage points? Column 1 in Table 1 reveals the old style "wrong" specification while columns 2 and 3 reveal the new style "right" specification (confirming Figure 3). The coefficient on the growth rate of the total poulation in the "wrong" specification (column 1) is positive and big. It looks like rapid population growth was a Good Thing between 1965 and 1990, at least after conditioning the growth equation with schooling, resource endowment, openness, economic geography, policy and institutional quality. But the demographic result in column (1) sends out the wrong signal. The coefficient of the working-age population in the "right" specification (column 2) is positive, statistically significant, and big, while that of total population is now negative and significant. The "right" specification implies that a one percentage point increase in the growth rate of the working age population was associated with a 1.46 percentage point increase in the growth rate of GDP per capita, after controlling for the growth in total population (and everything else that seems to matter). The negative coefficient on the growth rate of the total population is almost as big: a one percentage point decrease in the growth rate of the total population is associated with a 1.03 percentage point increase in the growth rate of GDP per capita, after controlling for the growth of the working-age population. Thus, population growth has only a weak effect on GDP per capita growth performance when the rate of growth of the working-age and dependent populations are equal. When the age distribution is stable, as in steady state, population growth doesn't matter very much. When the age distribution changes, as in a demographic transition, population growth matters a lot: indeed, multiplying those beta coefficients times the demographic growth rates in East Asia yields the 1.5 to 2 percentage points.[1]

[1] When these equations are estimated using instrumental variable techniques, the demographic results are, if anything, even stronger. See Bloom and Williamson (1997b, Table 3).

Did Demography Influence Growth in the pre-1914 Atlantic Economy?

In terms of speed and magnitude, there is nothing in the 19th century likely to match the East Asian demographic transition (Bloom and Williamson 1997a, b; Higgins and Williamson 1997). Furthermore, it can be argued that most of the Asian demographic transition has been exogenous to the miracle itself. After all, the infant mortality reductions clearly had their source in the massive public health technology transfer in the 1940s and 1950s, a technology transfer from the postwar industrial economies to the Third World which had been pent up by two world wars, a great depression, the wars of colonial liberation, and the absence of effective international health and financial institutions to facilitate the transfer. By the late 1940s, the institutions were in place and the pent-up health technologies were released, like DDT-induced malaria eradication. An endogenous fertility response to both the prior exogenous infant and child mortality decline and to the beginnings of an economic miracle served only to mute what was already a very big demographic transition. Without that lagged fertility response, the impact of the infant mortality decline on age distribution dynamics would have been even more profound. Thus, debate over the endogenity of the fertility decline -- although certainly interesting and half of the transition story -- is irrelevant to the issue at hand. Robert Fogel's (1994a, b) recent stress on the nutrition-mortality connection suggests that this late 20th century Asian argument is far less likely to hold for the 19th century Atlantic economy, to the extent that the infant mortality decline was endogenous and much slower a century or two ago. This old debate (e.g, McKeown 1962) over whether the 19th century decline in European mortality was due to exogenous public health intervention or endogenous family investments in their health environment takes on even greater meaning in this context.

Perhaps, therefore, the demographic lessons of 19th century history are different than those of the 20th century. Perhaps, but consider the fact that mass migrations might have dominated demographic transitions in the previous century, at least in the Atlantic economy. Recall that those mass migrations self-

selected young adults (Hatton and Williamson 1997: Chp. 2), and if they were sufficiently "mass" they might have produced something like the demographic drama seen more recently in Asia. It would also help if the mass migrations were driven largely by exogenous changes in transport costs, frontier discovery, pogroms, previous migrations (pioneer emigrants financing new emigrants and helping them with job search), and previous (large) gaps in living standards between sending and receiving countries (rather than current and endogenous changes in the living standard gap). Timothy Hatton and I have shown that to a very large extent this "exogenity" was true in the Atlantic economy, especially on that upswing of the emigration life-cycle which all European countries seemed to have passed through on their way to peak emigration rates (Hatton and Williamson 1997: Chp. 3). On that upswing, it was not rising living standard gaps that raised the emigration rate, but rather forces which either released the constraint on potential European emigrants or augmented their numbers, or both.

In any case, let us see whether the late 19th century Atlantic economy reveals any of the growth-demography connections already documented for the last four or five decades in East Asia. To do so, I rely on a data base which Alan Taylor and I first used to confront the impact of mass migration on convergence (Taylor and Williamson 1997); it grew when Kevin O'Rourke and I used it to confront European growth around the periphery (O'Rourke and Williamson 1997); it grew still further when Alan Taylor explored Atlantic economy convergence in greater detail (Taylor 1996); and it finally reached its penultimate state when Kevin O'Rourke recently completed his pioneering test of the Bairoch tariffs-are-good-for-growth thesis (O'Rourke 1997). I have simply tacked on the demographic information to this Atlantic economy data base, added some variables that the new growth theory says should matter, and tinkered a bit with the rest.

The demographic information is summarized in Table 2. The economically active are assumed to be those aged 15-64. To the extent that mass migration accounts for much of the country differences in activity rates, then this measure understates its impact -- after all, not only did migrants tend to be young adults, but they also tended to be male and able-bodied. Understated or not, the variance across the Atlantic economy

was very big. On average, the growth rates of active and dependent populations were roughly the same in the emigrating Old World, the difference (DIFF) being only -0.05 or -0.07 percent, depending on whether one uses weighted or unweighted averages. With DIFF close to zero, it makes it appear as if the Old World was in demographic steady state. As far as age distribution dynamics are concerned, there is simply no net evidence of a demographic transition in Europe 1870-1913. This result may, of course, have been due to the fact that when the swollen cohort reached young adult status, it emigrated (Easterlin 1961; Hatton and Williamson 1994). In sharp contrast with Europe, DIFF was +0.7 percent in the immigrating New World, clearly describing a region in demographic transition where the economically active were growing far faster than the dependent population. Based on demography alone, the New World had a transitional growth advantage. Furthermore, the variance within the Old World was very large: DIFF was +0.51 percent in Great Britain, demographic conditions which favored growth, a convenient offset to the alleged forces of technological failure there; DIFF was -0.42 percent in Austria, demographic conditions which disfavored growth, an inconvenient offset to otherwise impressive catch up forces in this country located on the margin of the European periphery; and DIFF was -0.36 in Spain, demographic conditions which help explain economic failure in this part of the European periphery. These DIFF figures may be modest by the standards of East Asia since 1965, when it was an enormous 2.1 percent, but they are nearly the same as Latin America since 1965, when it was +0.8 percent. Thus, while it looks like the demographic drama of the late 19th century Atlantic economy wasn't up to the standards of miraculous East Asia, it does measure up to the rest of the contemporary Third World.

Was mass migration an important source of the demographic drama in the Atlantic economy? Given what we know about the activity rates of migrants and non-migrants prior to 1914, Table 3 estimates how much of the observed DIFFs among seventeen members of the Atlantic economy can be explained by mass migration between 1870 and 1910. In four cases, all of DIFF is explained by mass migration: Argentina,

Denmark, Italy and Norway. In nine cases, more than half of DIFF is explained by mass migration: the previous four plus Australia, Belgium, Canada, Germany and the United States. In five cases, migration seems to have made no net contribution to DIFF: Austria and France -- countries with very low emigration rates, plus Ireland, Sweden and the UK -- countries which may have had relatively low young-adult selectivity bias (e.g., more emigrants left as family groups). Using weighted averages, it appears that all of the Old World DIFF and two-thirds of the New World DIFF is explained by mass migration. Table 3 clearly establishes that mass migration was the central source of demographic drama in the globalizing Atlantic economy, not some demographic transition.

Did the favored countries exploit their demographic advantage, and did the disfavored countries escape the burden of their demographic disadvantage? Was the demographic impact big? The answers emerge from Table 4. The specification for the growth regressions are as close to those for 1965-1990 in Table 1 as I can make them. Yet, the underlying data are nowhere near the quality of that available for 1965-1990 and some are missing altogether (openness, initial life expectancy, initial government savings, the quality of institutions), so I did not expect Table 4 to replicate the big t-statistics reported in Table 1. Nevertheless, Table 4 does offer some useful insights into the problem at hand, and they seem to be robust. To begin with, there was convergence in the Atlantic economy when one conditions by economic geography, demography, resource endowment, schooling and the upward trend in growth rates. But my focus is on demography, and here the results are similar to those found for late 20th century Asia. They should help clarify a long-standing debate among economic historians over the impact of population growth. The first column in Table 4 is the "wrong" specification, erroneously implying that population growth is a Good Thing. Column 2 gets the specification "right": population growth is no longer a Good Thing, but the growth rate of the economically active certainly is; given population growth, a 1 percentage point increase in the growth rate

of the active population raises GDP per capita growth by 1.03 percentage points.[2] Column 3 repeats the regression with the growth rates of the active and dependent populations. Column 4 reports DIFF, the difference in the growth rates of the economically active and dependent populations: a one percentage point increase in DIFF yields a 0.75 percentage point increase in GDP per capita growth rates.

How much of the variance in growth rates around the Atlantic economy can be explained by the variance in DIFF, and thus, to a large extent, by mass migration? Table 2 documents that GDP per capita grew 0.47 percentage points faster in the New World than Old (weighted averages). But the New World demographic advantage[3] seems to have accounted for most, if not all, of the difference: using unweighted averages, (0.75[0.70-(-0.07)] = 0.58 divided by 0.63 is about 92%, or nine-tenths of the difference in GDP per capita growth rates; using weighted averages, (0.75[0.70-(-0.05)]=0.56 divided by 0.47 is 119%, or all of the difference in growth rates). GDP per capita grew 0.3 percentage points faster in the United States than in France, and DIFF explains all of it. Italy played catch-up with Britain, growing 0.3 percentage points faster, but the Italian catch-up would have been much faster without the demographic disadvantage she carried due to heavy emigration. If Italy had had the same DIFF as Britain, the Italian GDP per capita growth rate would have been 0.9 percentage points higher than Britain's, not just 0.3 percentage points higher. Although Irish real wages were catching up to British real wages (O'Rourke and Williamson 1997), GDP per capita grew at the same rate on either side of the Irish Sea, partly because Ireland was not blessed with the big demographic advantage that Britain had. If Ireland had had the same DIFF as Britain, the Irish GDP per capita growth rate

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[2] If the output elasticity with respect to labor was 0.5, then the 1 percentage point increase in the growth rate in the economically active should have raised GDP per capita growth by only 0.52 percentage points. The total impact is double that, 1.03 percentage points, because it includes accumulation and other responses as well.

[3] One must distinguish between levels and changes. The demographic changes in the New World were clearly advantageous to growth. However, the levels were low since the frontier economies had higher dependency rates, as Alan Taylor and I have argued elsewhere (Taylor and Williamson 1994).

would have been 0.3 percentage points above, rather than equal to, Britain.

Mass migration had a profound impact on per capita income growth around the Atlantic economy prior to World War I. It raised GDP per capita growth in labor scarce immigrating countries, lowered GDP per capita growth in labor abundant emigrating countries, and it influenced relative performance within Europe. But what about real wages, living standards and inequality?

What Drives Inequality?

The "Conditional" Kuznets Curve. The Kuznets Curve takes the form of an inverted U: it predicts that inequality should rise during the first decades of the industrial revolution, reaching a peak before falling as the economy approaches maturity. Since all countries begin with different political, cultural and historical endowments, the early portion of each Kuznets Curve is likely to exhibit eccentricities for that reason alone. But as time wears on, path dependence wears out, and each Kuznets Curve should look more and more like the next. The idea is that derived factor demand drives the Kuznets Curve. It is argued that labor-saving and skills-using development is especially strong on the up-side of the Kuznets Curve, but that these forces peter out in later stages of development as the transition from an agrarian to an industrial society is completed. Indeed, Kuznets himself made this argument, and it has been replicated empirically by simulation (Robinson 1976). Of course, some technological shock may start the mature economy on another Kuznets Curve later in life, as we have seen in some OECD countries since the early 1970s (Smeeding and Coder 1995). I label these forces "demand".

The strongest, and least sophisticated, version of the hypothesis predicts an unconditional Kuznets Curve. A weaker, and more sophisticated, version would admit that other events can intervene to offset the forces generating the Kuznets Curve. Indeed, why hasn't the Kuznets Curve been conditioned by many of the same variables which are used to condition the standard catch-up growth equation? There are four such

variables that are likely to matter -- globalization, education supply, demography and demand.

This quartet certainly makes sense in the context of the recent debate over what accounts for the spectacular rise in American inequality across the 1980s. Some say it is the booming demand for skills generated by the new computer age, benefitting those with skills near the top of the income distribution. Some say it is immigration, since low-skilled foreign-born are flooding American labor markets, hurting the unskilled at the bottom of the income distribution with whom the immigrants compete (at least initially). Some say it is trade and globalization, since labor-intensive goods produced in the Third World are putting unskilled Americans out of work while the export of skill-intensive goods are raising the demand for skilled Americans. Some say it's a slowdown in educational supply. Shouldn't we see the impact of globalization, education supply, demography and demand on inequality in other epochs and for other countries, not just for America since 1970? Would the elusive Kuznets Curve emerge from hiding if it were conditioned by globalization, education supply and demography?

Measuring Inequality in the Distant Past. We do not have comprehensive and comparable data measuring inequality levels and trends for the Atlantic economy over the century prior to the Great Depression. Economic historians need not feel guilty about this, since it was only a year ago that Klaus Deininger and Lyn Squire (1996) were able to supply this kind of data for the late 20th century! We do have scraps for a few countries (e.g., Lindert 1997), but even for them the data often become available only after World War I. However, it is not clear why the absence of size distribution information should do serious damage to our research agenda. After all, we should prefer an inequality index that measures gaps between income per person close to the bottom relative to income per person at the middle or at the top. And we have such a measure: the unskilled worker's wage relative to the returns on <u>all</u> factors per laborer (including skill premia, farm rents and returns to capital). This inequality index, **w/y**, exploits my unskilled wage rate data

(Williamson 1995) and Maddison's GDP per worker hour data (Maddison 1994, 1995).[4] Ideally, and to be most consistent with the evidence used in the debates about OECD inequality trends during the 1980s, I would have preferred an inequality index **w/z**, where **z = y-w** is the income (per laborer) accruing to all factors other than unskilled labor. It turns out that **z** is hard to construct for our late 19th century panel, so I have stuck with **w/y**.

For the skeptics, Table 5 documents the correlation between the **w/y** proxy and various size distribution measures where both are available between 1870 and 1929. Where the top 10% and 20% income shares rose, **w/y** fell. Where the wage-rental ratio rose, so did **w/y**. And the correlation coefficients are pretty high. This is certainly a convenient finding, since it will make it possible to say something about inequality trends the world around after the mid 19th century (including Asia, the Mideast and Latin America), at least for those countries whose GDP per worker Maddison can document and for those countries whose real wages I can document.

The Impact of Globalization and Mass Migration on Inequality in the Atlantic Economy

At this time, I am able to say something about only one of the four potential determinants of inequality trends in the pre-1914 Atlantic economy -- globalization, and mass migrations in particular.

Figure 4 plots the percentage change per annum in the **w/y** index relative to its 1870 base. It ranges from +0.97 and +0.98 for Denmark and Sweden, to -1.22 and -1.45 for Australia and the United States. It is plotted against the 1870 real wage in Figure 4. The evidence offers a stunning confirmation of a central

[4] The Williamson **w** is in fact a real wage rate, **w/c**, where the deflator is a cost of living index. The Maddison **y** is in fact real GDP per worker hour, **y/p**, where the deflator is the implicit GDP price index. Both **w/c** and **y/p** have been reflated to nominal levels in computing **w/y** since I want to isolate the behavior of factor returns, as opposed to relative commodity prices. The Williamson (1995) data have been revised and are available upon request.

hypothesis that emerged from the recent globalization debates led by Adrian Wood (1994): between 1870 and 1913, inequality rose dramatically in rich, land abundant, labor scarce New World countries like Australia, Canada and the United States; inequality fell dramatically in poor, land scarce, labor abundant, newly industrializing countries like Norway, Sweden, Denmark and Italy; inequality rose only modestly in middle-income, land scarce, industrial economies like Belgium, France, Germany, the Netherlands and the United Kingdom; and inequality rose only modestly in poor, labor abundant countries which refused to play the globalization game, like Portugal and Spain.

A key stylized fact emerges from this evidence on the globalizing late 19th century Atlantic economy: resource rich, labor scarce countries underwent rising inequality and resource poor, labor abundant countries underwent falling inequality. This result is consistent with conventional trade theory which says that trade booms should raise the demand for the abundant factor among all trading partners. That is, conventional trade theory says that globalization through trade should provoke factor price convergence: relative to its trading partner, globalization should have provoked a rise in European unskilled wages (received by folks near the bottom of the distributional pyramid) and a fall in land rents (received by folks at the top of the distributional pyramid). The result is also consistent with the evidence that emigrants left the labor abundant Old World and entered the labor scarce New World en mass. I think mass migration is doing most of the work here (Williamson 1997), as Figure 5 suggests. The impact of net immigration on the labor force is along the horizontal axis, and the log of inequality change is on the vertical axis. While the correlation in Figure 5 is quite strong, far more work needs to be done to sort out these globalization effects into trade and migration components.

So, what happened after World War I when quotas were imposed in immigrating countries, when capital markets collapsed, and when trade barriers rose -- that is, under conditions of de-globalization? First,

we know that convergence ceased (Williamson 1996). Second, the pre-war globalization-inequality connection was broken. Figure 6 shows the correlation between inequality trends (**w/y**) and a 1921 real wage measure of labor scarcity. The late 19th century inverse correlation has disappeared, replaced by a positive correlation. In the interwar period of de-globalization, the poorer countries underwent sharply increasing inequality while the richer countries underwent more moderate increases, or, in four cases -- Australia, Belgium, Canada and the United States, egalitarian trends.

A Bottom Line

Demographic forces can have a profound impact on the growth of nations. But it's not the overall rate of population growth that matters. Instead, it's a change in the age distribution that matters. When the child cohort is relatively big, a small share of the population is working and saving, generating slow GDP per capita growth. When the economically active adult cohort is relatively big, a large share of the population is working and saving, generating fast GDP per capita growth. A switch from one demographic regime to another will cause growth to accelerate. In the 19th century, differences in demographic regime account for a large share of the differences in GDP per capita growth performance. Mass migration explains most of the demographic differences around the Atlantic economy, not some demographic transition.

Demographic forces can have a profound impact on income distribution and the structure of factor rewards too. It appears that mass migration can account for much of the variety in inequality trends around the Atlantic economy -- its rise in the New World, its fall in the European periphery, and its relative stability in both the industrial core and in those countries who stayed aloof from globlization forces.

Demographic forces need not always have a profound impact on growth or distribution. It depends on the historical time and place. For it to matter, the demographic shocks must be big, they must be mostly

exogenous with respect to the growth itself, and they must translate into changes in the age distribution. If these conditions are not satisfied, history will offer no evidence that demography matters. If they are satisfied, as in the late 19th century Atlantic economy and in late 20th century Asia, demography can have a powerful impact.

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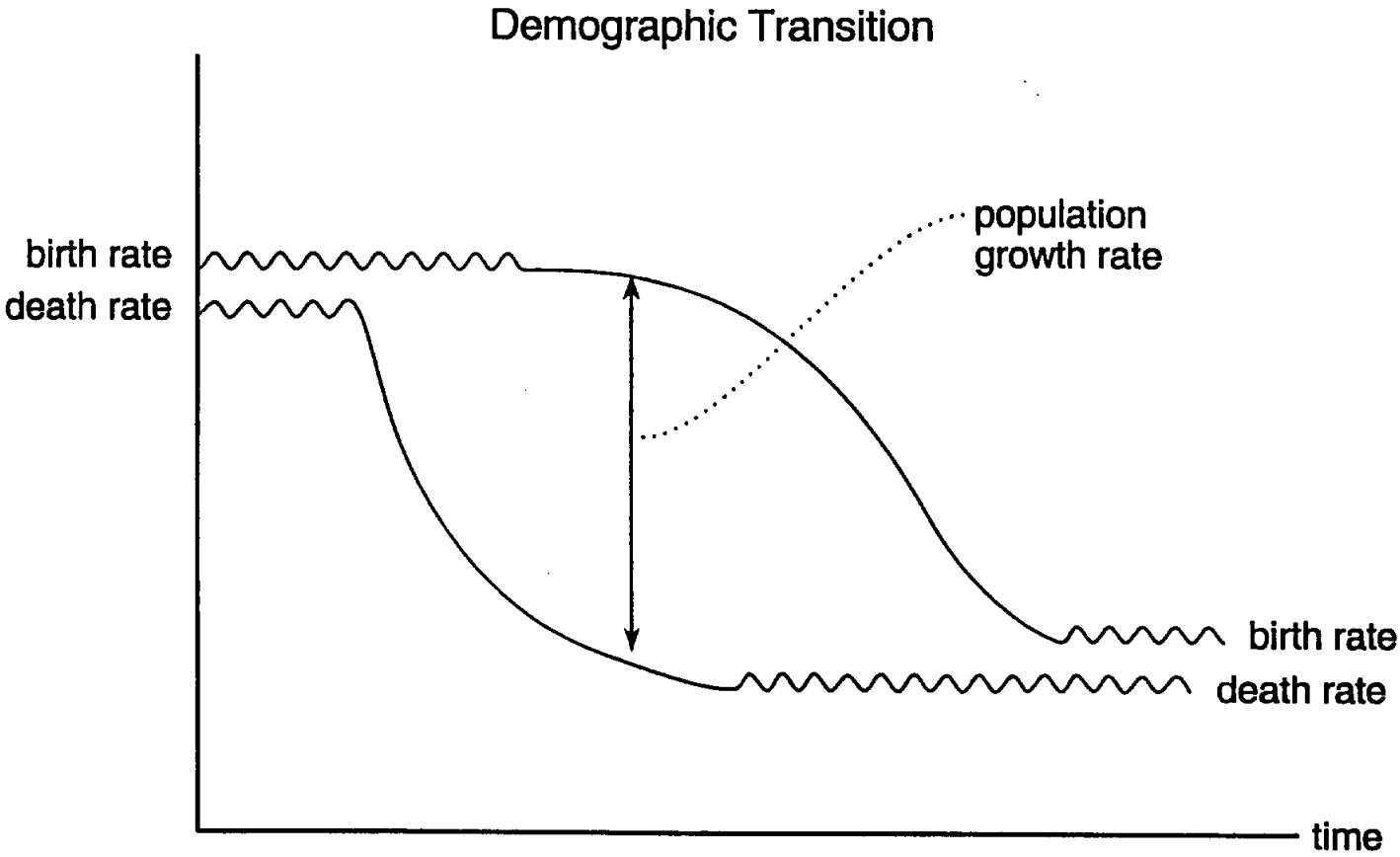
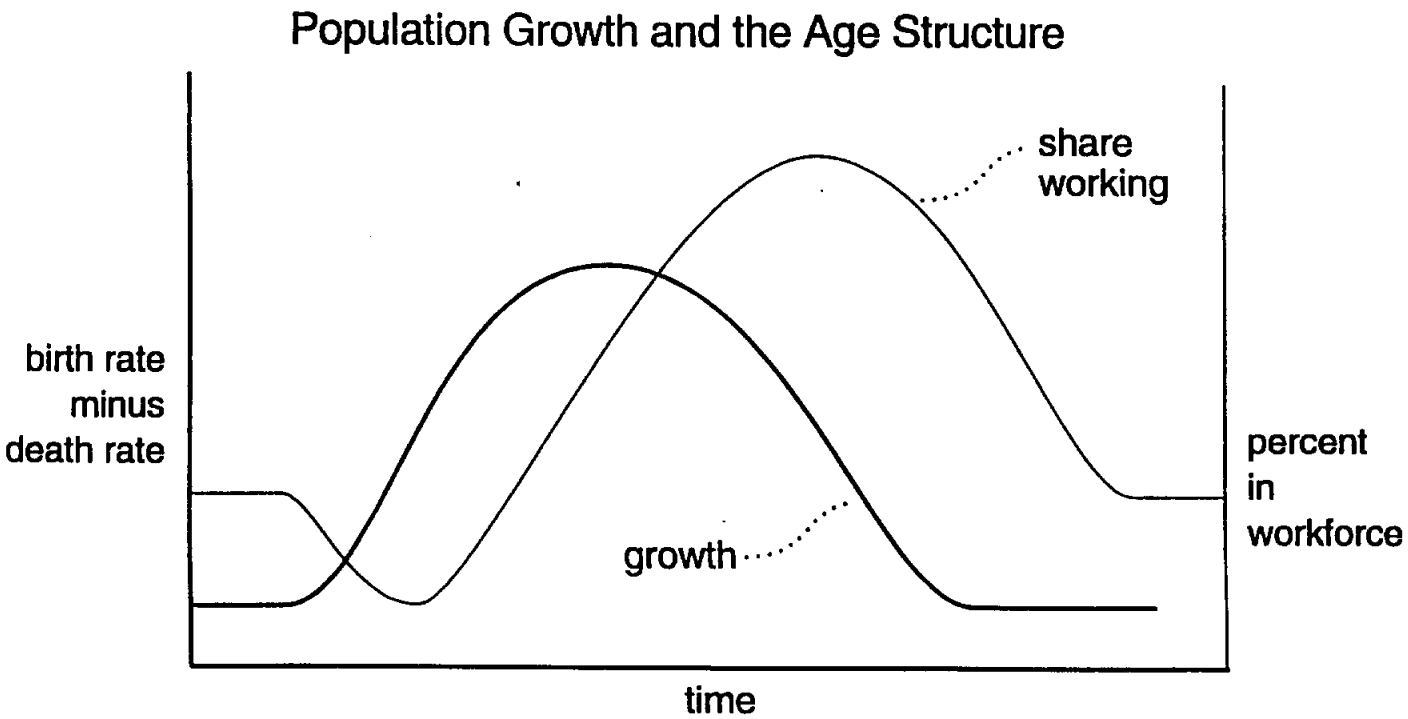
Figure 1





Source: Bloom and Williamson (1997b), Figure 1.

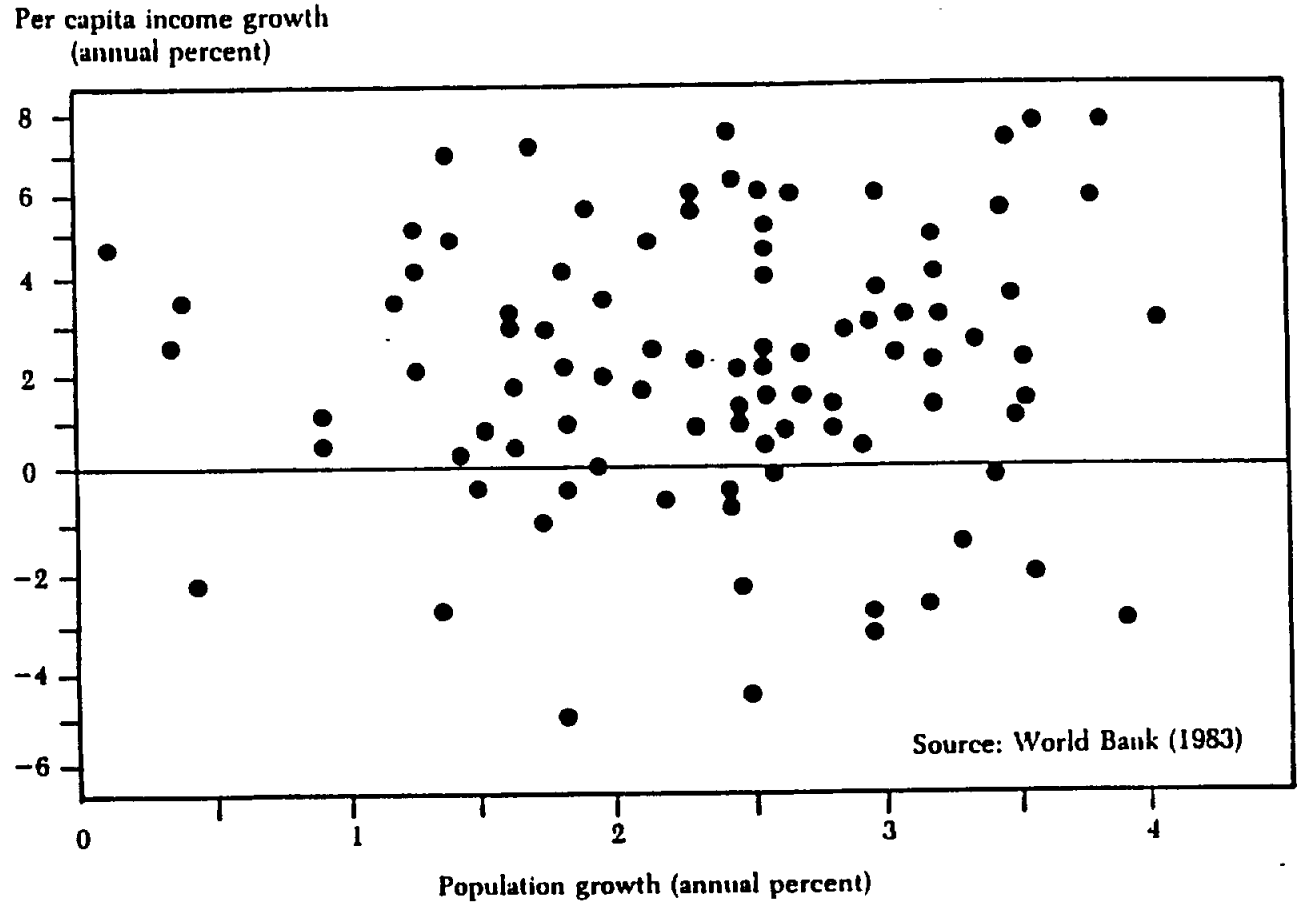
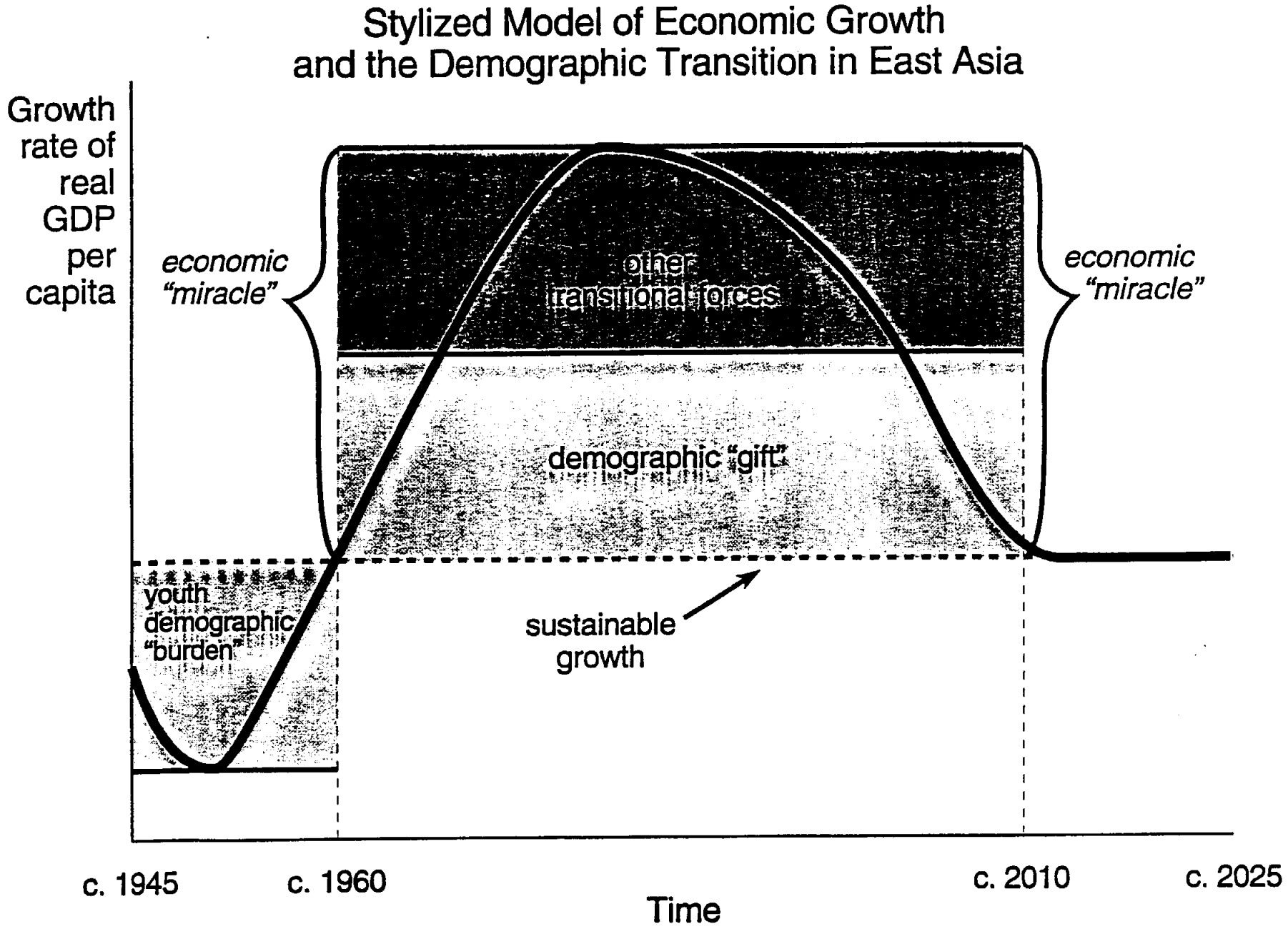


Figure 2. Income per Capita Growth and Population Growth, Developing Countries, 1970–81

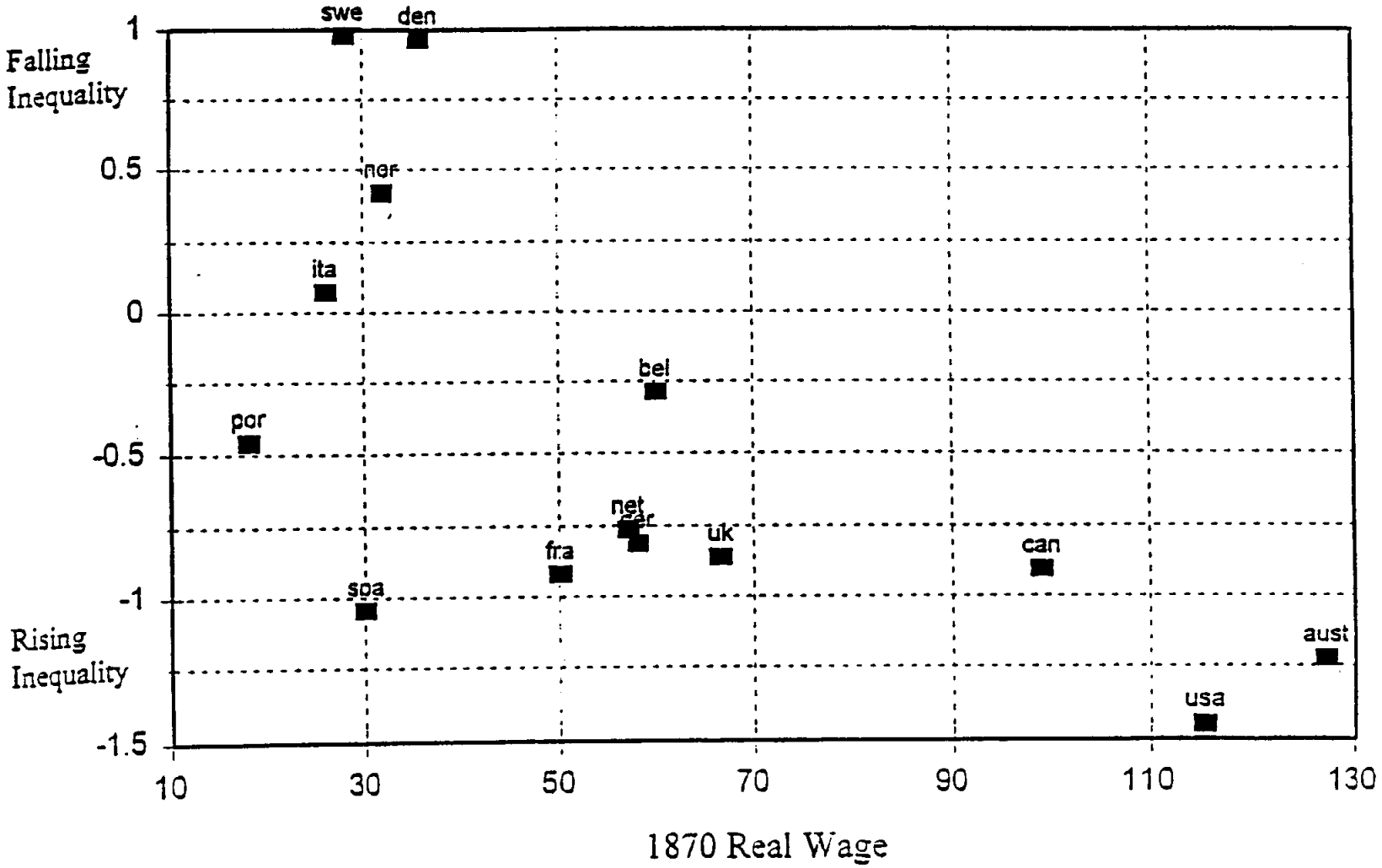
Source: Kelley (1988), Figure 2.

Figure 3



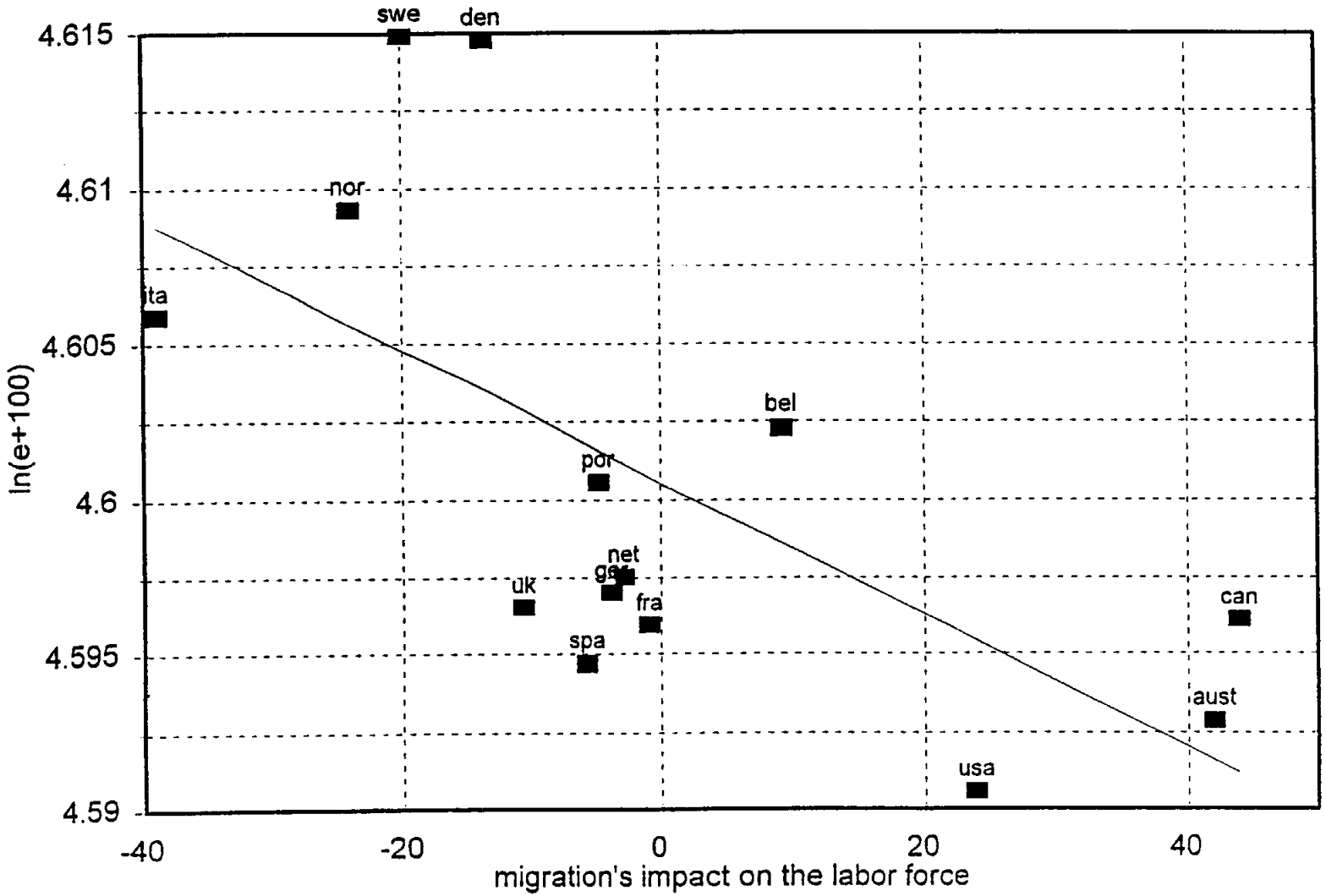
Source: Bloom and Williamson (1997b), Figure 7.

Figure 4 Initial real wage vs inequality trends 1870-1913



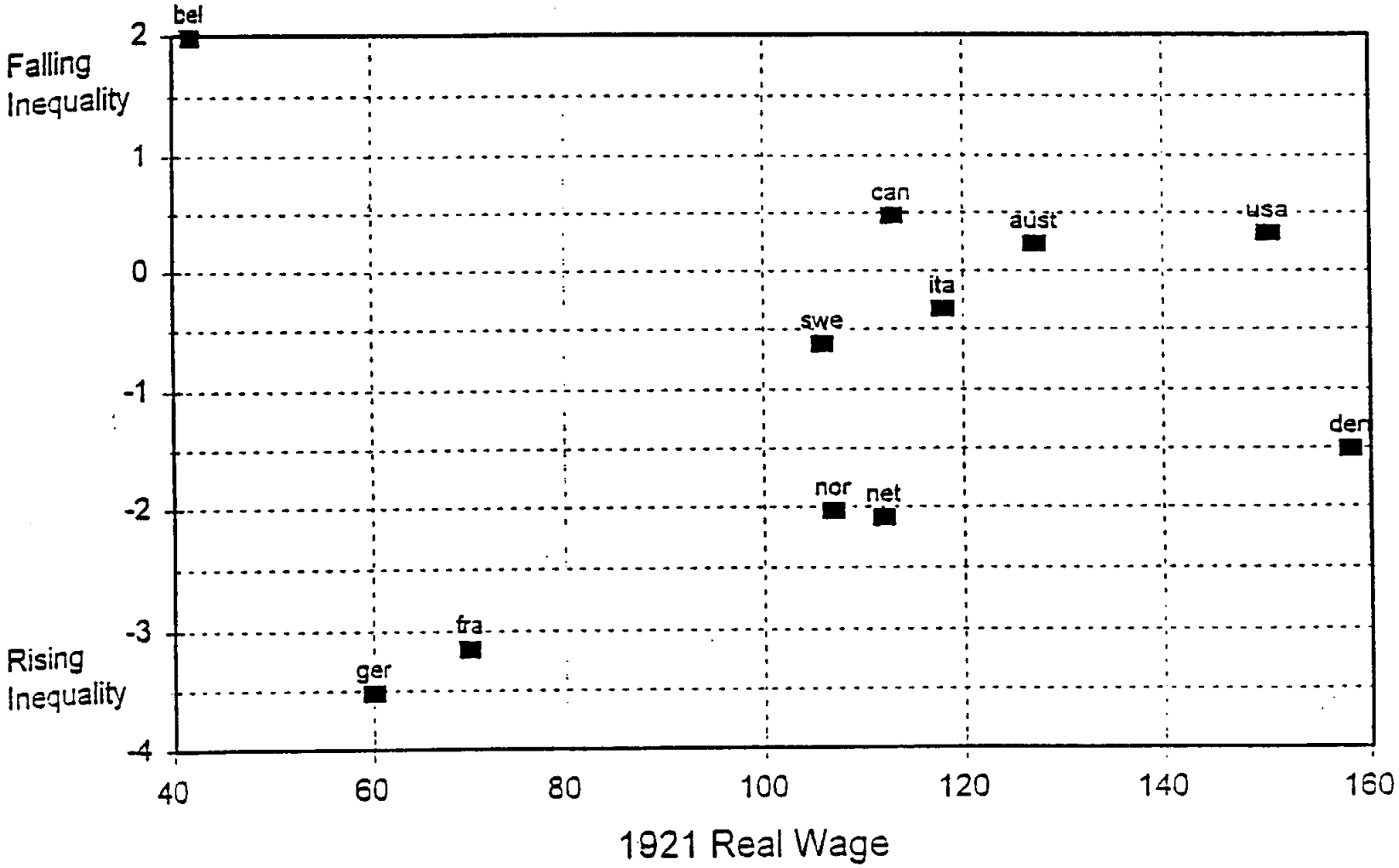
Source: Williamson (1997).

Figure 5 Inequality trends vs migration's impact on labor force, 1870-1913



Source: Williamson (1997).

Figure 6 Initial real wage vs inequality trends 1921-1938



Source: Williamson (1997).

Table 1
Effects of Population on Economic Growth, 1965-90

Dependent variable: growth rate of real GDP per capita, 1965-90
Sample: 78 countries

	OLS Model Specifications:		
Independent variables	(1) Emerging Asia	(2) New, Unconstrained	(3) New, Constrained
Constant	-27.38 (4.30)	-19.50 (4.30)	-14.30 (4.10)
GPOP6590	0.56 (0.16)	-1.03 (0.40)	---
GEAP6590	---	1.46 (0.34)	---
GEAP6590-GDEP6590	---	---	1.68 (0.35)
Log GDP per capita as ratio of US log GDP per capita, 1965	-2.30 (0.22)	-2.00 (0.21)	-1.97 (0.22)
Log years of secondary schooling 1965	0.37 (0.15)	0.22 (0.14)	0.28 (0.14)
Natural resource abundance	-2.40 (1.17)	-2.35 (1.00)	-2.57 (1.10)
Access to ports (landlocked)	-0.87 (0.29)	-0.64 (0.27)	-0.40 (0.27)
Located in the tropics	-1.09 (0.33)	-1.31 (0.30)	-1.20 (0.31)
Ration of coastline distance to land area	0.29 (0.12)	0.24 (0.11)	0.23 (0.12)
Openness	1.88 (0.36)	1.92 (0.32)	1.72 (0.33)
Log life expectancy, 1960	5.81 (0.98)	3.96 (0.97)	2.94 (0.97)
Average government savings, 1970-90	0.15 (0.03)	0.12 (0.03)	0.13 (0.03)
Quality of institutions	0.22 (0.07)	0.20 (0.07)	0.15 (0.07)
Adjusted R^2	0.83	0.86	0.85

Notes: Standard errors are reported in parenthesis below coefficient estimates; OLS estimates throughout.

Source: Bloom and Williamson (1997b, Tables 1 and 2).

Table 2

Population Dynamics and Economic Growth in the Atlantic Economy, 1870-1913 (in percent per annum)

	Population				GDP Per Capita
	Total	Active	Dependent	DIFF	
Argentina	3.42%	3.65%	3.12%	0.53%	2.5%
Australia	2.95	3.27	2.45	0.82	0.9
Austria	0.86	0.69	1.11	-0.42	1.5
Belgium	0.98	1.04	0.87	0.18	1.0
Canada	1.74	2.08	1.27	0.81	2.2
Denmark	1.07	1.03	1.13	-0.10	1.6
Finland	1.42	1.34	1.55	-0.21	1.4
France	0.22	0.23	0.20	0.04	1.5
Germany	1.20	1.18	1.22	-0.04	1.6
Ireland	-0.49	-0.45	-0.55	0.10	1.0
Italy	0.64	0.53	0.81	-0.28	1.3
Netherlands	1.23	1.16	1.33	-0.17	0.9
Norway	0.77	0.73	0.82	-0.09	1.3
Portugal	0.76	0.68	0.87	-0.19	0.5
Spain	0.59	0.46	0.81	-0.36	1.2
Sweden	0.68	0.69	0.67	0.02	1.5
United Kingdom	1.13	1.32	0.81	0.51	1.0
United States	2.17	2.42	1.78	0.64	1.8
Unweighted Averages					
Old World	0.79	0.76	0.83	-0.07	1.23
New World	2.57	2.85	2.16	0.70	1.86
Total	1.18	1.22	1.13	0.10	1.37
Weighted Averages (by 1879 population shares)					
Old World	0.77	0.75	0.79	-0.05	1.33
New World	2.2	2.5	1.8	0.7	1.8
Total	1.0	1.1	1.0	0.1	1.4

Sources: Maddison (1995); Mitchell (1980, 1983).

Table 3: Population Increase and Migration Rates in the Atlantic Economy, 1870-1913

(all figures in rates: see notes)

	Active Population		Dependent Population		DIFF Population		% DIFF Explained by
	Net Migration	Total	Net Migration	Total	Net Migration	Total	Net Migration
Argentina	32.78	36.48	18.82	31.22	13.97	5.26	All
Australia	12.99	32.72	7.46	24.49	5.54	8.22	67
Austria	1.82	6.87	1.04	11.06	0.78	-4.19	None
Belgium	2.79	10.43	1.60	8.67	1.19	1.76	67
Canada	14.57	20.78	8.36	12.72	6.21	8.06	77
Denmark	-4.35	10.28	-2.49	11.27	-1.85	-0.98	All
France	-0.14	2.35	-0.08	1.96	-0.06	0.38	None
Germany	-0.84	11.83	-0.48	12.23	-0.36	-0.40	89
Ireland	-13.51	-4.54	-7.75	-5.53	-5.76	0.99	None
Italy	-11.07	5.26	-6.35	8.08	-4.72	-2.82	All
Netherlands	-1.04	11.61	-0.60	13.29	-0.44	-1.68	26
Norway	-7.85	7.27	-4.51	8.21	-3.35	-0.94	All
Portugal	-1.67	6.81	-0.96	8.68	-0.71	-1.87	38
Spain	-1.76	4.56	-1.01	8.13	-0.75	-3.57	21
Sweden	-6.25	6.87	-3.59	6.66	-2.66	0.22	None
United Kingdom	-3.81	13.23	-2.18	8.12	-1.62	5.11	None
United States	8.22	24.22	4.72	17.79	3.50	6.42	55
Unweighted Averages							
Old World	-3.67	7.14	-2.10	7.75	-1.56	-0.61	All
New World	17.14	28.55	9.84	21.56	7.30	6.99	All
Immig. Ctys	12.20	21.92	7.00	17.66	5.20	4.26	All
Emmig. Ctys	-4.75	6.87	-2.73	7.37	-2.03	-0.50	All
Weighted Average (Using 1870 Population Weights)							
Old World	-2.83	7.32	-1.69	7.90	-1.14	-0.58	All
New World	9.84	24.65	5.65	18.13	4.19	6.52	64
Immig. Ctys	7.03	18.52	4.03	15.40	2.99	3.12	96
Emmig. Ctys	-3.57	7.39	-2.05	7.47	-1.52	-0.08	All

Note: All entries are calculated as a total increase 1870-1910 divided by the 1870 active, dependent, and total populations as relevant.

Table 4
Effects of Population on Economic Growth in the Atlantic Economy, 1870-1913

Dependent variable: growth rate of real GDP per capita

	Four Conditional Growth Models:			
Variables	(1)	(2)	(3)	(4)
Constant	0.020175*** (0.002661)	0.021631*** (0.002525)	0.021709*** (0.002539)	0.025038*** (0.003262)
GPOP7010	0.448085*** (0.819428)	-0.659005 (0.482456)		
GEAP7010		1.027151** (0.442129)	0.640586*** (0.167574)	
GDEP7010			-0.270970 (0.197093)	
DIFF				0.751387** (0.222636)
1870 GDP per capita	-0.00000655*** (0.00000139)	-0.00000638*** (0.00000128)	-0.00000641*** (0.00000128)	-0.00000538*** (0.00000169)
Mid-period enrollment rate	0.010715*** (0.003531)	0.008801** (0.003349)	0.0008753** (0.003356)	0.003537 (0.004230)
Coal production per EAP	0.000784* (0.000408)	0.000550 (0.000388)	0.000541 (0.000389)	0.000260 (0.000516)
Area in Wheat per EAP	-0.003328 (0.004420)	-0.004924 (0.004128)	-0.004972 (0.004129)	0.001620 (0.005186)
Access to Ports	0.000916 (0.002654)	0.002754 (0.002565)	0.002777 (0.002567)	0.003940 (0.003431)
Coastline/land area	-0.001352 (0.028169)	-0.012085 (0.025904)	-0.012231 (0.025889)	-0.011037 (0.034770)
Dummy (1870-1890)	-0.006315*** (0.001342)	-0.005906*** (0.001246)	-0.005863*** (0.001251)	-0.004562** (0.001635)
Adjusted R^2	0.5896	0.6531	0.6535	0.3749
Overall F	6.746***	7.695***	7.705***	3.399***
Observations	33	33	33	33

Notes: The dependent variable is annual percent change in per capita GDP. Standard errors reported in parenthesis, and the number of asterisks (1,2, or 3) denotes significance at 10, 5, and 1 per cent levels respectively. DIFF= GEAP7010 - GDEP7010; EAP = economically active population; DEP = dependent population (young and old).

Sample: There are 17 countries in the sample including Argentina, Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Spain, Sweden, the UK and the USA. Each country supplies two observations, 1870-1890 and 1890-1913, with the exception of Spain, which is absent from 1870-1890.

Table 5
Correlating w/y with Other Inequality Data c1870-c1929

Inequality Data	Sample Correlation with w/y	Sample
Top 10% income share	-0.939	1870-1913 Den, Ger, Nor, UK
	-0.721	1921-1929 Den, Net, Nor, Swe
	-0.944	1870-1929 Den, Ger, Net, Nor, Swe, UK
Top 20% income share	N/A	1870-1913 Nor, UK
	-0.844	1921-1929 Den, Net, Nor, Swe, UK
	-0.838	1870-1929 Den, Net, Nor, Swe, UK
Wage-farm land value ratio	0.700	1870-1913 Aus, Den, Fra, Ger, Spa, Swe, UK, USA

Note: All inequality statistics are calculated in percentage changes.

Sources: w/y is taken from Williamson (1997, Appendix Tables 1 and 2); the wage-farm land value ratio is taken from O'Rourke, Taylor, and Williamson (1996, Table 2); the income share data are taken from Flora et al. (1987), Hartog and Veenbergen (1978), Lindert and Williamson (1983), and Kuznets (1966).

Appendix: Description of the Data

The 17 countries in the sample underlying Table 4 include Argentina, Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Spain, Sweden, the United Kingdom, and the United States, to each of which yields two observations one for 1870-1890 and one for 1890-1913, excluding Spain for 1870-1890. However, this appendix reports available data for Portugal 1870-1913, and for Spain, 1870-1890.

Abbreviations:

(IHSE) Mitchell, Brian R., *European Historical Statistics*, 2rd ed., New York: Stockton Press, 1980.

(IHSAA) Mitchell, Brian R., *International Historical Statistics, The Americas and Australia*, London: The MacMillian Press Ltd., 1983.

Per Capita Real Gross Domestic Product (in 1990 Geary-Khamis dollars)

Maddison, Angus, *Monitoring the World Economy*, Paris: OECD, 1995.

Historical series are adjusted for current territorial definitions. In particular, only present-day Austria is considered as part of the Austro-Hungarian Empire while the United Kingdom denotes England, Scotland, Wales, and Northern Ireland. Maddison also provides a partial separate series for each of France, Germany, Italy, and the UK using situational territorial definitions. These series correct for territorial change during the period, for example including the transfer of Alsace and Lorraine, which is considered part of Germany throughout the period, and parts of Italy, which was ceded territory from Austria following the First World War. See Maddison for details, and Table A.1 for a summary of the data. The subsequent growth rates derived from the two series, however, are nearly identical, largely due to assumptions in the original estimates. In order to avoid unnecessary complications in the collection of coastline and land area data described below, the series using contemporary territorial definitions is employed in the analysis.

National Population Demographics (in thousands of people)

All of the demographic data were taken from (IHSE) and (IHSAA). Note that some observations not reported in the standard format are estimated using prior or later census data. For example, the German 1871 data reports a 60-69 category which must be broken up into 60-64 and 65-70 using data on the relative size of the 70-74 versus 75-79 populations in 1881. The demographics for each of 1870, 1890, and 1913 country populations were estimated using geometric averages on the available data above, depicted in Tables A.2.1-3. In addition, the growth rates of the active, dependent, and total population were based on the above estimate, the results of which are depicted in Tables A.3.1-3.

International Migration (in thousands per annum)

Data was sought on gross and net migration rates for all countries. Annual migratory flows were converted into rates using interpolated census estimates of population. Data for the 1870-1913 period extracted from the following sources, with exceptions listed below:

Ferenczi, Imre and Wilcox, Walter F., *International Migrations*, New York: National Bureau of Economic Research, 2 vols., 1929-1931.

AUSTRALIA

Vamplew, Wray, *Australians: Historical Statistics, Broadway*, N.S.W.: Fairfax, Syme, and Weldom, 1987, pp. 6-7.

PORTUGAL

Baganha, Moria, *Portugese Emmigration into the United States*, 1820-1930, New York: Garland Publishing, 1990, Table IV:III, pp. 213-4.

Where only gross flows were available, additional assumptions were made to allow estimates of net flows:

IRELAND: since return migration was rare, and there were no inflows from other countries, we set net equal to gross.

ITALY: the ratio of net to gross falls from .78 to .72 between the 1890s and 1900s, a modest fall given the surge in return migration; a crude linear projection might have that ratio at .84 in the 1880s and .90 in the 1870s, and it is assumed as such to make net estimates.

NORWAY: assumed ratio net to gross the same as Sweden and apply for all decades.

PORTUGAL: assumed ratio of net to gross the same as Spain and apply for 1880-1910, and assume 1870 same as 1880.

SWEDEN: projected ratio of net to gross backwards to the 1870s to be 0.95.

See Table A.4 for description of decadal migration rates and Table A.5 for the full detail of implied and/or assumed net to gross ratios.

Population migration rates were converted into active and dependent population migration rates using an estimate of the relative labor force participation rate of migrants to non-migrants during the period, assumed to be the same for all countries, as reported in the following:

Taylor, Alan M., and Williamson, Jeffrey G. 1997 forthcoming. Convergence in the Age of Mass Migration. *European Review of Economic History*.

The procedure for conversion of net population migration rates into net active population migration rates hinges on the assumed equivalence between the labor force and active population. Define the net migration rate R as the ratio of migrants M per annum to initial population N. Further, let AlphaM and AlphaN be the respective labor force participation rates for migrants (F/M) and non-migrants (D/N), and Gamma as AlphaM/AlphaN, where D is the initial size of the labor force and F is the number to migrants joining the labor force. Finally define the active population net migration rate as A, simply the ratio of F to D, which is generated by the following identity:

$$L = (F/D) = (M/N)*(F/M)*(N/D) = R * Gamma.$$

A similar expression generates the dependent population net migration rate, while the DIFF net migration rate is simply the difference between the active and dependent rates.

School Enrollment (in percent)

Enrollment rates, reported in Table A.6, are primarily taken from (IHSE) and (IHSAA), and are fully reported in the following:

O'Rourke, Kevin, and Williamson, Jeffrey G. 1995. Open Economy Forces and Late 19th Century Scandinavian Catch-Up. *Discussion Paper Series, Harvard Institute of Economic Research*, Paper Number 1709, January.

Coastline/Land Area (in km/km^2)

The data is from an on-line version of the CIA World Fact Book located on the Alpha Command and Control Information System WWW server, a home page maintained by the System Test, Validation & Integration branch of the Allied Command Atlantic System Support Center found at:

http://cliffie.nosc.mil

Observations are for current territorial definitions and are reported in Table A.6.

Coal Production (in thousands of metric tons)

All of the data are from (IHSE) and (IHSAA), and are reported in Table A.6. Observations include the production of both hard and brown coal, and are corrected for territorial change. The following countries were determined to not have produced any coal in either 1870 or 1890 based on later available observations of coal production and current period observations regarding the net export of coal: Argentina, Denmark, Finland, Ireland, Norway, and Portugal. Proceudres relating to observations missing and subsequently estimated are fully described below.

Estimated Observations:

1870	Australia	used	1881-89	geometric average
1870	Spain	used	1875	replacement

Area of Wheat Crops (in thousands of hectares)

All of the data are from (IHSE) and (IHSAA), and are reported in Table A.6. Observations are only for the land area used for the production of wheat, and are corrected for territorial change. Only Finland in 1870 was determed to not have used any land for wheat production. Procedures relating to observations missing and subsequently estimated are fully described below:

Estimated Observations:

1870	Argentina	used	1872	as	replacement
1870	Belgium	used	1856	as	replacement
1870	Canada	used	1871	as	replacement
1870	Denmark	used	1871	as	replacement
1870	France	used	1871	as	replacement
1870	Germany	used	1871	as	replacement
1870	Italy	used	1871	as	replacement
1870	Norway	used	1865	as	replacement
1890	Belgium	used	1895	as	replacement
1890	Finland	used	1909	as	replacement
1890	Spain	used	1897	as	replacement

Missing Observations:

1870 Portugal, Spain
1890 Portugal

Table A.1: Per Capita GDP in the Atlantic Economy (1870-1913)

	Levels (in 1990 dollars)			Growth Rates (in percent)		
	1870	1890	1913	1870-1913	1870-1890	1890-1913
Argentina	1311	2152	3797	2.50	2.51	2.50
Australia	3801	4775	5505	0.87	1.15	0.62
Austria	1875	2460	3488	1.45	1.37	1.53
Belgium	2640	3355	4130	1.05	1.21	0.91
Canada	1620	2254	4213	2.25	1.67	2.76
Denmark	1927	2427	3764	1.57	1.16	1.93
Finland	1107	1341	2050	1.44	0.96	1.86
France	1858	2354	3452	1.45	1.19	1.68
Germany	1913	2539	3833	1.63	1.43	1.81
Ireland	1773	2225	2733	1.01	1.14	0.90
Italy	1467	1631	2507	1.25	0.53	1.89
Netherlands	2640	3113	3950	0.94	0.83	1.04
Norway	1303	1617	2275	1.30	1.09	1.50
Portugal	1085	1227	1354	0.52	0.62	0.43
Spain	1376	1847	2255	1.16	1.48	0.87
Sweden	1664	2086	3096	1.45	1.14	1.73
United Kingdom	3263	4099	5032	1.01	1.15	0.90
United States	2457	3396	5307	1.81	1.63	1.96
Mean	1949	2494	3486	1.37	1.24	1.49
Standard Dev.	745	940	1151	0.48	0.44	0.64
Dispersion	14.63%	14.21%	10.90%	12.44%	12.58%	18.67%

Data Source Maddison (1991)

Table A.2.1: Estimated Population Demographics (1870)

	Age Distribution (in thousands)					Aggregated (in thousands)		
	0-14	15-29	30-49	50-64	65+	Total	Active	Depend
Argentina	807	531	345	86	20	1789	962	827
Australia	550	304	350	85	23	1311	739	572
Austria	6953	5195	5144	2277	815	20383	12615	7768
Belgium	1615	1249	1212	623	320	5019	3085	1934
Canada	1523	1022	694	265	131	3635	1981	1654
Denmark	596	442	437	206	103	1784	1085	699
Finland	598	480	439	180	72	1769	1099	670
France	9716	8755	9513	5232	2604	35820	23500	12320
Germany	13889	10411	9769	4783	1739	40591	24963	15628
Ireland	1924	985	1286	912	325	5433	3183	2249
Italy	8659	6799	6630	3196	1359	26643	16626	10018
Netherlands	1220	933	896	411	200	3658	2239	1419
Norway	618	444	402	183	107	1754	1029	725
Portugal	1481	1113	1097	477	207	4375	2687	1688
Spain	4981	3777	4014	2325	648	15746	10117	5629
Sweden	1469	1009	1043	470	226	4217	2522	1695
United Kingdom	9307	6748	5849	2597	1236	25736	15193	10542
United States	15105	10825	8365	3021	1153	38469	22211	16258
Old World	63025	48340	47731	23871	9961	192928	119942	72986
New World	17984	12682	9754	3457	1327	45204	25893	19311
Total	81009	61021	57486	27328	11288	238132	145835	92297

	Age Distribution (in percent)					Aggregated (in percent)	
	0-14	15-29	30-49	50-64	65+	Active	Depend
Argentina	45.09	29.69	19.31	4.79	1.12	53.79	46.21
Australia	41.93	23.20	26.67	6.49	1.72	56.35	43.65
Austria	34.11	25.49	25.23	11.17	4.00	61.89	38.11
Belgium	32.17	24.89	24.16	12.42	6.37	61.46	38.54
Canada	41.89	28.10	19.10	7.29	3.62	54.49	45.51
Denmark	33.41	24.78	24.50	11.55	5.77	60.82	39.18
Finland	33.80	27.13	24.82	10.18	4.07	62.13	37.87
France	27.12	24.44	26.56	14.61	7.27	65.61	34.39
Germany	34.22	25.65	24.07	11.78	4.28	61.50	38.50
Ireland	35.42	18.14	23.67	16.79	5.99	58.59	41.41
Italy	32.50	25.52	24.89	12.00	5.10	62.40	37.60
Netherlands	33.34	25.49	24.48	11.22	5.46	61.20	38.80
Norway	35.22	25.29	22.94	10.42	6.12	58.65	41.35
Portugal	33.86	25.44	25.07	10.91	4.72	61.42	38.58
Spain	31.63	23.99	25.49	14.77	4.12	64.25	35.75
Sweden	34.84	23.93	24.73	11.15	5.36	59.81	40.19
United Kingdom	36.16	26.22	22.73	10.09	4.80	59.04	40.96
United States	39.27	28.14	21.74	7.85	3.00	57.74	42.26
Mean	35.33	25.31	23.90	10.86	4.61	60.06	39.94
Variance	18.36	5.89	4.40	8.75	2.49	9.64	9.64
Dispersion	1.47%	0.92%	0.77%	7.42%	11.76%	0.27%	0.60%

Data Source Mitchell, B. R. (1980, 1983)

Table A.2.2: Estimated Population Demographics (1890)

	Age Distribution (in thousands)					Aggregated (in thousands)		
	0-14	15-29	30-49	50-64	65+	Total	Active	Depend
Argentina	1385	942	760	205	60	3353	1907	1445
Australia	971	728	619	212	79	2610	1559	1051
Austria	8161	6148	5729	2695	1163	23896	14572	9324
Belgium	1990	1601	1386	703	391	6071	3690	2381
Canada	1750	1361	1015	418	214	4757	2794	1963
Denmark	756	517	499	247	150	2169	1263	906
Finland	851	585	568	256	116	2376	1409	967
France	9949	9314	9962	5530	3125	37880	24806	13075
Germany	17372	12804	11438	5291	2522	49427	29533	19894
Ireland	1590	981	1169	788	305	4833	2938	1895
Italy	10009	7498	7201	3805	1671	30184	18504	11680
Netherlands	1601	1387	1046	520	275	4829	2953	1876
Norway	712	467	429	226	151	1985	1122	863
Portugal	1669	1233	1194	633	310	5039	3060	1979
Spain	5848	4540	4291	2077	788	17544	10908	6636
Sweden	1594	1128	1089	606	366	4783	2823	1960
United Kingdom	11361	8985	7637	3266	1528	32776	19888	12888
United States	22219	17933	14302	5428	2415	62297	37663	24634
Old World	73464	57189	53637	26643	12860	223793	137469	86324
New World	26325	20964	16696	6262	2768	73016	43923	29094
Total	99789	78153	70334	32905	15628	296809	181391	115418

	Age Distribution (in percent)					Aggregated (in percent)	
	0-14	15-29	30-49	50-64	65+	Active	Depend
Argentina	41.32	28.09	22.68	6.12	1.79	56.89	43.11
Australia	37.22	27.89	23.73	8.12	3.04	59.74	40.26
Austria	34.15	25.73	23.97	11.28	4.87	60.98	39.02
Belgium	32.78	26.37	22.83	11.58	6.44	60.78	39.22
Canada	36.78	28.62	21.34	8.78	4.49	58.73	41.28
Denmark	34.85	23.84	23.01	11.39	6.92	58.23	41.77
Finland	35.82	24.62	23.91	10.77	4.88	59.30	40.70
France	26.27	24.59	26.30	14.60	8.25	65.48	34.52
Germany	35.15	25.90	23.14	10.70	5.10	59.75	40.25
Ireland	32.89	20.30	24.19	16.30	6.32	60.79	39.21
Italy	33.16	24.84	23.86	12.61	5.54	61.30	38.70
Netherlands	33.16	28.73	21.66	10.77	5.69	61.15	38.85
Norway	35.87	23.53	21.61	11.39	7.61	56.52	43.48
Portugal	33.12	24.47	23.70	12.56	6.15	60.73	39.27
Spain	33.33	25.88	24.46	11.84	4.49	62.17	37.83
Sweden	33.33	23.58	22.77	12.67	7.65	59.02	40.98
United Kingdom	34.66	27.41	23.30	9.96	4.66	60.68	39.32
United States	35.67	28.79	22.96	8.71	3.88	60.46	39.54
Mean	34.42	25.73	23.30	11.12	5.43	60.15	39.85
Variance	8.60	5.16	1.36	5.51	2.75	4.05	4.05
Dispersion	0.73%	0.78%	0.25%	4.46%	9.31%	0.11%	0.26%

Data Source Mitchell, B. R. (1980, 1983)

Table A.2.3: Estimated Population Demographics (1913)

	Age Distribution (in thousands)					Aggregated (in thousands)		
	0-14	15-29	30-49	50-64	65+	Total	Active	Depend
Argentina	2928	2324	1643	525	173	7592	4491	3101
Australia	1422	1331	1175	443	197	4568	2949	1620
Austria	11107	7130	6725	3077	1359	29398	16932	12466
Belgium	2312	1965	2018	836	491	7622	4819	2803
Canada	2500	2196	1881	720	348	7645	4797	2848
Denmark	944	705	652	328	188	2816	1684	1132
Finland	1108	831	763	355	190	3248	1950	1298
France	10011	9347	10899	5744	3392	39393	25990	13403
Germany	22916	17585	16760	7050	3442	67754	41396	26358
Ireland	1291	777	1180	661	481	4390	2618	1772
Italy	11853	8739	7724	4368	2304	34988	20831	14157
Netherlands	2132	1574	1473	629	372	6181	3677	2504
Norway	846	596	523	286	185	2436	1405	1031
Portugal	2087	1540	1347	711	360	6046	3598	2448
Spain	6830	4960	4811	2534	1144	20277	12304	7973
Sweden	1777	1405	1284	697	477	5641	3386	2255
United Kingdom	12701	10942	11246	4548	2227	41664	26736	14928
United States	30468	27844	24685	9618	4238	96854	62147	34707
Old World	87915	68096	67404	31825	16612	271853	167326	104527
New World	37318	33695	29383	11306	4957	116659	74384	42275
Total	125234	101791	96788	43131	21569	388512	241709	146802

	Age Distribution (in percent)					Aggregated (in percent)	
	0-14	15-29	30-49	50-64	65+	Active	Depend
Argentina	38.56	30.61	21.64	6.91	2.28	59.16	40.84
Australia	31.14	29.14	25.71	9.70	4.31	64.55	35.45
Austria	37.78	24.25	22.87	10.47	4.62	57.60	42.40
Belgium	30.33	25.78	26.48	10.97	6.44	63.23	36.77
Canada	32.70	28.72	24.60	9.42	4.56	62.74	37.26
Denmark	33.52	25.03	23.15	11.63	6.66	59.82	40.18
Finland	34.12	25.59	23.50	10.94	5.85	60.03	39.97
France	25.41	23.73	27.67	14.58	8.61	65.98	34.02
Germany	33.82	25.95	24.74	10.41	5.08	61.10	38.90
Ireland	29.41	17.71	26.87	15.05	10.96	59.63	40.37
Italy	33.88	24.98	22.08	12.48	6.59	59.54	40.46
Netherlands	34.50	25.47	23.84	10.18	6.02	59.49	40.51
Norway	34.75	24.47	21.46	11.75	7.58	57.68	42.32
Portugal	34.53	25.47	22.28	11.77	5.96	59.52	40.48
Spain	33.68	24.46	23.73	12.49	5.64	60.68	39.32
Sweden	31.51	24.91	22.76	12.36	8.46	60.03	39.97
United Kingdom	30.48	26.26	26.99	10.92	5.35	64.17	35.83
United States	31.46	28.75	25.49	9.93	4.38	64.17	35.83
Mean	32.87	25.63	24.21	11.22	6.07	61.06	38.94
Variance	9.21	7.60	3.80	3.51	3.86	6.08	6.08
Dispersion	0.85%	1.16%	0.65%	2.78%	10.45%	0.16%	0.40%

Data Source Mitchell, B. R. (1980, 1983)

Table A.3.1: Population Dynamics and Economic Growth in the Atlantic Economy (1870-1913)

	Annual Population Growth (in percent)				Annual Growth (in percent)	
	Total	Active	Dependent	Diff	GDP pc	Wages
Argentina	3.42	3.65	3.12	0.53	2.50	0.96
Australia	2.95	3.27	2.45	0.82	0.87	0.02
Austria	0.86	0.69	1.11	-0.42	1.45	N/A
Belgium	0.98	1.04	0.87	0.18	1.05	1.05
Canada	1.74	2.08	1.27	0.81	2.25	1.86
Denmark	1.07	1.03	1.13	-0.10	1.57	2.45
Finland	1.42	1.34	1.55	-0.21	1.44	N/A
France	0.22	0.23	0.20	0.04	1.45	0.60
Germany	1.20	1.18	1.22	-0.04	1.63	1.08
Ireland	-0.49	-0.45	-0.55	0.10	1.01	1.42
Italy	0.64	0.53	0.81	-0.28	1.25	1.76
Netherlands	1.23	1.16	1.33	-0.17	0.94	0.76
Norway	0.77	0.73	0.82	-0.09	1.30	2.53
Portugal	0.76	0.68	0.87	-0.19	0.52	0.52
Spain	0.59	0.46	0.81	-0.36	1.16	0.00
Sweden	0.68	0.69	0.67	0.02	1.45	2.96
United Kingdom	1.13	1.32	0.81	0.51	1.01	1.09
United States	2.17	2.42	1.78	0.64	1.81	0.90
Unweighted Averages						
Old World	0.79	0.76	0.83	-0.07	1.23	
New World	2.57	2.85	2.16	0.70	1.86	
Total	1.18	1.22	1.13	0.10	1.37	
Weighted Averages (by 1870 population shares)						
Old World	0.77	0.75	0.79	-0.05	1.33	
New World	2.21	2.47	1.81	0.66	1.84	
Total	1.04	1.07	0.99	0.09	1.42	

Table A.3.2: Population Dynamics and Economic Growth in the Atlantic Economy (1870-1890)

	Annual Population Growth (in percent)				Annual Growth (in percent)	
	Total	Active	Dependent	Diff	GDP pc	Wages
Argentina	3.19	3.48	2.83	0.65	2.51	-0.25
Australia	3.50	3.80	3.09	0.72	1.15	0.16
Austria	0.80	0.72	0.92	-0.19	1.37	N/A
Belgium	0.96	0.90	1.04	-0.15	1.21	1.82
Canada	1.35	1.73	0.86	0.87	1.67	2.33
Denmark	0.98	0.76	1.31	-0.54	1.16	2.32
Finland	1.49	1.25	1.85	-0.60	0.96	N/A
France	0.28	0.27	0.30	-0.03	1.19	1.14
Germany	0.99	0.84	1.21	-0.37	1.43	1.36
Ireland	-0.58	-0.40	-0.85	0.45	1.14	2.15
Italy	0.63	0.54	0.77	-0.23	0.53	1.50
Netherlands	1.40	1.39	1.40	-0.01	0.83	1.92
Norway	0.62	0.43	0.87	-0.44	1.09	2.62
Portugal	0.71	0.65	0.80	-0.15	0.62	1.37
Spain	0.54	0.38	0.83	-0.45	1.48	-0.20
Sweden	0.63	0.57	0.73	-0.16	1.14	3.80
United Kingdom	1.22	1.36	1.01	0.35	1.15	1.72
United States	2.44	2.68	2.10	0.58	1.63	1.17
Unweighted Averages						
Old World	0.76	0.69	0.87	-0.18	1.09	
New World	2.62	2.92	2.22	0.70	1.74	
Total	1.17	1.19	1.17	0.02	1.24	
Weighted Averages (by 1870 population shares)						
Old World	0.73	0.68	0.82	-0.14	1.16	
New World	2.41	2.66	2.06	0.61	1.65	
Total	1.05	1.05	1.05	0.00	1.25	

Table A.3.3: Population Dynamics and Economic Growth in the Atlantic Economy (1890-1913)

	Annual Population Growth (in percent)				Annual Growth (in percent)	
	Total	Active	Dependent	Diff	GDP pc	Wages
Argentina	3.62	3.79	3.37	0.42	2.50	2.03
Australia	2.46	2.81	1.90	0.91	0.62	-0.10
Austria	0.90	0.65	1.27	-0.62	1.53	N/A
Belgium	0.99	1.17	0.71	0.46	0.91	0.39
Canada	2.08	2.38	1.63	0.75	2.76	1.46
Denmark	1.14	1.26	0.97	0.29	1.93	2.56
Finland	1.37	1.42	1.29	0.13	1.86	N/A
France	0.17	0.20	0.11	0.10	1.68	0.13
Germany	1.38	1.48	1.23	0.25	1.81	0.83
Ireland	-0.42	-0.50	-0.29	-0.21	0.90	0.80
Italy	0.64	0.52	0.84	-0.32	1.89	1.98
Netherlands	1.08	0.96	1.26	-0.31	1.04	-0.23
Norway	0.89	0.98	0.78	0.21	1.50	2.45
Portugal	0.80	0.71	0.93	-0.22	0.43	-0.22
Spain	0.63	0.52	0.80	-0.28	0.87	0.17
Sweden	0.72	0.79	0.61	0.18	1.73	2.23
United Kingdom	1.05	1.29	0.64	0.65	0.90	0.55
United States	1.94	2.20	1.50	0.70	1.96	0.67
Unweighted Averages						
Old World	0.81	0.82	0.80	0.02	1.35	
New World	2.53	2.80	2.10	0.69	1.96	
Total	1.19	1.26	1.09	0.17	1.49	
Weighted Averages (by 1870 population shares)						
Old World	0.80	0.81	0.78	0.03	1.47	
New World	2.03	2.30	1.60	0.70	2.01	
Total	1.03	1.09	0.93	0.16	1.57	

Table A.4: Migration in the Atlantic Economy (1870-1913)

	Gross (per thousand per annum)				Net (per thousand per annum)			
	1870s	1880s	1890s	1900s	1870s	1880s	1890s	1900s
Argentina	12.26	24.76	15.78	25.47	4.94	19.07	7.17	15.78
Australia	N/A	N/A	N/A	N/A	9.56	15.07	1.85	-0.02
Austria	N/A	N/A	N/A	N/A	N/A	N./A	N/A	N/A
Belgium	-2.03	-2.18	-1.96	-2.32	0.93	1.06	1.8	2.88
Canada	8.42	18.84	7.50	22.64	-1.14	5.94	5.54	17.35
Denmark	-1.97	-3.74	-2.60	-2.80	-1.95	-3.68	-2.55	-2.58
Finland	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
France	-0.16	-0.28	-0.18	-0.15	-0.09	-0.19	-0.11	-0.01
Germany	-1.35	-2.91	-1.18	-0.43	-1.34	-2.89	-1.12	2.45
Ireland	-11.28	-16.04	-9.70	-7.93	-11.28	-16.04	-9.7	-7.93
Italy	-4.28	-6.09	-8.65	-17.97	-3.86	-5.12	-6.78	-13.01
Netherlands	-2.66	-4.06	-4.62	-5.36	-0.1	-0.81	-1.16	-0.31
Norway	-4.33	-10.16	-4.56	-7.15	-4.11	-8.99	-3.23	-4.68
Portugal	-2.91	-3.79	-5.04	-5.67	-0.73	-0.95	-0.46	-2.12
Spain	-2.91	-3.91	-4.63	-6.70	-0.73	-0.98	-0.42	-2.5
Sweden	-2.96	-8.24	-5.32	-4.48	-2.81	-7.3	-3.77	-2.93
United Kingdom	-3.87	-5.71	-3.92	-7.08	-1.52	-3.23	-0.93	-3.31
United States	6.24	9.43	5.66	10.10	3.73	6.32	2.33	3.72

Data Source Taylor and Williamson (1997)

Note: minus denotes emmigration, while net adjusts for repatriation

Table A.5: Implied Net to Gross Ratios

	Decadal Ratio of Net to Gross				Period
	1870s	1880s	1890s	1900s	Average
Argentina	0.40	0.77	0.45	0.62	0.56
Australia	N/A	N/A	N/A	N/A	N/A
Austria	0.60	0.60	0.60	0.60	0.60
Belgium	-0.46	-0.49	-0.92	-1.24	-0.78
Canada	-0.14	0.32	0.74	0.77	0.42
Denmark	0.99	0.98	0.98	0.92	0.97
Finland	N/A	N/A	N/A	N/A	N/A
France	0.56	0.68	0.61	0.07	0.48
Germany	0.99	0.99	0.95	-5.70	-0.69
Ireland	1.00	1.00	1.00	1.00	1.00
Italy	0.90	0.84	0.78	0.72	0.81
Netherlands	0.04	0.20	0.25	0.06	0.14
Norway	0.95	0.88	0.71	0.65	0.80
Portugal	0.25	0.25	0.09	0.37	0.24
Spain	0.25	0.25	0.09	0.37	0.24
Sweden	0.95	0.89	0.71	0.65	0.80
United Kingdom	0.39	0.57	0.24	0.47	0.42
United States	0.60	0.67	0.41	0.37	0.51

Table A.6: Other Data

	Enrollment Rates	Coastline Length	Land Area	Ratio *100	Coal Production 1870	Coal Production 1890	Land Area - Wheat 1870	Land Area - Wheat 1890
Argentina	20	4989	2736690	0.182	0	0	73	1202
Australia	84	25760	7617930	0.338	653	3523	455	1307
Austria	59	0	82730	0	7217	24260	986	1147
Belgium	56	64	30230	0.212	13697	20366	367	180
Canada	80	243791	9220970	2.644	683	2799	667	746
Denmark	70	3379	42370	7.975	0	0	57	45
Finland	10	1126	305470	0.369	0	0	0	3
France	80	3427	545630	0.628	13259	26083	6423	7062
Germany	73	2389	349520	0.684	37856	89251	2170	2327
Ireland	45	1448	68890	2.102	0	0	105	37
Italy	37	4996	294020	1.699	59	376	4737	4407
Netherlands	65	451	33920	1.33	32	109	84	85
Norway	64	21925	307860	7.122	0	0	5	4
Portugal	23	1793	91640	1.957	0	0	.	.
Spain	46	4964	499400	0.994	610	1210	.	3858
Sweden	65	3218	410928	0.783	37	188	51	71
United Kingdom	53	12429	241590	5.145	112203	184528	1417	966
United States	93	19924	9166600	0.217	36677	143128	8476	14846