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AN ECONOMIC MODEL OF SWEDISH EMIGRATION

JOHN MICHAEL QUIGLEY


I. INTRODUCTION

The causes and the patterns of European migration to nineteenth-century America have been analyzed by demographers, sociologists, and economic historians on both sides of the Atlantic. Although their collective judgment is by no means unanimous, the qualitative literature gives the strong impression that levels of migration to the United States depended on differences in the economic opportunities in the “source” and the “receiving” countries, and in particular, that demand conditions in the United States were of primary importance in inducing European migration.

This paper investigates those general hypotheses by considering the conditions of Swedish migration to the United States during the period 1867–1908. Some of the findings, notably those regarding the relative importance of the “push” exerted by Swedish economic conditions and the “pull” of American economic opportunities, cast doubt on well-known and widely held beliefs regarding the determinants of international migration in the latter half of the nineteenth century. The indications are either that Swedish migration experience was somehow atypical, or else that the general conclusions of Jerome, Easterlin, and others need to be reexamined in the light of Swedish experience.

* This paper has benefited from the criticism of Alexander Gerschenkron, Birgitta Odén, John F. Kain, Henry Rosovsky, and the members of the Harvard Seminar in Economic History. Financial support was provided by the National Bureau of Economic Research, Inc.


2. In particular, the results of this analysis contradict the general conclusions of Jerome and Easterlin concerning the relative importance of demand for labor in the donor and recipient country. They are also at variance with the conclusions of D. S. Thomas with respect to Sweden. See H. Jerome, Migration and Business Cycles (NBER, 1926); R. A. Easterlin, “Economic-Demographic Interactions and Long Swings in Economic Growth,” American Economic Review, LVI (Dec. 1966), 1063–1105; also Population and Economic Growth (NBER, 1968); and D. S. Thomas, Social and Economic Aspects of Swedish Population Movements, 1750–1933 (Macmillan, 1941).
Section II begins with a short survey of the economic literature dealing with the question of international migration to the United States during the latter half of the nineteenth century and with the Swedish component of that massive flow. Recent econometric developments in the analysis of migratory flows are then summarized in Section III, and a simple quantitative model of Swedish migration is developed in Section IV. The econometric results and their implications are then considered in some detail. Section VI presents the conclusions of the analysis.

II. PREVIOUS ANALYSES OF EUROPEAN MIGRATION

Major analyses of European migration to the United States are due to Jerome and Brinley Thomas, but neither of these works includes a detailed investigation of migration from Sweden. Jerome compares migratory flows across countries and concludes that the volume of international migration during the period 1860–1916 was dominated by economic conditions in the United States. With regard to Sweden, he asserts that "conditions in Sweden have probably exerted some influence upon fluctuations in emigration to the United States, [but] that influence has been . . . less effective than the attracting and repelling power of good and bad conditions in the United States." 

Easterlin's recent book on population and economic growth echoes Jerome's general conclusion; Brinley Thomas, on the other hand, introduces a model connecting the entire Atlantic community by flows of goods, capital, and labor. Thomas's model implies that there were opposing cycles in North America and Europe, with migratory flows acting as an adjustment mechanism.

The most complete history and analysis of Swedish population movement was accomplished by Dorothy Swaine Thomas.

8. Tomaske has tested the applicability of this model to Sweden in some detail. He concludes: "It does not appear that the Swedish economy behaved as if Sweden were part of a closely knit greater Atlantic economy drawing on a common pool of resources." (J. A. Tomaske, "International Migration and Economic Growth: The Swedish Experience," Journal of Economic History, XXV (Dec. 1965), pp. 696–699.)
She presents a separate analysis and discussion of Swedish agricultural and industrial influences upon net emigration. Based upon an analysis of correlation coefficients, the conclusion she reaches is "that the main push from agriculture was latent and lasted well through the 'eighties; that the temporary, recurring pushes due to harvest failures played a very slight role after the 'seventies, and that the rise and decline of American prosperity was the major factor in the wave-like movement of emigration from the early 'seventies through 1908."¹ For the industrial sector she concludes that "the industrial push from Sweden and the industrial pull to America were both effective, but that the pull, particularly in the later period, played a somewhat more important role than the push."²

Further controversy is generated by a simple emigration model presented in Wilkinson's recent article on the "long swing" hypothesis as applied to population growth in Sweden. Wilkinson regresses annual Swedish emigration on its lagged value, manufacturing output in the United States, and manufacturing output in Sweden. Because the estimated coefficients of the two series are of the same order of magnitude, the author concludes that "the long swings in Swedish emigration are due to more than fluctuations in the demand for labor in the United States."³

From the discussion of the work of Jerome, Brinley Thomas, and Easterlin, however, it appears that their contradictory conclusions are reached without detailed analysis of the Swedish experience. The following sections of this paper address these am-

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Swedish emigration in some detail are F. E. Janson, *The Background of Swedish Immigration* (University of Pennsylvania, 1931), and J. S. Lindberg, *The Background of Swedish Emigration to the United States* (University of Minnesota, 1930).

2. *Ibid.*, pp. 166-69. The conclusions and methodology can be criticized on a number of grounds. For the agricultural sector, Thomas's results are based upon the simple correlation between an index representing the state of the Swedish harvest and net emigration the following year vis-à-vis the simple correlation between a composite index of U.S. business cycles for the same time period. Based on the wage series developed in Section IV, the simple correlation between agricultural wages in Sweden and gross agricultural migration changes the results for the same time periods. For the industrial sector, Thomas's conclusion is based upon comparing the correlation coefficients relating Swedish and U.S. business cycle indices to net emigration for different time periods. The conclusion is reversed for most time periods if the correlations between U.S. and Swedish industrial wages and migration from the industrial sector are analyzed in the same way, using the series presented in Section IV.
bilities by considering the influences of both Swedish and American economic and demographic conditions upon Swedish migration to America and by investigating explicitly their relative influence.

III. ECONOMETRIC INVESTIGATION OF MIGRATION

The general notion that the likelihood of migration is related to projected differences in economic well-being has been made operational in several recent econometric investigations.

In the abstract, individual migration decisions are made by evaluating monetary differences in amenity relative to "tastes" or to the "psychic costs" of relocation.

In applying this theory, alternative econometric models of migratory behavior have been advanced by Fleischer, Lowry, Blanco, Kelley, and most recently by Bowles. The first four analyses rely upon contemporaneous earnings or unemployment rates at the source and destination to measure prospective economic well-being and thus to explain the variation in gross or net migration. Bowles's model of U.S. interregional migration, in contrast, relates the number of migrants explicitly to the difference between alternative present values of lifetime incomes under a variety of assumptions.

In the historical content, with considerable uncertainty and with subjective discount rates unknown, it seems reasonable to use contemporaneous economic conditions as estimates of the economic benefits associated with employment in the source and the receiving countries. However, it is still not clear whether the independent


5. Even within the framework of income stream differentials, however, it may be possible to distinguish differences in migratory responses to the "push" of economic conditions in the region of origin and to the "pull" of economic opportunities in the region of destination. If potential migrants evaluate less uncertain but uniformly inferior present economic conditions versus alternative economic prospects with greater uncertainty around a substantially higher mean, they may, in effect, apply different discount rates to the alternative income streams. Thus the elasticity of migration with respect to incremental changes in the income stream at the "source" may be higher (or lower) than at the "destination," indicating that the "push" (or the "pull") predominates.
variables used as proxies for earnings should be unemployment rates (as emphasized by Fleischer and Kelley) or wage rates (as emphasized by Blanco and Brinley Thomas). Potential migrants, at least during the late nineteenth century, were likely to be marginal workers in their own countries — those employees most likely to be dismissed in bad times. On the other hand, especially for the time period before 1910, when wages were more flexible downwards, the wage series should reflect higher unemployment levels directly in terms of lower wages.  

For several reasons, the model presented in the next section relies on real wage levels in Sweden and in the United States as the principal explanatory variables. A substantial proportion of the Swedish emigrants were from the agricultural sector of the economy — a sector where even the best unemployment data are likely to be misleading, where unemployment is likely to be "disguised," and where various levels of underemployment in hard times are to be expected. In addition, any unemployment statistics for either country are strongly biased in favor of urban unemployment in capital goods industries. Moreover, consistent unemployment information is virtually nonexistent in both the United States and Sweden prior to about 1890.

IV. The Model

On the basis of the foregoing discussion and for reasons to be presented, we hypothesize that the annual volume of migration from Sweden to the United States in year \( t \) is a function of:

1. real wage levels in Sweden and in the United States at year \( t \);
2. the state of the Swedish harvest during the previous year;
3. the (lagged) birth rate in Sweden;
4. the previous year's level of migration.

1. Real Wage Levels \( (Y_{s,t}, Y_{r,t}, Y_{us,t}, Y_{us,t}) \)

It is desirable to develop separate but comparable models for agricultural and industrial migration from Sweden. We thus compute two measures of Swedish wages: real wages for agricultural workers \( (Y_{s,t}) \) and the corresponding wages for Swedish industrial workers \( (Y_{r,t}) \).


7. See Historical Statistics of the United States from Colonial Times to the Present (U.S. Department of Commerce, 1957), Ch. 5.
Real income in agriculture is computed in the following way: Bagge, Lundberg, and Svennilson have compiled an average daily wage rate for agricultural workers in each county in Sweden for each year from 1860 to 1908. These county averages have been weighted by the agricultural populations in each county to produce an average daily wage rate for each year from 1860 to 1908. This money wage rate was deflated by Myrdal's cost-of-living index to arrive at an estimate of the real wages in Swedish agriculture.

$Y_{st}$ was computed in a similar manner: Wages in Sweden provides an estimate of annual earnings of male workers in manufacturing and mining as a whole. Those figures were deflated by Myrdal's cost-of-living index to obtain real annual earnings in the industrial sector of the economy.

For agricultural wages in the United States, it was slightly more difficult to derive consistent wage series, and it became necessary to combine information from several sources. During the period 1866-1892, the U.S. Department of Agriculture completed nine separate investigations into the course of wages for farm workers. Weighted average national figures are available through the Department of Agriculture's Division of Statistics. In the 1912 Census, wage data were made comparable to the Department of Agriculture's figures for 1870, 1880, 1890, 1900, and 1910. With these additional data, there were three years of overlap between the Department of Agriculture-Holmes series and that computed by Paul Douglas for the period 1890-1926. Since the overlapping data matched within 1 percent, the earlier observations were added to the Douglas series and the missing years were estimated by linear interpolation. This produced a single money wage index for the entire period 1866-1908.

9. G. Myrdal, The Cost of Living in Sweden 1830-1930 (P. S. King and Sons, 1933), pp. 194-99. The base year is 1890. Since payments in kind (often food and housing) are not always included in the money wage series, dividing by an overall cost-of-living index may bias the estimated real wage. Nevertheless, the price of food (65 percent of the cost of living index) increased only slightly during this period (about 0.02 percent a year). The price of housing, which did increase at an annual rate of less than 0.5 percent during the period, has a weight of only 7.5 percent in the cost-of-living index calculation. This indicates that the error introduced is probably rather small.
2. U.S. Department of Agriculture, Wages of Farm Labor, Division of Statistics, Miscellaneous Series, Report No. 4, 1892. Surveys were taken in 1866, 1869, 1875, 1879, 1882, 1885, 1888, 1890, and 1892.
To arrive at an estimate of real wages in U.S. agriculture \((Y_{a\text{-ag}})\), the money wage index was divided by the cost-of-living index derived by Long. Jane Wages in the manufacturing sector \((Y_{u\text{-man}})\) were also taken from Long’s recent study.

2. **The State of the Swedish Harvest \((H_{t-1})\)**

In the Swedish context, the state of the harvest in the preceding year, \(H_{t-1}\), may have an effect upon decisions to migrate that is separate from its influence upon agricultural wages. This is due to the rural credit and mortgage system widespread in Sweden in the nineteenth century. Following a poor harvest, peasants and small landowners were often unable to meet their mortgage obligations. As a result, large numbers of peasants, together with their servants and sharecroppers, would be evicted, thereby forcing mobility upon a sizable proportion of the rural population. To test whether the harvest yield produced any additional stimulus to emigration, Sundbärg’s index of Swedish harvests is used. The harvest index is a rating scale based upon official crop reports; the values are between 0 (severe famine) and 90 (superabundance). A value of 60 represents an “average” yield.

3. **The Lagged Birth Rate in Sweden \((B_{t-x})\)**

There is some evidence, at least for other countries, that the course of migration was affected by changes in entry into the labor force even after accounting for wage differences. For Sweden there is a certain amount of qualitative evidence suggested in the historical literature that maintains that emigration was stimulated by the combination of increases in the rural population and the decline in the additions to land under cultivation. To test for this influence, we define a variable, \(B_{t-x}\), representing the Swedish birth rate lagged \(x\) years. Larger values of this variable should be associated

6. These considerations are discussed in some detail in Lindberg, op. cit., pp. 146–64. See also the following reference.
8. Easterlin, for example, mentions a cross-section association among countries between the rate of labor market entry and the secular rate of overseas migration (*Population and Economic Growth*, p. 33).
10. The data were obtained from the *Statistisk Arsbok för Sverige*, 1935, p. 133.
with increased population pressure at the time of migration decisions.

4. The Previous Level of Migration ($M_{t-1}$)

We may expect the annual volume of migration to be sensitive to its previous level for several reasons. In the first place, recently migrated countrymen provide a most valuable source of information on labor markets and employment opportunities to the home country. Other information provided by recent migrants may substantially reduce the psychic costs of moving, and the very existence of a colony of recent migrants makes the process of emigration easier, from a psychological viewpoint, for those remaining in the mother country. In addition, in many instances families may migrate in stages, with the primary wage earner seeking employment and housing at the destination before sending for his family.

From another viewpoint, this specification (the so-called Koyck lag) may be interpreted as a delayed adjustment process, whereby migration decisions are taken in response to a geometrically declining average of previous economic conditions on both sides of the Atlantic.

As the theoretical discussion indicates, it would be desirable to have information regarding the cost of emigrating to America during each of the years under investigation. An extensive search for these data proved only partially successful. The scattered transportation cost figures cannot be used in their present form.

2. See P. Nelson, "Migration, Real Income, and Information," *Journal of Regional Science*, I (Winter 1959), 43-74 for a detailed discussion of the importance of information transfer in explaining migration levels and the relationship of information transfer to the population of recent migrants. The contents of letters sent to the home country by recently migrated Swedes have been analyzed in various issues of the *Yearbook of the Swedish Historical Society of America*.

3. An analysis of the few actual Swedish emigration contracts that have been preserved indicates that a sizable proportion of married men emigrated without their families and a large number of wives and children emigrated unaccompanied by their husbands, presumably because the primary wage earner settled in the United States and then sent for his family. See the following footnote.

In addition, unpublished research by Odén on Swedish migration to Massachusetts in the 1880’s indicates that about one third of married emigrants arrived in the United States without their families. Of this group 62 percent sent for their dependents one year after landing in the United States. Rough calculations indicate that a savings rate of about 8-10 percent was required to finance emigration for dependents after one year. (*Kalender över Svenskarna* i Worcester, Worcester, Mass., 1883.)

4. An attempt was made to piece together price data from advertisements in Swedish newspapers, particularly *Göteborgs Handels och Sjöfarts Tidning*. Also, a thorough search of the county archives in Gothenberg (Göteborgs Landsarkiv) uncovered a few hundred contracts between emigrant agents and
On the basis of other evidence, it is not clear how important changes in transportation costs were in stimulating migration from Sweden. Steerage fare from Gothenburg to New York apparently averaged between 20 and 40 dollars. The average Swede arrived in this country with only about this same amount of cash in his possession.\(^5\)

Other evidence, however, indicates that a sizable percentage of Swedish emigrants had their passage advanced by relatives already in the United States.\(^6\) This indicates that, for a great many Swedes at least, transportation costs were not an absolute barrier to emigration. In any case, the lack of data precludes testing the influence of changing transportation costs.

The migration statistics are taken from Swedish rather than American sources because American immigration statistics reported Swedish and Norwegian immigrants together until about 1880, and because the American statistics recorded virtually no one who entered the country through Canada. The dependent variable, gross trans-Atlantic emigration \((M_t)\), is taken from Sundbärg's compilation.\(^7\) These figures differ from those used by D. S. Thomas and others. Other analyses are typically based upon total Swedish emigration even though emigration by destination is available (the difference is about 10 percent).

Swedish citizens. These contracts (located in the archives of Polis Kammar of Gothenberg) indicated that the money cost of transport between Gothenberg and New York declined from 135 Sw. kronor in 1869 to 115 Sw. kronor in 1880 to 105 Sw. kronor in 1893. From all sources it was possible to obtain price information for only about half of the time period under consideration. Thanks are expressed to Mr. Gösta Lext and the staff of Göteborg's Landsarkiv for their patience and assistance in allowing me access to their files.

5. The U.S. Treasury Department, for example, calculated that the average Swedish immigrant arriving in 1892 brought $20.09 with him. In 1897, it was estimated that of 7900 Swedish immigrants, less than 2000 brought more than $30.00 with them. The National Economic Society in Stockholm estimated that the average emigrant departed with $40.20 in 1890. These figures indicate that the cost of emigration relative to the emigrant's net worth presented a substantial barrier to emigrating. See Report of the Select Committee on Immigration and Naturalization, House Document No. 3472, 51st Congress, Second Session, 1891, p. 445. See also Senate Hearings on Immigration, Statement of Mr. Schwartz, Senate Document No. 114, 53rd Congress, Second Session, 1894, p. 30; Arrivals of All Passengers and Immigrants in the United States, U.S. Treasury Dept., 1893; Report of the Commissioner General of Immigration, U.S. Treasury Dept., 1897; and Special Consular Reports, European Emigration, 1890, p. 272.

6. In 1890 it was estimated that half of Sweden's emigrants had their passage advanced. For the years 1908, 1909, and 1910, respectively, it was estimated that 36.4 percent, 29.8 percent, and 31.2 percent of the immigrants arriving from Sweden had received prepaid tickets from America. See U.S. Senate, Statistical Review of Immigration, 1880-1900, Senate Document No. 756, 61st Congress, Third Session, 1911, p. 379.

It is also of interest to investigate differences in migration behavior between Sweden's agricultural and nonagricultural sectors. Sundbärg presents figures for total emigration for each of eight major occupational categories for the years 1866–1908. The reported gross figure for agriculture (jordbruk) was used to define the agricultural migration variable \( M^a_t \); the other seven categories were combined to compute the nonagricultural migration variable \( M^i_t \).

Although the beginning and ending observations for the time period under investigation, 1867–1908, reflect the availability of particular data, the period as a whole reflects more than 95 percent of all the Swedish immigration to America prior to World War I.

The functional form chosen for the model is the double log specification with all variables expressed as natural logarithms. This specification was chosen for two reasons. First, there are indications that the logarithmic form fits the data better as measured by both the explained variance and the \( t \)-ratios of the coefficients. Second, the logarithmic form can be easily interpreted; the coefficients unambiguously reflect the elasticities of Swedish migration with respect to each of the independent variables. By using this functional form, comparability between the different time periods and currencies for the wage variables is assured, and the coefficients of the other variables are also easily interpreted.

V. THE ECONOMETRIC RESULTS

Equations (1) and (2) show the estimated coefficients of two models that seek to explain gross trans-Atlantic emigration from Sweden during the period 1867–1908. \( t \)-values are in parentheses under the coefficients; an asterisk indicates that the coefficient is significantly different from zero at the 0.05 level. All variables are in natural logarithms.\(^8\)

\[
M_t = 45.740 + 0.399M_{t-1}' - 3.674Y^a_{st} - 4.431Y^i_{st} \\
(2.723)^* (3.151)^* (3.115)^* (2.043)^* \\
+ 1.764Y^a_{us} + 6.521Y^i_{us} - 0.445H_{t-1} \\
(2.104)^* (3.165)* (0.986) \\
R^2 = 0.83.
\]

\[
M_t = 37.140 + 0.389M_{t-1}' - 3.521Y^a_{st} - 4.394Y^i_{st} \\
(2.035)^* (3.059)^* (2.976)^* (2.021)^* \\
R^2 = 0.83.
\]

\(^8\) Ibid., pp. 266–37. Because cross classifications by destination and occupation are not available, \( M^a \) and \( M^i \) refer to gross emigration to all destinations of the agricultural and industrial sectors, respectively.
A glance at these relationships discloses that all the coefficients have the expected sign and all the magnitudes appear reasonable. Moreover, both models are capable of explaining more than four fifths of the variation in Swedish emigration during the period under investigation. In equation (2), four of the seven coefficients are significant by conventional criteria, and the others are larger than their standard errors.

Since the appropriate lag for the birth rate variable is not known a priori, models similar to equation (2) were estimated for values of the birth rate variable lagged from 15 to 30 years. The lag indicated for the birth rate variable presented in equation (2), 26 years, was chosen because it represents the average age of adult Swedish emigrants during the period.\textsuperscript{1} It should be noted that the coefficients of the other variables are remarkably stable.

The equation indicates that variations in emigration from Sweden were responsive to changes in both agricultural and industrial wages in both countries. The coefficient of the harvest index is not significantly different from zero, and there is only slight evidence that variations in birth rates or population pressures exerted an independent influence upon the level of migration.

These models allow for explicit testing of the strength of the “pull” from the United States relative to the “push” from Sweden. If the conclusions of Easterlin, Jerome, and D. S. Thomas are still correct when applied to Swedish migration, we would expect that the coefficient for $Y^s_{ut}$ would be larger than the coefficient for $Y^a_{ut}$, and the coefficient for $Y^i_{ut}$ would be larger than that of $Y^i_{st}$. As is obvious from both models, the indications are that the influence of both Swedish agricultural and industrial conditions was as important as corresponding conditions in the United States.\textsuperscript{2}

Separate emigration models are constructed for agricultural and nonagricultural sectors of the economy in the following way.

9. The results presented in the text are based upon two-stage least squares estimates using the lagged independent variables as instruments. The parameter estimates are consistent although they may not be fully efficient. Alternative estimates are discussed in subsequent footnotes. See N. Liviatan, “Consistent Estimation of Distributed Lags,” International Economic Review, IV (Jan. 1963), 44–52.

1. G. Sundbärg, Emigrationsutredningen, Bilaga IV, op. cit., p. 176, table A.

2. In particular, the hypothesis that the sum of the income elasticities is zero, i.e., that the “push” and the “pull” factors have about the same effect, cannot be rejected at the 0.05 level ($t=0.469$ for equation (1), $t=0.879$ for equation (2)).
For agricultural migration the second model can be estimated directly. For agricultural workers $Y'_t$ represents the attraction of urban or manufacturing employment in Sweden; $Y^i_{us}$ and $Y^a_{us}$ represent the attractions of manufacturing employment and agricultural employment in the United States. $Y^a$ represents the economic incentive for remaining in the Swedish agricultural sector. For non-agricultural migration we need be concerned with fewer choices; the incidence of industrial workers becoming agricultural workers in Sweden may be presumed to be small, but the attraction of the agricultural sector in the United States cannot be neglected, especially when it is recognized that many individuals not classified as agricultural workers at the time of migration had indeed been raised in Sweden’s agricultural sector. The variable $H_{t-1}$ is retained to account for the additional competition for nonagricultural employment accompanying poor harvests and the resulting mortgage foreclosures.

When the model is applied separately to emigration among the agricultural population, the resulting regression equation is

$$ M^a_t = 45.110 + 0.272M^a_{t-1} - 3.652Y^a_{st} - 4.438Y^i_{st} $$

$$ + 1.353Y^a_{us} + 7.257Y^i_{us} - 0.788H_{t-1} + 0.629B_{t-26} $$

$$ (2.138)^* (1.631) (2.677)^* (1.796) $$

$$ (1.850) (3.030)^* (1.523) (0.584) $$

$$ R^2 = 0.76. $$

The coefficients of this expression are similar to those relating to total emigration. A minor difference is in the coefficient of the harvest term, which is larger and has a substantially larger $t$-ratio. The coefficient gives some evidence (the level of confidence is roughly 0.15) that the state of the harvest played an independent role in motivating Swedish agricultural emigration, even when the influence of agricultural wages is taken into account. The birth rate variable is clearly insignificant.

The coefficients of the wage variables indicate that, contrary to accepted opinion, there is every reason to believe that Swedish economic conditions exerted at least as powerful an influence upon agricultural emigration as conditions in the United States did.\(^3\)

The estimated model for nonagricultural emigration from Sweden is

$$ M^i_t = 52.730 + 0.474M^i_{t-1} - 8.436Y^i_{st} + 2.667Y^a_{us} $$

$$ (2.467)^* (3.031)^* (3.594)^* (2.716)^* $$

3. The hypothesis that the sum of the income elasticities is zero cannot be rejected for this model either ($t=1.099$).
$+ 5.680Y_{ag t} - 0.415H_{t-1}$

(2.396) * (0.779)

$+ 2.690B_{t-26}$

(1.214)

$R^2 = 0.74$.

Despite the fact that nonagricultural occupations are far more heterogeneous, the regression equation fits these data almost as well. The two variables that measure changes in the supply of laborers seeking industrial employment in Sweden are $B_{t-26}$ and $H_{t-1}$. The latter is clearly insignificant.

Although the overall $R^2$ is slightly lower than in the agricultural model, each of the income elasticities is highly significant. We may infer that wage and income considerations played an important role in formulating migration decisions among the market-oriented industrial workers.

The coefficient of the wage variable indicates that Swedish industrial conditions exerted a powerful stimulus toward emigration. In particular, the coefficient indicates that a 1 percent increase in industrial wages in Sweden can be associated in the short run with a reduction in the level of nonagricultural emigration of over 8 percent. On the other side of the Atlantic, neither the agricultural nor the industrial wages exerted as strong a "pull" effect. The coefficients indicate that U.S. farm wages were important in inducing immigration from Sweden. This is consistent with the fact that many of those not classified as agricultural workers at that time of emigration had originated in the agricultural sector of Sweden.

The nonagricultural sector and the urban areas can be thought of as intermediate steps in the emigration process for many Swedes. An individual migrated to the cities or sought employment in the industrial sector and later made the decision to migrate to America. There is less convincing evidence of a lagged migration response within the agricultural sector than in the industrial sector of the Swedish economy. The knowledge of particular employment opportunities supplied by recent emigrants was probably of more value

4. Again, the null hypothesis that the "push" and "pull" influences are the same cannot be rejected ($t = -0.191$).

5. Further evidence for this conclusion can be found in the breakdown of nonagricultural migration by occupation. Although the numbers in the "unclassified" occupational category (durfiga och ej uppfina yrken) were relatively small in the early years (6\(\frac{1}{2}\) percent of the total in 1870), by 1888 unclassified workers made up 17 percent of the total emigration in the nonagricultural sector. It is probable that most of these workers had formerly been employed in the agricultural sector in Sweden.
to industrial workers than to agricultural workers contemplating resettlement under the Homestead Act, for example. The lagged migration term also indicates that the long-run income elasticities of migration were significantly higher for industrial than for agricultural workers.\(^6\)

Figure I indicates the actual pattern of Swedish emigration and the pattern predicted by equations (2), (3), and (4). The ordinate is in natural logarithms.

VI. CONCLUSIONS

The analysis presented in the previous sections demonstrates that, at least for Sweden, it is unfair to conclude that the pattern of emigration during the period 1867–1908 was dominated by economic conditions in the United States. The evidence indicates that the “push” of domestic conditions in Sweden was at least as important in inducing migration across the Atlantic.\(^7\) There is also weak, but consistent, evidence that the fortunes of the Swedish harvest and population pressures measured by the lagged birth rate provided inducements to migration among both agricultural and industrial workers.

6. The lack of statistical significance of the lagged dependent variable in one of the disaggregated models may suggest that specification be modified to delete \(M_{t-1}.\) The ordinary least squares estimates for this specification are

\[
M^*_t = 57.730 - 4.776Y^*_t - 4.539Y^*_t + 1.501Y^*_t + 9.549Y^*_t \\
(2.873)*(3.963)*(2.200) \\
- 0.622H_{t-1} + 0.628B_{t-2} \\
(1.199) \\
R^2 = 0.74,
\]

(4a) \[
M'_{t-1} = 80.160 - 12.720Y'_{t-1} + 3.753Y'_{t-1} + 9.314Y'_{t-1} \\
(3.736)*(6.123) \\
- 0.412H_{t-1} + 2.783B_{t-2} \\
(0.699) \\
R^2 = 0.68.
\]

The Durbin-Watson statistics do not give conclusive evidence of autocorrelation; although the coefficients are uniformly larger for this specification, the conclusions of the main text are unchanged. When (3a) and (4a) are re-estimated using the Cochrane-Orcutt-Paris-Winston method, the coefficients are slightly lower, but the null hypothesis that the sum of the income elasticities is zero cannot be rejected in either case. For models identical to (3) and (4) estimated by ordinary least squares, the coefficients of the lagged dependent variables are larger and have smaller computed standard errors. The coefficients of the other variables are about the same in magnitude and tell the same story as those already presented. As measured by beta weights, the order of importance of the individual income variables in each equation is the same as the order of relative magnitudes of their coefficients. As measured by partial correlation coefficients, there is little difference between the industrial wage variables or the agricultural wage variables in the two countries.

More than a half century ago Gustav Sundbärg argued that if Swedish economic development had begun twenty years earlier, the number of emigrants would have been inconsequential regardless
of developments across the Atlantic. By using the economic model developed in this paper, it is possible, in a somewhat crude way, to address this counterfactual proposition.

We can use the regression estimate of total Swedish emigration (equation (2)) to project emigration levels under the assumption that the variables measuring the influences of the Swedish economy at time \( t \) take on the values they realized at time \( t+20 \). This is equivalent to assuming that the American economic conditions, Swedish harvests, and birth rates remained the same as those historically recorded; but that economic development and increases in real income, as measured by \( Y_a \) and \( Y_s \), came to Sweden twenty years earlier. The “take-off” into sustained growth thus becomes the decade of the 1850’s instead of the 1870’s.

With this technique to compute annual migration during the period 1868–1888, it is estimated that annual emigration from Sweden would have been insignificant instead of the observed annual level of about 21,000. This calculation again indicates that conditions internal to the Swedish economy played no small role in motivating emigration during the latter half of the nineteenth century.

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9. The calculations based on equation (2) or on either of the alternatives mentioned in note 6, page 124 show that the annual level of migration could have varied between less than 1 and 5 percent of the actual figures, with the average level of migration being about 1 percent of the recorded value.