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ABSTRACT

This paper examines the determinants of overseas mass migration from eleven European countries in the late 19th century. They typically passed through something like a half-century life-cycle: a steep rise in emigration rates from low levels in preindustrial decades, followed by a plateau of very high emigration, and then a subsequent fall during more mature stages of industrialization. Using a new real wage data base, we are able to isolate the impact of economic and demographic forces (associated with the industrial revolution) on this emigration experience. The steep rise in emigration rates was driven mainly by fertility boom and infant mortality decline, events early in the demographic transition which, with a two decade lag, tended to glut the age cohort most responsive to wage gaps between the labor-abundant Old World and the labor-scarce New World. The steep fall in emigration rates was driven mainly by the forces of convergence and catching up -- more rapid real wage growth at home encouraged an increasingly large share to stay at home. Since we show elsewhere that these mass migrations contributed significantly to an impressive late 19th century economic convergence, they can be viewed as an important part of a long run equilibrium adjustment manifested by an evolving global labor market.

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I. INTRODUCTION

Rising mass emigration from Europe to the New World was one of the most important features of the evolving world economy in the nineteenth century. Between 1850 and 1913, more than 40 million people emigrated from Europe to the New World. Although a significant and growing share ultimately returned home, this mass migration represented an unparalleled population transfer which had profound effects on the global distribution of population, income and wealth. The United States absorbed nearly two thirds of the emigrants, although there were sizable flows to Canada, Australasia, and Latin America, the latter including Argentina, Brazil and Cuba. The migrants left countries with abundant labor and low living standards and entered countries with scarce labor and high living standards. While these migrations were taking place, real wages in the Old World gradually began catching up with real wages in the New World. In some cases, the catching up was quite fast, as in the countries with high emigration rates like Ireland, Italy, Norway and Sweden; in other cases, the catching up was slow, as in the countries with low emigration rates like France. While such evidence suggests that the mass migration made a significant contribution to the convergence taking place in the world economy, some countries with high emigration failed to share in the real wage convergence (like Spain), while others with low emigration did share in it (like Belgium and the Netherlands).

The early migrant flows came chiefly from Northwest Europe, the United Kingdom and Scandinavia in particular, but as the period wore on the composition shifted from the north and west to the south and east. After 1890, the balance shifted decisively in favor of

the "new emigrants" coming from southern Europe (Italy, Spain and Portugal) and eastern Europe (Austria-Hungary and Poland).

This paper offers explanations for nineteenth century emigration experience. It follows in the established tradition led by Easterlin (1961), Tomaske (1971), Massey (1988), Baines (1991) and others. We improve on these earlier contributions in four ways. First, and most important, we employ new data on relative real wages (Williamson, 1992), an intertemporal cross section that has not until recently been available for research on this question. Second, we combine this new labor market data with other evidence which makes it possible to test some important assertions that have been part of the literature for some time. Third, we evaluate these hypotheses in the context of multivariate regression models. Fourth, we then use these estimated models to sort out the underlying forces that were primarily responsible for the emigrations.

One of the main challenges is to explain why emigration rates were not always highest for the poorest countries, whose populations clearly would have gained most from the move, and why emigration rates often rose from low levels as successful development took place at home. After all, conventional theory would suggest that successful development (e.g., rising wages) at home would make the move overseas less attractive. A number of hypotheses have been put forward to account for these counterintuitive events, but they have not been subjected to comprehensive test. The major hypotheses considered are as follows: First, in the light of the persistence in emigration rates over time, it has also been suggested that past emigration largely determines current emigration through the financial and job search help of "friends and neighbors" already abroad. This is a path

dependent argument which insists that history matters: historical events like famine and pogroms, which created high emigration in the past, are likely to be largely responsible for high emigration rates in the present; and historical events like revolution-induced land reforms, which suppressed emigration in the past, are likely to be largely responsible for low emigration rates in the present. Second, in the light of the surge in eastern and southern European emigration, it has also been suggested that economic development at home raises the propensity to emigrate. To do so, it has to fight against the countervailing influence of diminished living standard differentials due to real wage catch up at home either by providing the means to finance a costly passage or by changing attitudes towards labor mobility. Third, it has sometimes been suggested that nineteenth century emigration acted as a European "safety valve" so that rising population growth associated with the demographic transition directly induced higher rates of emigration. Did such demographic events have a direct influence, or did they manifest themselves only indirectly through labor markets?

Our results strongly support the view that there was considerable persistence in emigration rates, that emigration responded systematically to real wages gaps between home and abroad, but that this response depended strongly on direct demographic influences and weakly on the level of industrialization at home.

II. WHO WERE THE EMIGRANTS?

A number of studies have examined the composition of the emigrant flows from various European countries (e.g., Carlsson, 1976, for Sweden; Erickson, 1972, for Great Britain; Fitzpatrick, 1984, for Ireland; Hvidt, 1975, for Denmark; Swierenga, 1986, for Holland), with the following results.

First, they were typically young adults. Only 8 percent of the immigrants entering the United States between 1868 and 1910 were over 40 and another 16 percent were under 15. Thus, the migrants exhibited very high labor participation rates. Second, the emigrants were dominated by males who accounted for 64 percent of all immigrants to the United States between 1851 and 1910. Females formed a higher proportion for some emigrating countries like Ireland, where they accounted for 48 percent between 1851 and 1913. In other cases, such as Italy and Spain, females typically comprised less than a quarter of the total. Third, the emigrants tended to be single and emigrated as individuals rather than in family groups. There was, however, a significant minority who emigrated as family groups, often young couples with small children. In general, however, the migrants carried a very low dependency burden with them to the New World. Fourth, although the bulk of emigration was made up of young single individuals without government assistance, the vast majority were aided by previous emigrants currently resident in the receiving countries. This took the form of remittances, pre-paid tickets, accommodation and subsistence upon arrival in the destination country, and help in job search. Finally, the emigrants were mainly unskilled. No doubt this was due in part to the fact that they were young. After all, most of the emigrants

would have acquired skills had they remained in their home country; many certainly acquired them in their destination country.

The evidence suggests, therefore, that those who emigrated had the most to gain from the move, and should have been most responsive to labor market conditions. By emigrating when young, they were able to reap the rewards over most of their working lives. By moving as single individuals, they were able to minimize the costs of the move including the earnings foregone in passage and during job search. Such costs were reduced even further by the assistance of friends and relatives in the destination countries. Since the emigrants were typically unskilled, they also had little country or technology specific human capital invested and hence stood to lose few of the rents from such acquired skills. This picture reinforces the widespread notion that economic motives were uppermost in driving the late nineteenth century mass migrations.

III. EXPLAINING EUROPEAN EMIGRATION

We examine the emigration experience of eleven countries over the period 1850 to 1913. These are presented as average decadal emigration rates per thousand of the sending country population in Table 1. The decade averages are used to smooth out the sharp year to year fluctuations evident in many of the country time series. We do so since our interest is in the long run determinants of emigration rather than in the short run timing of these permanent moves. A number of studies have already shown that these dramatic short run fluctuations are strongly associated with unemployment and industrial crises both in the

sending European and receiving New World countries. The data are for intercontinental migrations and therefore exclude emigration to other European countries. These series were drawn from the authoritative study by Ferenczi and Willcox (1929). The original sources were taken from the origin country and were based chiefly on the issue of exit visas or, more commonly, on the registration of passengers on ships bound for extra-European ports.

There are several points to note about these series. First, they are limited to western European countries. Although similar migration data are available for some eastern European countries, they are often less reliable, and in any case we do not have adequate information on the requisite explanatory variables to make it possible to include these countries in the analysis. Nonetheless, the eleven-country sample encompasses a wide variety of experience. The observations range from the very low gross emigration rates for France to the very high rates for Ireland. The data also exhibit substantial variation for individual countries over time, contrasting, for example, the rising emigration rate for the Netherlands and the declining emigration rate for Ireland. A second point which has been noted is that gross emigration rates often differ substantially from net rates although the difference varies from country to country. One of our objectives in this paper is to see if explanations of late nineteenth century emigration behavior are significantly different when return migration is included.

What explains the variety in emigration rates across countries and over time? In his pioneering paper published over 30 years ago, Richard Easterlin (1961) examined the relationship between European emigration and population growth. If emigration was a true vent for "surplus" population, then countries with relatively high rates of natural increase

should have exhibited higher emigration rates than those with low rates of natural increase. Comparing average country emigration rates 1861-1910 with rates of natural increase lagged 20 years, Easterlin found a strong positive correlation. However, the comparison of trends in emigration rates across countries with the trends in natural increase yielded a much weaker relationship.

Easterlin viewed the rate of natural increase 20 years earlier as a proxy for the current rate of additions to the labor force: "Relatively high additions to the labor market would be expected, other things remaining equal, to result in labor market slack (comparatively slower growth in wages, less secure employment, etc) and to lead to relatively higher emigration" (1961, p. 332). If so, then this would be better captured by an index of current labor market conditions, such as the real wage, which would reflect the net impact of both labor supply and demand. However, there are alternative interpretations of Easterlin's correlation: first, if differences in natural increase were driven chiefly by variations in births and infant mortality then it could act as a proxy for the proportion of the population who, 20 or 30 years later, were in the prime emigration age group. Since this age cohort had a higher propensity to emigrate, one might observe higher emigration rates associated with faster lagged natural increase even if real wage gaps between home and abroad stayed constant. And since rising fertility rates and falling infant mortality rates are associated with early industrialization, rising emigration rates might possibly be correlated with rising real wages at home if the influence of these demographic transition variables was sufficiently powerful.

A second possibility is that with rising population growth, a genuine labor surplus

developed in rural areas. There is some evidence from Germany, for example, that "proto-industrial" areas, which combined high birth rates with poor agriculture and declining cottage industry, had higher emigration rates than other areas (Kamphoefner, 1976, p. 182). Land access was also often a critical determinant: those who were unable to inherit or marry into a tenancy or small holding had little option but to leave (Walker, 1964, p. 164). The same was true of other emigrating countries such as Ireland.

No adequate measure of internationally comparable real wage rates were available to Easterlin and he had to make do with Mulhall's crude estimates of per capita income. He found no significant correlation between income levels and emigration rates. Easterlin did suggest, however, that there was a negative relationship between home per capita income and emigration rates once lagged population growth was taken into account. Econometric evidence presented by Tomaske (1971) suggested that, across countries, the relationship between Mulhall's income per capita and emigration to the United States was insignificant, even in the presence of lagged natural increase, unless an additional variable, the lagged dependent variable, was included.

Crippled by lack of adequate data, this important debate has lain dormant for about two decades. The appearance of a recently developed real wage data base for internationally comparable urban unskilled male occupations (Williamson, 1992) makes it possible to breath new life into the debate. These data have three principal advantages over what was available to Easterlin and Tomaske. First, they offer an income measure far more relevant to the decision facing potential migrants. The wage rates were taken from urban occupations (such as the building trades) which were ubiquitous in all countries, and they were deflated

by cost of living estimates that were developed from purchasing-power-parity constructs. Second, since these real wage indices are comparable across time and between countries, we are able to pool the country time series in the emigration analysis, something earlier studies were unable to do. Third, since we have comparable real wage estimates for major immigrant New World countries, we are able to develop a measure of the wage gap between sending and receiving countries which is also comparable across countries and over time.

The row labelled A in Table 2 reports the absolute real wage indexed on Britain 1900=100. The row labelled B reports the home real wage as a percent of that in the relevant receiving region. For most Old World countries, the New World wage is taken to be a population weighted average of Australia, Canada and the United States. For Italy, however, the New World is taken to be a weighted average of Argentina and the United States, and for Spain the New World is assumed to be represented by Argentina alone (having no real wage observations for Brazil and Cuba).

Row A indicates that real wages were rising strongly everywhere, although some, like Denmark, Ireland, Norway and Sweden, were doing especially well, while others, like Belgium, France and Spain, were not. If we compared these real wage trends with the emigration rate trends, the negative relationship would be weak since, with the exception of Ireland, there is no strong evidence of downward trend in emigration rates. Indeed, the correlation coefficient between gross emigration and the wage in our full sample is -0.05, while it is -0.16 in the smaller sample of net emigration rates. Thus, there is at best only a very weak negative correlation between home wages and emigration. In the late nineteenth century, rising real wages at home did not appear to diminish emigration in any significant

way, at least when crude bi-variate correlations are examined.

A more appropriate measure of the overseas migration incentive, however, is the gap between home and New World real wages. It has been shown elsewhere (Williamson, 1992) that real wages converged in the late nineteenth century, and that most of that convergence was driven by the gradual erosion in the real wage gap favoring the New World. Row B in Table 2 confirms that finding. For example, between the 1870s and the early twentieth century, Danish real wages rose from about 35 percent to about 57 percent of the New World, a significant catch-up over about three decades. Swedish experience was similar, her real wage rising from about 23 percent of the New World in the 1850s to about 56 percent at the end of the period. Ireland recorded much the same catch-up on the New World. In fact, the only European countries in Table 2 which fail to show some catch up are France, Germany and Spain.

In certain cases like Ireland and Norway, an inverse correlation between the emigration rate and the wage ratio is clearly revealed in the raw data. Indeed, a recent paper (Hatton and Williamson, 1992) confirmed that inverse correlation for Ireland and successfully explained most of the secular fall in the Irish emigration rate after the famine. Previous studies of other emigrating countries also support this view (Wilkinson, 1970). However, over the full intertemporal cross section, the inverse correlation between the wage ratio and the emigration rate is still modest, -0.12 for gross emigration and -0.28 for net emigration. True, the correlation clearly supports the view that the wage gap between New World and Old is the appropriate variable to use in the emigration analysis, not the Old World home wage alone. Nonetheless, the weak correlation clearly implies that a more

comprehensive model is needed to account for late nineteenth century European emigration to the New World.

Several studies have asserted, but not adequately tested, which additional variables ought to be included in such a model. As we have pointed out, a central stylized fact makes it clear that real wage gaps will not suffice by themselves: during the course of modern economic growth, emigration rates rise steeply at first from very low levels, the rise then begins to slow down, emigration rates reach a peak, and subsequently they fall off. This stylized fact has emerged from studies of both the time series of aggregate emigration for a number of countries (Akerman, 1976) and of the local emigration rates within individual countries (Gould, 1979), and it has been used to make predictions about the future of Mexican immigration into America (Massey, 1988). The stylized fact is plotted in Figure 1, and several explanations have been offered for its shape, but each of them can be characterized by the time path captured by Figure 2 where we isolate movements along some downward-sloping home country emigration function (EM) and shifts in that function. In pre-industrial episodes, we observe low emigration rates (e_0) and low wages (w_0). Industrialization and other events then serve both to raise the emigration function to EM' and real wages to w_1. The former dominates in this example since emigration rates have risen to e_1; in the absence of the shift in EM, emigration rates would have fallen to e_1'. In later stages of development, EM is taken to be stable so that further improvements in real wages at home, to w_2, cut back emigration rates to e_2. Thus, the stylized facts of Figure 1 are reproduced in Figure 2. What, then, might account for the rightward shifts in EM during early industrialization and its stability thereafter?

The first explanation appeals to the costs of migration. Although there is a strong incentive to flee pre-industrial poverty, the costs may be prohibitive for most workers. After all, the potential migrant cannot get loans for the move, and his income is too close to subsistence to make it possible to accumulate the necessary savings. Thus, enormous wage gaps between an industrializing, resource-rich New World and a backward, resource-poor Old World can be quite consistent with low emigration rates. As industrialization takes place in the home country, real wages rise and the supply constraint on emigration is gradually released: more and more potential emigrants can now finance the move, and, in contrast with conventional theory, the home wage and emigration are positively correlated. As industrialization continues, the backlog of potential migrants is slowly exhausted as more and more workers find it possible to finance the move. When the migration cost constraint is no longer binding, further increases in the real wage cause the emigration rate to decline from the peak.

According to this view, emigration histories should pass through two regimes, the first emigrant supply constrained, and the second emigrant demand constrained. The emigrant-supply-constrained regime is consistent with rising emigration and rising home wages implied by Figure 1, and it can also be made consistent with the downward-sloping EM function in Figure 2 by appealing to rightward shifts in that function induced by "chain migration". The idea is that rightward shifts in the EM function is driven by the remittances of previous (now rich) emigrants who finance the moves of impecunious late comers. As the stock of emigrants abroad increases, so too do their remittances home, and thus the current emigration rate rises even though the home wage is increasing. This rising influence

continues as long as potential emigrants find their move financially-constrained, but the latter diminishes as the real wage increases at home. At some point, that constraint is no longer binding and further increases in the home wage reduces the emigration rate as the economy moves up a more stable EM function, and emigration experience enters regime two. While this tale of regime switch is plausible, we should remember that it takes no account of changing employment conditions overseas. The Old World has to catch up with the New, at least sometime after the regime switch, if the emigration rate is to decline from its peak.

A second hypothesis appeals to a process of diffusion. Gould (1980) illustrated the process by reference to the experience of latecomers to mass migration, such as Italy and Hungary where the within-country regional variance in emigration rates diminished over time. Regions with low initial emigration rates converged on the earlier emigrating regions, causing the aggregate emigration rate to increase. It is not clear from these facts alone, however, what mechanism was driving the diffusion process. If some inter-regional convergence of wage rates within the home country was at work, backward rural regions catching up with more advanced urban regions, then the process would be consistent with the cost-of-migration arguments outlined above. Some writers have suggested that the diffusion process depended instead on the diffusion of information, but, in this case, other arguments would have to be invoked to get the process started and to cause it to diminish after the initial surge.

What about the issue of persistence and path dependence? The influence of friends and relatives abroad sending letters containing information about prospects overseas is well

documented, and such information is likely to have reinforced the decision to emigrate. Furthermore, there is abundant evidence that current emigrants' cost of passage was financed by previous emigrants. This evidence takes the form of large emigrant remittances and frequent use of pre-paid tickets: those travelling on pre-paid tickets accounted for 30 percent of Finnish emigrants 1891-1914, for 50 percent of Swedish emigrants in the 1880s, for 40 percent of Norwegian emigrants in the 1870s, and for about 25 percent of Danish emigrants 1881-1895 (Kero, 1991, p. 191; Hvidt, 1975, p. 129). Such evidence clearly argues for the case that past emigration encourages present emigration -- what we call persistence. In econometric models, this persistence is often captured by including lagged emigration as a dependent variable, a variable that is often the most significant in time series analysis (Gould, 1979, p. 659).

Should lagged emigration be measured by recent emigrant flows, or by the total surviving stock of emigrants who have moved in the past? We are not certain, but there is reason to believe that recent flows are the best indicator of the friends and relatives effect. After all, the data clearly show that the remittance probabilities and magnitudes are far higher shortly after arrival than a decade latter. And one can only suspect that the same would characterize attitudes of past migrants regarding support for the job search of new emigrants. In any case, a future version of this paper will use evidence now being collected on the stock of past migrants, evidence that will make it possible to discriminate between the empirical relevance of past stocks or recent flows. We think it may matter to interpretations emerging from our work, as we shall point out below.

The important point is that persistence is likely to matter in accounting for the

variety in European emigration experience in the late nineteenth century. Historical events in the past -- like famines and revolutions -- are likely to have a potent influence on country emigration experience in the present even after those events have disappeared from the memory of current generations. Low French emigration in the 1890s may have its source in the revolution-induced land reforms a century before, and high Irish emigration in the 1890s may have its source in the potato famine a half century before.

Finally, what about the influence of industrialization and structural transformation? In many qualitative accounts of European emigration, the key factor is economic development at home, not just rising wages but the whole set of changes which accompany industrialization and change attitudes towards emigration. As a historian of Norwegian emigration put it: "Mass emigration occurred in the period of disruption when Norway was becoming part of the world economy, when industrialization was beginning, when new means of transport were creating a national market, when a money economy was transforming the old social order, when international competition in an age of free trade was causing Norwegian farmers to struggle for their lives and when internal migration reached unprecedented proportions, with a new social mobility being created within Norway itself" (Semmingsen, 1960, pp. 152-3).

The importance of industrialization in raising labor mobility has recently been stressed by Massey (1988). European industrialization involved, above all, reduced attachment to the land and a rise in wage labor. The combination of more commercialized agriculture, more consolidated land holdings, diminished smallholdings, the erosion of common rights, and relatively high and rising wages in the booming cities all served to

produce a rural exodus (Williamson, 1990). The rise of overseas emigration was correlated with the growth of internal migration and can be seen as part of the same phenomenon (Baines, 1985). To the extent that migrants from rural areas in Europe became urban workers in the New World (or in other European countries), it was simply a rural-urban movement across international boundaries (Thomas, 1972).

It would be misleading, however, to view European intercontinental migration as simply part of a more general rural exodus. A number of studies have shown that overseas emigration rates from urban areas were as high or even higher than from rural areas (Carlsson, 1976, p. 136; Hvidt, 1975, pp. 43-53; Semmingsen, 1972, p. 53). After all, urban populations were also relatively mobile. The overseas mobility of rural populations was probably lower, and for three reasons. First, a significant share of those in the mobile rural age cohorts migrated towards their own cities. Second, the rural exodus tended to deplete the number of village residents in the mobile age cohort, while it augmented those cohorts in the cities. For that reason alone, it must have created a relatively young urban labor force (Williamson, 1988) that would have been more responsive to wage gaps favoring the New World. Third, city workers had had more experience with urban labor markets at home, the very labor markets which absorbed so many of them when they arrived overseas. For this reason too, they might have been more responsive to wage gaps favoring the New World. In short, rising urban population shares and falling agricultural employment shares at home might have fostered greater overseas emigration, given the wage gap between Old World and New.

These, then, are the main arguments that appear in the qualitative accounts

describing European emigration in the late nineteenth century. How effective are they when confronted systematically with the quantitative evidence?

IV. THE MODEL AND THE RESULTS

Here we apply an econometric model to the decadal emigration rates presented in Table 1, incorporating where possible the hypotheses discussed in Section III. Four main explanatory variables are introduced: the real wage gap between the home country and foreign destinations, log(Wh/Wf); a demographic variable, RNI; industrialization, measured by the share of the labor force in agriculture, Sa; and the lagged dependent variable, M. We also allow for some interactions between the variables. The model is written as

$$M_{it} = \alpha_0 + \alpha_1 Sa_{it} + \alpha_2 \log(Wh_{it}/Wf_{it}) + \alpha_3 Sa_{it} \log(Wh_{it}/Wf_{it})$$
$$+ \alpha_4 RNI_{it-1} + \alpha_5 Sa_{it} RNI_{it-1} + \alpha_6 time + \alpha_7 M_{it-1} + \sum_{j=1}^{n-1} \alpha_j D_j$$

The data are described in the Appendix.

The wage gap is measured by the log of the ratio of the real urban unskilled wage rate in the home country to a weighted average of those in the destination countries which were relevant to emigrants from the country in question. The real wage gap measures the expected income gain from emigration and should take a negative sign. While most time series studies of annual migration introduce unemployment rates as well, we need not do so here since our focus is on decade averages and the longer run. The wage gap variable

is also interacted with the labor force share in agriculture to see whether industrialization influenced emigration rates in ways additional to its impact on real wages and baby booms.

Following Easterlin, RNI refers to the rate of natural increase lagged two decades. Since we have already controlled for the (indirect) influence of demographic gluts on home labor markets by including the wage gap, we interpret RNI instead as reflecting a glut in the prime emigration age group two decades later, a direct demographic influence. RNI is also interacted with Sa. This confronts the hypothesis that absorptive capacity in agriculture was less than that in industry: it asserts that rapid population growth would be more likely to spill over into emigration the more agrarian the economy. Time is introduced separately in order to assess whether there was present some (unmeasured) change in migration propensities or some (undocumented) decline in steerage costs.

The lagged dependent variable (the emigration rate in the previous decade) is included to capture emigration persistence and path dependence. As noted in Section III, this may be interpreted as a proxy for "friends and relatives" or "chain migration" effects, rather than simply slow adaptation of expectations about the future. If we believe it reflects the latter, then the impact of the other variables should be converted to long run steady state by multiplying each by $1/(1-\alpha_7)$. If instead we believe it reflects the former, a similar adjustment is necessary since the stock of emigrants abroad (proxied by the lagged dependent variable) embodies the influence of past events with an obvious long run influence (path dependence). The choice between the two views may not appear to matter, but the explicit introduction of the emigrant-stock-abroad variable (as opposed to its proxy, the lagged dependent variable) into the regressions may serve to lower the size of the

estimated parameters below what is reported here in its absence. A future version of this paper will attempt to resolve this issue.

Finally, dummy variables are included to test for country-specific effects.

The dependent variable is the decadal gross emigration rate. The sample (N=44) includes the 56 cell observations in Table 2 less 11 due to the presence of the lagged dependent variable and less one due to the lack of Sa data for Germany in the 1860s. The remaining sample is therefore: Belgium 1860-1913 (5); Denmark 1880-1913 (3); France 1870-1913 (4); Germany 1870-1913 (4); Great Britain 1860-1913 (5); Ireland 1860-1913 (5); Italy 1880-1913 (3); Netherlands 1860-1913 (5); Norway 1880-1913 (3); Spain 1890-1913 (2); and Sweden 1860-1913 (5).

Table 3 summarizes the results: they are generally quite successful with the adjusted R^2 better than 0.7 in each case. The results strongly support the hypotheses developed in Section III. Let us consider each in detail.

The real wage gap between the Old World and the New had a powerful influence on emigration rates, and in the direction that conventional theory predicts: the higher the real wage at home, the lower the emigration rate. This result confirms the hypothesized downward sloping emigration function in Figure 2. The puzzling coincidence of rising emigration with the convergence of Old World on New World wage rates is now clearly explained by demographically-induced rightward shifts in the emigration function. The results presented in column 4 suggest that, in long run steady state, a ten percent rise in the real wage ratio tended to reduce the emigration rate (per 100 population) by (0.1)(-0.458)/(1-0.426) = 0.08, or 0.8 per thousand. The orders of magnitude are similar when the

real wage ratio is interacted with the agricultural share. It should be noted, however, that this estimated impact is lower than those obtained from annual time series models for individual countries. For example, a ten percent rise in the wage ratio lowered the Irish emigration rate in the long run by 2.5 per thousand (Hatton and Williamson, 1992) and the figure for the UK as a whole was 2.2 per thousand (Hatton, 1992). It appears that the elasticity of emigration rates with respect to relative wages was smaller across countries than over time for any given country. Nonetheless, it was powerful enough to have mattered a great deal, as we shall see.

The demographic influence was profound, just as Easterlin suggested, but its influence was felt directly on emigration not simply indirectly through a glut in home labor markets. That is, the indirect effect that Easterlin stressed is already present in our wage gap variable. The direct demographic effects are significant and large in each column of Table 3. The coefficients in column 1 imply that in the long run a permanent rise of one per thousand in natural increase two decades earlier led to an increase in the emigration rate of 0.77 per thousand, a powerful impact indeed (almost one-for-one), especially to the extent that the rise in RNI was pronounced on the upswing of the European demographic transition. It appears that stage of the demographic transition was responsible for much of the variation in emigration rates across countries, and that rightward shifts in the emigration function on the upswing of mass migration surges were indeed being driven by direct demographic forces.

While the impact of Sa by itself is negative as predicted and significant in the first two columns of Table 3, there is some evidence that it had conflicting effects on emigration.

To the extent that it magnified the effects of the relative wage and the rate of natural increase, it enhanced both the negative and positive influence of these variables on emigration. But as the interactions are suppressed, the size and significance of Sa by itself declines. Choosing between the alternative specifications in Table 3 is difficult since the RESET test is satisfied for all four equations and varies little between them. In any case, all the results reported in Table 3 suggest that the net impact of Sa was small.

It is worth noting that the coefficient on time is never significant in any of the regressions, a result which appears to reject the assertion that factors like declining steerage costs help explain the rise of mass migration in the late nineteenth century (including improved quality of ship accommodations and diminished wage loss associated with faster passage and more predictable schedules). Furthermore, there is nothing unusual about those low French emigration rates: French emigration simply reflects a different demographic regime in that part of Europe. By contrast, Ireland and the Latin countries exhibit much higher emigration than can be accounted for by economic and demographic variables alone, so omitted cultural and institutional factors mattered in those cases. For the remaining countries, however, there are no country-specific effects: when dummies for all countries (but one) are added to the model, these additional dummies can be rejected individually and jointly.

Lagged emigration mattered as Tomaske and others have suggested, even though our focus is on long period decade averages. The coefficient on M_{t-1} is always highly significant, and the estimates are very stable across regressions, bounded by the narrow range 0.41 to 0.46. This persistence explains a large share of the emigration rates. For example,

persistence and path dependence largely explains why a country like Ireland with gross emigration rates ten times those of Belgium in the 1850s (Table 1) continued to record far higher emigration rates even though its home wage rose far faster up to the 1890s than did that of Belgium. Our future research will see whether these large persistence effects hold up when the lagged dependent variable is either replaced or augmented by the past stock of migrants.

It has often been suggested that the appropriate variable for analysis should be net rather than gross emigration. Unfortunately, it is not possible to obtain net emigration for all country/decades in our sample. However, a smaller sample of those documenting net emigration rates was also used to estimate the model (Appendix Table 2), and it can be compared with estimates using gross emigration rates over a similar sample (Appendix Table 1). The only differences between the two are that the dummy for France becomes more positive and the time trend is more strongly negative. Apart from these minor differences, it appears that net and gross emigration can be explained by the same set of variables, with roughly the same magnitudes on the estimated coefficients.

V. CONFRONTING THE STYLIZED FACTS OF EUROPEAN EMIGRATION

As was pointed out in Section III, some observers have characterized the typical country emigration experience as following a life cycle pattern like that in Figure 1. This stylized inverted U was originally intended to describe late nineteenth century Scandinavian experience, and not necessarily that of all European countries, although Massey (1988) has

recently tried to generalize it. We have already argued that the upswing portion appears to be inconsistent with conventional theory and thus poses a challenge. Can our econometric results be used to explain this pattern?

To begin with, can this inverted U be identified in our sample? We explored this question by estimating a quadratic for each country using annual gross emigration rates from 1860 to 1913. Since Italy and Spain do not have a full time series extending back as far as 1860, we excluded them, even though they exhibit a strong upward trend which might be viewed as the early portion of the emigration cycle. Regressions for the remaining nine countries are presented in Table 4. With only one exception (Belgium), the regressions support the inverted U emigration pattern. This pattern is most marked for the three nordic countries (Denmark, Norway and Sweden) and Germany. These were all countries which experienced rapid rates of natural increase and rapid real wage growth over the period. The inverted U is also highly significant for France, although it is shallow and almost entirely due to the modest surge in emigration in the late 1880s. There is some evidence of an inverted U for Great Britain, Ireland and the Netherlands, but the coefficients on time and time squared are insignificant in all cases but one. In the British and Irish cases, the insignificance is largely due to the surge in emigration in the decade just prior to World War I. Elsewhere we have shown this to be due to the reversal of British and Irish real wage convergence on the New World (Hatton, 1992; Hatton and Williamson, 1992).

The data therefore do not unambiguously support a late nineteenth century inverted emigration U, partly because some countries did not pass through the different phases at the same time. Some peaked early while others evidently had not passed a peak by the end

of the period. To analyze the forces which were driving the emigration rate over the emigration life cycle, the emigration history of each country must be realigned so that the upswing, the peak and the downswing coincide. To do so, the peak emigration decade must be located for each country. For eight of the nine countries in Table 4 we can simply select the decade when the estimated quadratic reached a maximum. For the remaining countries -- Belgium, Italy and Spain, we assume the maximum occurred in the final decade, 1900-1913. Using these criteria, the peak decades are:

Belgium: 1900s	Great Britain: 1890s	Norway: 1890s
Denmark: 1890s	Ireland: 1860s	Spain: 1900s
France: 1880s	Italy: 1900s	Sweden: 1890s
Germany: 1880s	Netherlands: 1900s	

Next, we force history to conform to what we call "emigration time". For each country, the peak decade is given a value of 5 with the decades 1 to 4 leading up to the peak and the decades 6 to 9 following on the downswing. Gross emigration rates are then regressed on "emigration time" and "emigration time" squared, where the full set of country dummies (standardized on Britain) are included to allow for individual country differences. The result appears in column 1 of Table 5 (although the country dummies are not reported), and it confirms a strong inverted U. This stylized pattern of late nineteenth century European emigration is plotted in Figure 3 ("actual"): the life cycle begins with the first decade of emigration time recording an emigration rate a bit above 2 per thousand; it

then soars to nearly 6 per thousand in the peak decade before falling sharply to around 3 per thousand in the eighth decade and one per thousand in the ninth decade.

What, then, accounts for this stylized emigration pattern? We search for the answer by first regressing fitted values from Table 3 (column 1) on emigration time and emigration time squared. This appears as the second column in Table 5, and the result is also plotted in Figure 3 ("fitted values"). Although the fitted values are slightly flatter than the actual values in Figure 3, it is apparent that the variables used to explain late nineteenth century emigration rates account for a large part of the emigration upswings and downswings observed in the data.

Do the key explanatory variables also follow systematic trends over emigration time? The answer appears in Table 5, columns 3 through 5 (quadratic regressions which again include country dummies, although they are not reported in the table). The rate of natural increase lagged two decades reveals a strong quadratic: that is, it replicates the demographic transition. Lagged natural increase follows the same inverted U as does emigration itself, but with a difference: the peak appears in decade seven, two decades after the peak in emigration. The log of the wage ratio does not follow a quadratic trend over emigration time, but rather exhibits a fairly steep linear downward trend: that is, it replicates real wage convergence as Old World real wages catch up with those in the New. For the European countries in our sample, their real wage converged on the New World real wage at an impressive average rate of 4.5 percent per decade (see confirming evidence in Williamson, 1992). Impressive real wage convergence such as this must have put powerful downward pressure on the emigration rate for the typical European country. Finally, the same exercise

was performed on Sa. As column 5 in Table 5 shows, Sa also exhibits a non-linear trend: it declines over the late nineteenth century sample period, first rapidly, but then more slowly, replicating patterns noted long ago by Colin Clark and Simon Kuznets.

What role did each of these variables play in contributing to the observed emigration life cycle? The answer lies with the product of the estimated coefficients in Table 3 and the changes in the variables themselves. Since the estimation model is dynamic by virtue of the inclusion of the lagged dependent variable, it seems appropriate to use the long run coefficients thus implied by the model reported in column 4 of Table 3. By so doing, we at least take some account of the cumulative impact of the explanatory variables embodied in the lagged dependent variable. The changing contribution of each of the three variables is shown in Figure 4, where each is normalized to zero in the first period of emigration time.

The upper plot shows the long run (direct) contribution of demographic events. For the typical European country in our sample, these demographic forces were central in boosting emigration rates on the upswing of the life cycle. It was assisted to a modest extent by the fall in Sa, plotted in the middle of Figure 4. Since the effect of Sa was, on balance, negative, the fall in Sa served to raise emigration on the upswing of the life cycle: that is, successful industrialization, holding the real wage constant, served on net to raise the emigration rate. Together, these two variables explain all of the upswing in emigration rates from Europe in the late nineteenth century: combined, they account for a rise of more than 3 per thousand in the annual emigration rate up to the fifth decade of emigration time; separately, most of the rise in the emigration rate is explained by demographic events. These two forces overwhelmed the offsetting impact of wage convergence which by itself would

have reduced the emigration rate by 1.5 per thousand. The impact of these demographic forces petered out over time as Europe began to move down the demographic transition: as Figure 4 illustrates, these demographic forces were driving up the emigration rate as the peak was approached in decade 5, but at a slower rate; and they began to pull down the emigration rate after decade 7. And as the demographic forces petered out, real wage convergence increasingly dominated emigration events. By the fifth decade of emigration time, the continued fall in the wage ratio -- the European home wage catching up on the New World real wage -- finally caused emigration rates to drop off. The fall in emigration rates accelerated on the downswing as (direct) demographic forces now joined these long run labor market effects.

To summarize, the emigration life cycle in late nineteenth century Europe was driven by two forces, one coming from evolving labor markets and one coming from changing numbers at risk. European real wages were catching up with New World real wages from mid-century to World War I, and this convergence served to keep more potential emigrants at home, a force which tended to lower emigration rates throughout. Had there not been high and rising rates of natural increase (eventually glutting young-adult cohorts who were more mobile), these wage convergence forces would have had a more potent impact, causing emigration rates to fall off much sooner. But high and rising rates of natural increase dominated, thus contributing to a surge in emigration rates. When the forces of demographic transition eased off, the forces of wage convergence began to dominate, causing emigration rates to reach a peak. When the forces of demographic transition reversed, they joined the forces of wage convergence, causing emigration rates to fall off

sharply.

VI. CONCLUDING REMARKS

This paper has examined the cross country and intertemporal determinants of overseas mass migrations from eleven European countries in the late nineteenth century. Using a new real wage data base, we have been able to pool decadal observations across countries and over time, something previous studies have been unable to do. Our results strongly support the pioneering work of Richard Easterlin: rates of natural increase at home and income gaps between home and overseas destinations mattered a great deal, while industrialization -- independent of its influence on real wages -- mattered only modestly.

The data confirm the existence of an emigration life cycle, and it seems to have been driven by these economic and demographic forces. The upswing of the emigration life cycle was driven chiefly by the forces of the demographic transition during early stages of European industrial revolutions. On the downswing of the emigration life cycle, the demographic forces ebbed so that the catching up of late industrializers in the form of wage convergence could dominate. These findings offer dramatic support to the observations of Frank Thistlewaite who three decades ago thought that the "inner secrets of emigration are to be sought in the working of those two revolutions which are so interconnected, the demographic and the industrial" (1960, pp. 36-7).

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Table 1

Gross (G) and Net (N) Emigration from Europe 1850-1913
(Emigrants per 1000 Population: Decade Averages)

		1850-9	1860-9	1870-9	1880-9	1890-9	1900-13
Belgium	G	1.90	2.22	2.03	2.18	1.96	2.32
	N	0.66	0.17	-0.93	-1.06	-1.80	-2.88
Denmark	G	-	-	1.97	3.74	2.60	2.80
	N	-	-	1.95	3.68	2.55	2.58
France	G	-	0.12	0.16	0.29	0.18	0.15
	N	-	0.11	0.09	0.19	0.11	0.01
Germany	G	1.80	1.61	1.35	2.91	1.18	0.43
	N	-	1.61	1.35	2.89	1.12	-2.45
Great Britain	G	4.38	2.47	3.87	5.71	3.92	7.08
	N	-	1.29	1.52	3.23	0.93	3.31
Ireland	G	18.99	15.16	11.28	16.04	9.70	7.93
	N	-	-	-	-	-	-
Italy	G	-	-	4.29	6.09	8.65	17.97
	N	-	-	-	-	6.78	13.01
Netherlands	G	0.50	1.67	2.66	4.06	4.62	5.36
	N	-	-	0.10	0.81	1.16	0.31
Norway	G	-	-	4.33	10.16	4.56	7.15
	N	-	-	-	-	-	-
Spain	G	-	-	-	3.91	4.63	6.70
	N	-	-	-	0.98	0.42	2.50
Sweden	G	0.51	2.52	2.96	8.25	5.32	4.49
	N	-	-	-	7.30	3.77	2.93

Table 2

Internationally Comparable WageRates and Wage Ratios
(A = Real Wage Rate, Great Britain 1900 = 100;
B = Real wage Ratio, Home to Receiving Countries)

		1850-9	1860-9	1870-9	1880-9	1890-9	1900-13
Belgium	A	37.7	43.7	51.5	59.7	71.3	76.3
	B	36.1	46.8	43.6	45.3	48.0	46.0
Denmark	A	-	-	41.6	52.5	70.9	94.2
	B	-	-	35.1	39.8	47.6	56.9
France	A	-	46.1	52.0	60.4	65.0	71.3
	B	-	49.2	44.1	45.8	43.8	43.0
Germany	A	52.7	55.4	62.5	68.6	78.1	85.9
	B	50.5	59.2	52.9	52.1	52.6	51.8
Great Britain	A	60.9	61.0	77.3	90.3	102.0	104.0
	B	58.4	65.2	65.5	68.5	68.7	62.8
Ireland	A	38.8	40.7	50.9	65.2	84.7	90.9
	B	37.2	43.5	43.1	49.5	57.0	54.9
Italy	A	-	-	26.2	34.3	37.3	46.5
	B	-	-	22.6	26.7	25.9	28.9
Netherlands	A	34.1	36.6	44.6	60.1	70.0	77.0
	B	32.7	39.2	37.7	45.6	47.1	46.5
Norway	A	-	-	35.1	44.0	59.7	66.6
	B	-	-	29.7	33.3	40.2	40.2
Spain	A	-	-	-	51.1	53.5	49.1
	B	-	-	-	68.8	61.7	51.2
Sweden	A	24.4	34.6	39.2	51.3	70.7	92.2
	B	23.4	37.0	33.2	38.9	47.5	55.6

Table 3

The Determinants of Gross Emigration in Late Nineteenth Century Europe (N=44)

	(1)	(2)	(3)	(4)
Constant	0.250 (1.038)	0.107 (0.394)	-0.216 (0.836)	-0.491** (1.755)
Share of Labor Force in Agriculture	-1.554* (2.952)	1.214* (2.479)	-0.755 (1.661)	-0.227 (0.694)
Log Wage Ratio		-0.354** (1.852)		-0.458* (2.522)
Log Wage Ratio times L.F. Share in Agriculture	-0.796* (2.036)		-0.938* (2.561)	
Lagged Natural Increase			0.037* (2.193)	0.044* (2.638)
Lagged Natural Increase times L.F. Share in Agriculture	0.076* (2.002)	0.087* (2.356)		
France	0.084 (0.432)	0.131 (0.685)	0.096 (0.509)	0.157 (0.844)
Ireland	0.546* (2.297)	0.543* (2.263)	0.567* (2.403)	0.578* (2.435)
Italy and Spain	0.527* (2.838)	0.587* (3.297)	0.463* (2.904)	0.157* (0.844)
Time	0.003 (0.093)	-0.007 (0.224)	0.007 (0.244)	-0.003 (0.104)
Lagged Dependent Variable	0.441* (2.684)	0.463* (2.799)	0.409* (2.470)	0.426* (2.576)
$\bar{R}^2$	0.727	0.722	0.733	0.732
RSS	1.695	1.726	1.661	1.669
RESET	0.004	0.042	0.091	0.005

Note: t statistics are in parenthesis. * denotes significance at the 5 percent level. ** denotes significance at the 10 percent level. RESET is the test for functional form using the square of the fitted values. The dependent variable is annual average emigration per 100 of population.

Table 4

Quadratic Trends in Emigration 1860-1913

	Constant	Time	Time²/100	$\bar{R}^2$
Belgium	0.273 (8.029)	-0.004 (2.107)	0.006 (2.328)	0.077
Denmark	-0.170 (1.760)	0.022 (3.774)	-0.024 (3.209)	0.272
France	-0.007 (0.594)	0.001 (2.224)	-0.0019 (2.162)	0.053
Germany	0.004 (0.053)	0.013 (3.114)	-0.022 (3.903)	0.353
Great Britain	0.229 (1.435)	0.009 (0.928)	-0.001 (0.073)	0.286
Ireland	1.424 (5.263)	0.008 (0.518)	-0.035 (1.593)	0.401
Netherlands	-0.022 (0.291)	0.013 (2.890)	-0.005 (0.820)	0.708
Norway	0.036 (0.131)	0.034 (2.110)	-0.041 (1.951)	0.052
Sweden	-5.330 (2.767)	0.586 (5.162)	-0.726 (4.875)	0.328

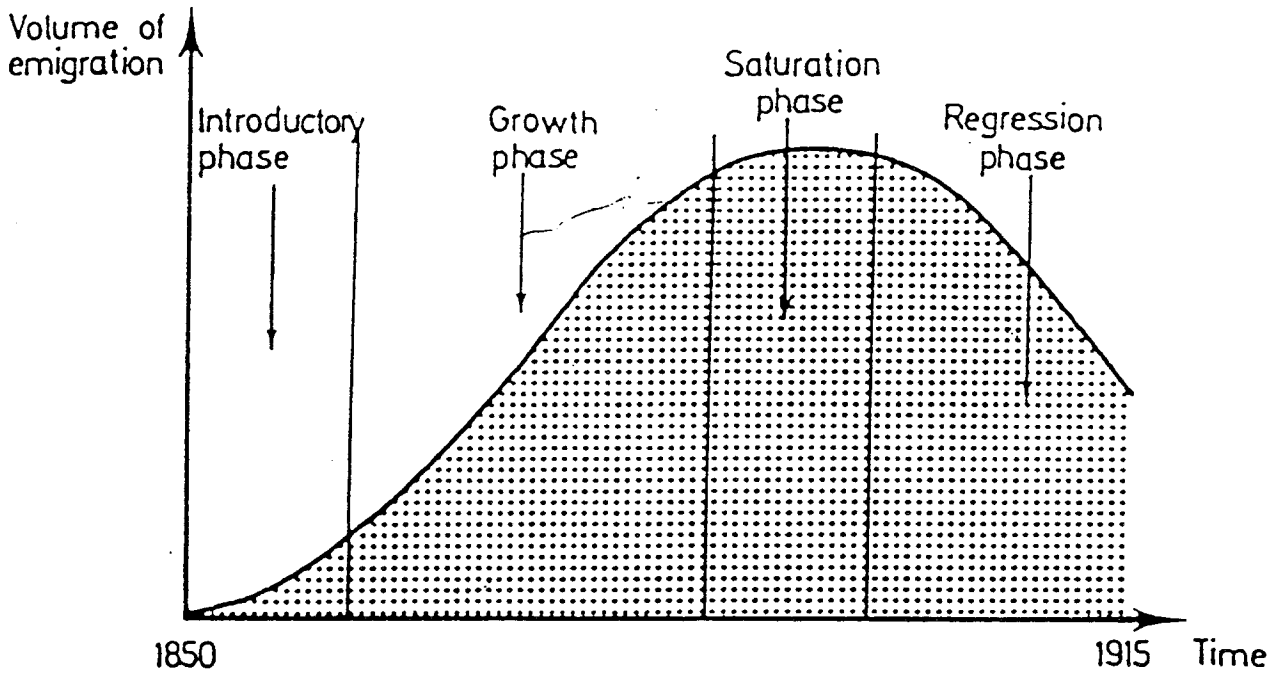
Note: Time runs from 1850 = 1.

Table 5

Trends in "Emigration Time" (N = 44)

Dependent Variable	**Gross Emigration Rate** (1)	**Fitted Values** (2)	**Rate of Natural Increase** (3)	**Log Wage Rate** (4)	**Share of L.F. in Agriculture** (5)
Constant	0.003	0.105	9.698	-0.548	0.284
	(0.020)	(1.481)	(7.309)	(10.245)	(12.472)
"Emigration Time"	0.253	0.161	1.699	0.045	-0.047
	(3.286)	(5.166)	(2.920)	(3.927)	(4.651)
"Emigration Time" squared	-0.027	-0.016	-0.128		0.002
	(3.170)	(4.760)	(2.015)		(2.053)
$\bar{R}^2$	0.742	0.946	0.804	0.838	0.961

Figure 1: The Stylized Pattern of
European Late 19th Century Emigration



Source: Akerman (1976, p. 25).

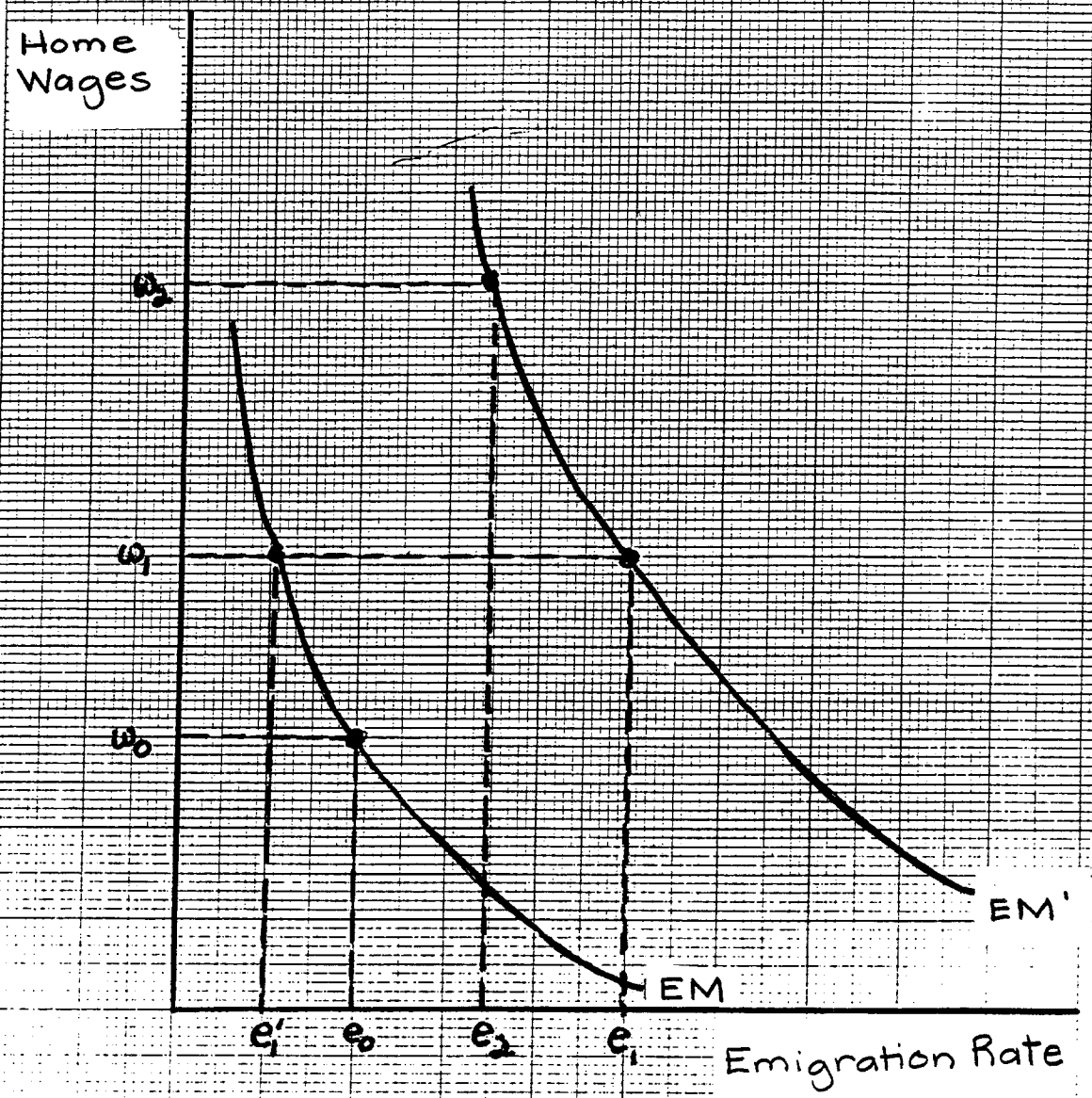


Figure 2. Stylized Emigration Responses

Fig 3: Stylised Emigration Paths

Per Thousand Population

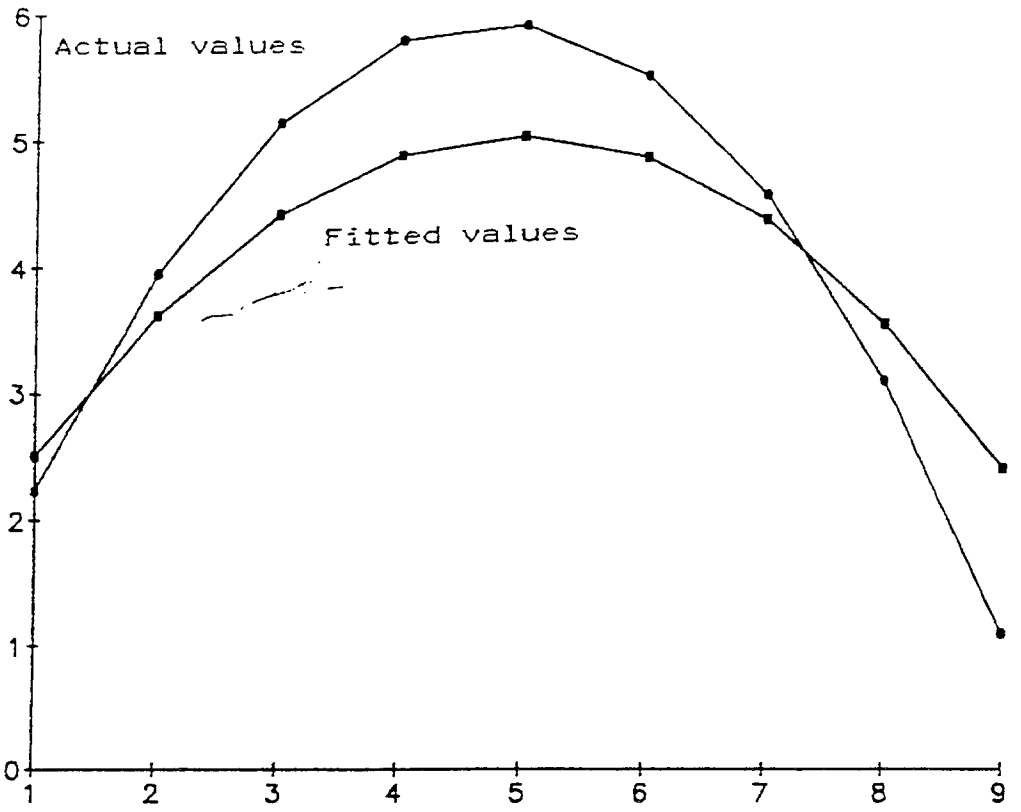
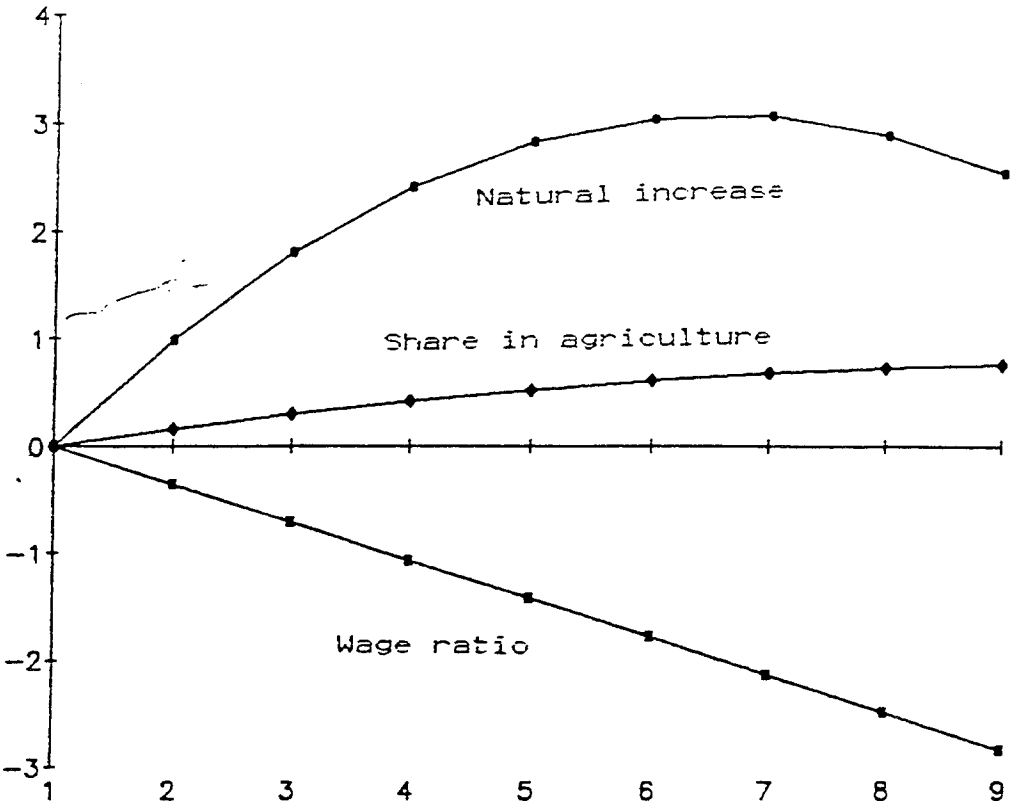


Fig 4: Trend Forces in Emigration

Per Thousand Population



APPENDIX

Four different sets of variables are utilized in the analysis carried out in this paper. The first consists of the dependent variables upon which this study has focused, the late 19th and early 20th century gross and net emigration rates of 11 European countries (Belgium, Denmark, France, Germany, Ireland, Italy, the Netherlands, Norway, Spain, Sweden, and Great Britain). The second set of variables is based on estimates of the real wage in each of these 11 sending Old World countries as well as the real wages in four receiving New World countries. The third group of variables is a collection of estimates of the share of the labor force in the primary sector in each of the 11 sample countries, while the fourth consists of measures of the rate of natural increase in these same countries. This appendix documents the sources and methods used to construct the four different sets of variables.

Decadal Averaging

The unit of observation for each variable in our analysis is the decadal average, which in all cases is calculated on the basis of underlying annual observations. For a given country, at most six decades of observations - from the 1850s through the first decade of the 1900s - are present in our dataset, although not all of these six decades are present for all countries. In most cases, a decade is defined as the period of time running from a year ending in "0" to a year ending in "9". Thus, the 1860s are the years 1860–1869, the 1870s the years 1870–79, and so on. The first decade of the 1900s is an exception to this rule, as averages for this "decade" are calculated from annual observations for the years 1900–1913. We also allow additional exceptions to our definition of a decade where doing so allows us

to keep decadal observations we might otherwise be forced to discard due to the lack of a small number of annual observations. Thus, we construct the first decadal average for some countries using data starting in years ending in "1" or "2," as opposed to the usual "0." When an initial decade is shortened in this way to allow for its inclusion in the overall sample, the abbreviated definition of the decade is used for the construction of all variable averages for that particular country and decade.

The years for which the earliest data are included for the countries in our sample are as follows: Belgium, 1850; Denmark, 1871; France, 1860; Germany, 1850; Ireland, 1851; Italy, 1871; Natherlands, 1850; Norway, 1870; Spain, 1882; Sweden, 1851; Great Britain, 1851.

Emigration Rates

The gross and net emigration rates used as dependent variables in our analysis are simple decadal (or near decadal) averages of the relevant annual emigration rates. For a given country and year, the particular emigration rate is calculated as the number of emigrants (gross or net) in that year divided by the country's population in the same year. The result is expressed as a percent.

The population estimates used for the calculation of the emigration rates are from Mitchell (1980), pp. 29–34. Mitchell's estimates are for census dates only; the annual estimates used in this paper are derived by linear interpolation.

All estimates of gross and net emigration flows are based on the data compiled in the "National Tables" section of Ferenczi and Willcox (1929). Gross flows are based on the emigration estimates tabulated for each sending country, with preference given to measures

which focus on extra-European emigration of citizens of the country in question. Net flows are derived by subtracting from the emigration flows estimates of the level of immigration. Most of our immigration estimates are derived from statistics compiled by each of the sending countries, although estimates for Belgium, Denmark, France, and Germany were constructed by aggregating estimates of emigration from each of these countries to various New World countries. (The data for these aggregations can also be found in the "National Tables" section of Ferenczi and Willcox.)

Our estimates of gross emigration from Great Britain are modifications of those published in Ferenczi and Willcox, as the latter include in their estimates emigrants from Ireland. To construct estimates for emigration from Great Britain alone, we subtract from Ferenczi and Willcox's values their estimates of emigration from Ireland, and then use this alternative measure of gross emigration in both the gross and net emigration rate calculations for Great Britain.

Gross emigration rates are available for all country-decade combinations in our sample. Because of insufficient immigration data, however, we are unable to compile net emigration rates for the following countries and decades: Germany, 1850s; Ireland, all decades; Italy, 1870s and 1880s; Netherlands, 1850s and 1860s; Norway, all decades; Sweden, 1850s, 1860s, and 1870s; Great Britain, 1850s.

Real Wages

All real wage data used in this paper are purchasing power parity adjusted estimates of the urban unskilled real wage rate in each of the sample countries. These estimates are compiled in Table A2.1 of Williamson (1992) and described in detail in the same source.

The values in his Table A2.1 are calculated such that the level of the real wage in Great Britain in 1905 is equal to 100.

Measures of real wages in the New World are also present in Table A2.1 of Williamson (1992), and they are used in this paper to construct the New World real wage relevant in calculating a real wage relative for each of the sending countries. To do this, a composite New World real wage is constructed as the population-weighted average of specific New World real wages. For all countries other than Italy and Spain, the New World real wage is taken to be a weighted average of the real wage in Canada, the United States, and Australia. For Italy, it is a weighted average of the real wage in the United States and Argentina, and, for Spain, it is proxied by the wage of Argentina alone.

Composites are constructed by (1) averaging each New World country's real wages over the appropriate decade, (2) averaging the annual population estimates, and (3) using the population averages as weights to calculate the New World composite wage. Due to the limited availability of wage information prior to 1870, the New World composite of Canada, the United States, and Australia - used for all countries except Italy and Spain - is actually just the United States for the 1850s and the United States and Australia for the 1860s.

Shares of the Labor Force in the Primary Sector

Our estimates of the share of the male labor force in the primary sector are based on results summarized in Table C1 of Mitchell (1980). In Table C1, Mitchell presents estimates by Bairoch *et al.* (1968) of male and female employment, by sector, in numerous European countries. From these data we construct estimates, at benchmark dates, of the share of the male labor force in agriculture, forestry, and fishing. We then exponentially interpolate

between these benchmark estimates to generate annual observations of the labor force share, from which we finally calculate decadal averages. For three countries - Germany (1870–1881), Norway (1870–1874), and Sweden (1851–1859) - we also extrapolate backwards from the benchmarks to obtain additional annual observations for our decadal averaging. Even with these extrapolations, however, there is insufficient data to calculate the first two decadal observations for Germany.

Rates of Natural Increase

The measures of the rate of natural increase used in this paper are based for the most part on birth and death rate estimates compiled in Table B6 of Mitchell (1980). For all cases except that of Ireland and Great Britain, these data are sufficient to calculate the average rate of natural increase — i.e., the difference between the birth and death rate — twenty years prior to each of the emigration rate dates in our sample. Extrapolation backwards of Mitchell's data is necessary in only two cases, that of Italy and the Netherlands. In the case of Italy, the rate of natural increase in each of the years from 1851 to 1861 is assumed to have been the same as the average rate of natural increase from 1862 to 1871. For the Netherlands, the rate of natural increase in the years from 1830 to 1839 is assumed to have been the same as the average rate of natural increase from 1840 to 1850.

Our estimates of the rate of natural increase for Ireland are derived differently for three separate periods of time. For the period 1830–1851, our estimates are based on results presented by Mokyr. In his Tables 3.1 and 3.2, Mokyr (1983) presents estimates of the birth rate and the death rate, respectively, in Ireland in 1841. We assume that the rates derived by Mokyr for 1841 also hold for all years from 1830–1845 as well as 1851. (Mokyr's Tables

3.1 and 3.2 both present upper and lower bound estimates of the birth and death rate; we use as our estimates the averages of these bounds.) For the famine years, 1846–1850, we assume annual birth rates to have been equal to 30.15 births per thousand inhabitants, which is the average of Mokyr's 1841 birth rate estimates minus his estimated drop in the birth rate during the famine years, which we derive from the results presented in Table 3 of Mokyr (1980). The death rate during the famine years is assumed to have been equal to 47.93 deaths per thousand inhabitants, which is the average of the three lower bound estimates also presented in Table 3 of Mokyr (1980). (The upper bound estimates equate averted births with deaths, and as such would not be appropriate for our purposes.)

For our estimates of the rate of natural increase in Ireland for the period 1872 and beyond, we once again use the source of most of our estimates of the rate of natural increase - the birth and death rates in Table B6 of Mitchell (1980). For the years between 1851 and 1872, linear interpolation is utilized to generate the annual observations upon which we base our decadal averages.

The rate of natural increase of the British population is estimated using two sets of data. For the period 1831 to 1871, estimates are based on the birth and death rates for England, excluding Monmouthshire, compiled by Wrigley and Schofield (1981) and summarized in Mitchell (1988), pp. 41 and 53. For 1872 onwards, our estimates are based on birth and death rates derived as population-weighted averages of the relevant rates in England and Wales, and Scotland. The birth and death rates we use for these calculations are from Mitchell (1980), Table B6, while the population estimates are from Mitchell (1988), pp. 11–12.

When calculating the rate of natural increase twenty years prior to decades which, in our sample, have been shortened or lengthened for reasons described earlier in this appendix, the annual observations used to calculate the rate of natural increase have been decreased or increased in a similar fashion.

The Samples

Gross migration is better documented than net migration, so that analysis of the latter entails a smaller sample.

Table 3 takes the gross emigration rate as the dependent variable, and has the largest decade-country sample (N=44): Belgium 1860-1913 (5); Denmark 1880-1913 (3); France 1870-1913 (4); Germany 1870-1913 (4); Great Britain 1860-1913 (5); Ireland 1860-1913 (5); Italy 1880-1913 (3); Netherlands 1860-1913 (5); Norway 1880-1913 (3); Spain 1890-1913 (2); and Sweden 1860-1913 (5).

Appendix Table 2 takes the net emigration rate as the dependent variable, and has a smaller decade-country sample (N=28): Belgium 1860-1913 (5); Denmark 1880-1913 (3); France 1870-1913 (4); Germany 1870-1913 (4); Great Britain 1870-1913 (4); Italy 1900-1913 (1); Netherlands 1880-1913 (3); Spain 1890-1913 (2); and Sweden 1890-1913 (2).

Appendix Table 1 takes the gross emigration rate as the dependent variable, but closely replicates the smaller sample of Appendix Table 2, extending the time series for two countries (N=32): Italy 1880-1913 (now 3) and Netherlands (now 5).

Appendix Table 1

The Determinants of Net Emigration in Late Nineteenth Century Europe (N=28)

	(1)	(2)	(3)	(4)
Constant	0.422**	0.345	-0.299	-0.433
	(1.892)	(0.362)	(0.822)	(1.053)
Share of Labor Force in Agriculture	-2.029*	-1.705*	-0.823*	-0.261
	(3.683)	(2.983)	(1.973)	(0.654)
Log Wage Ratio		-0.297		-0.506*
		(1.561)		(2.642)
Log Wage Ratio times L.F. share in Agriculture	-0.883*		-1.335*	
	(2.144)		(3.305)	
Lagged Natural Increase			0.050**	0.047
			(1.924)	(1.712)
Lagged Natural Increase times L.F. share in Agriculture	0.121**	0.131**		
	(1.954)	(2.022)		
France	0.422**	0.494*	0.331	0.370**
	(1.838)	(2.108)	(1.740)	(1.803)
Italy and Spain	0.730*	0.811*	0.526*	0.603*
	(2.538)	(2.653)	(3.827)	(2.831)
Time	-0.055**	-0.065*	-0.040	-0.051**
	(1.829)	(2.117)	(1.478)	(1.751)
Lagged Dependent Variable	0.598*	0.672*	0.557*	0.729*
	(2.538)	(2.654)	(2.188)	(2.831)
$\bar{R}^2$	0.759	0.736	0.758	0.732
RSS	0.405	0.444	0.406	0.466
RESET	0.003	0.757	0.421	1.747

Note: t statistics are in parenthesis. * denotes significance at the 5 percent level. ** denotes significace at the 10 percent level. RESET is the test for functional form using the square of the fitted values. The dependent variable is annual average emigration per 100 of population.

Appendix Table 2

The Determinants of Gross Emigration in Late Nineteenth Century Europe (N=32)

	(1)	(2)	(3)	(4)
Constant	0.290	0.161	-0.300	-0.642*
	(1.264)	(0.635)	(1.062)	(2.075)
Share of Labor Force in Agriculture	-1.894*	-1.634*	-0.809*	-0.177
	(3.304)	(2.818)	(2.057)	(0.574)
Log Wage Ratio		-0.363*		-0.540*
		(2.083)		(3.171)
Log Wage Ratio times L.F. share in Agriculture	-0.873*		-1.164*	
	(2.352)		(3.395)	
Lagged Natural Increase			0.044**	0.054*
			(2.031)	(2.439)
Lagged Natural Increase times L.F. share in Agriculture	0.107**	0.127*		
	(1.995)	(2.414)		
France	0.228	0.323	0.158	0.269
	(1.079)	(1.596)	(0.875)	(1.467)
Italy and Spain	0.675*	0.773*	0.512*	0.603*
	(2.909)	(3.450)	(3.011)	(3.511)
Time	-0.011	-0.022	-0.001	-0.014
	(0.368)	(0.761)	(0.037)	(0.510)
Lagged Dependent Variable	0.529*	0.567*	0.514**	0.566*
	(2.121)	(2.210)	(2.039)	(2.220)
$\bar{R}^2$	0.755	0.744	0.756	0.745
RSS	0.703	0.732	0.699	0.729
RESET	1.396	2.798	1.392	2.982

Note: t statistics are in parenthesis. * denotes significance at the 5 percent level. ** denotes significance at the 10 percent level. RESET is the test for functional form using the square of the fitted values. The dependent variable is annual average emigration per 100 of population.