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Demographic and Supply Aspects of Nationwide Building Cycles

A. MARRIAGE RATES

Fortunately for our study, marriage activity has been sub-
jected to intensive analysis on a nationwide basis with regard to
short- and long-swing movements. European students were
attracted to the use of marriage rates as a significant business
cycle indicator that would reach far back into the nineteenth
century and provide for many countries comparable time series
in standardized units of measurement. Highly formalized tech-
niques of time series decomposition were used to extract long
waves and short cycles from annual returns for twelve countries
in the period from 1870 to 1913. Growth trends were eliminated
by conversion to a per capita basis which, as was noted in our
earlier discussion, results in a gross measure of marriage activ-
ity. Long waves were extracted by taking an orthogonal function
of fifth or higher degree (yielding two or more turns) less a
similar function of second degree (yielding one turn). The lower
degree function approximated to the underlying movement of
marital habits or shifts in age composition. The fifth degree
function picks up any secondary waves if they are found in the
original series.[1] Chart 8-1 illustrates the relationship between the
original series and derived patterns for Great Britain and the
Netherlands. In both instances it will be observed that the fifth
degree function provided a very close fit; experimentation with
functions of higher degree yielded only insignificant improve-
ment [176, pp. 17f.]. The accompanying chart of the relationship
of the difference between the values of the fifth degree trend and
original values and unemployment rates indicates how accu-
rately the short cyclical component has been isolated and
measured apart from longer-wave movements. In some cases the
functions were computed from time series pushed back to the

CHART 8-1

Marriage Rates, Netherlands and Great Britain, 1870–1913

Marriages per 10,000 Population in the Netherlands
1870 to 1913
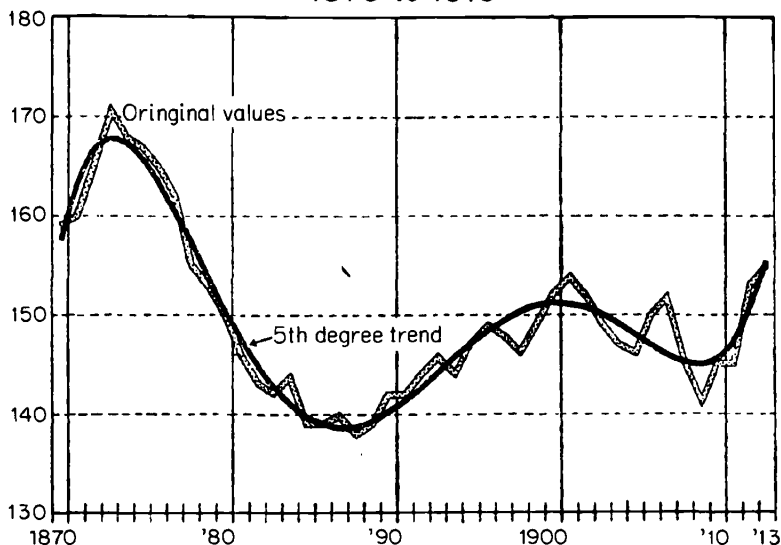
1850's; but only the segment of computed values for 1870 to 1913 is presented.

Being thus fortified as to the values of the statistical methods used, we present in Chart 8-2 the computed long-wave movements with superimposed short-wave oscillations for twelve countries presented separately and consolidated in three groups: industrial, agricultural, and mixed. The chart is clearly of exceptional interest because of the striking synchronization of wave patterns among the five "industrial" countries of Western and Northern Europe and among the agricultural countries which include the Balkans, Australia, and Italy. Of course the fifth degree function with its two generated long waves does not fit the original data equally well in all cases. Quite clearly the Nordic countries have only a slight tendency toward the "industrial" wave pattern; while the "fit" or dispersion of pattern from experience of the agricultural countries is much greater. However, the long-wave movements are more concordant than the short cyclic movements. Thus, the correlation of the long-wave values for the Netherlands and Great Britain yielded a coefficient of .83; but the short cyclical components were correlated
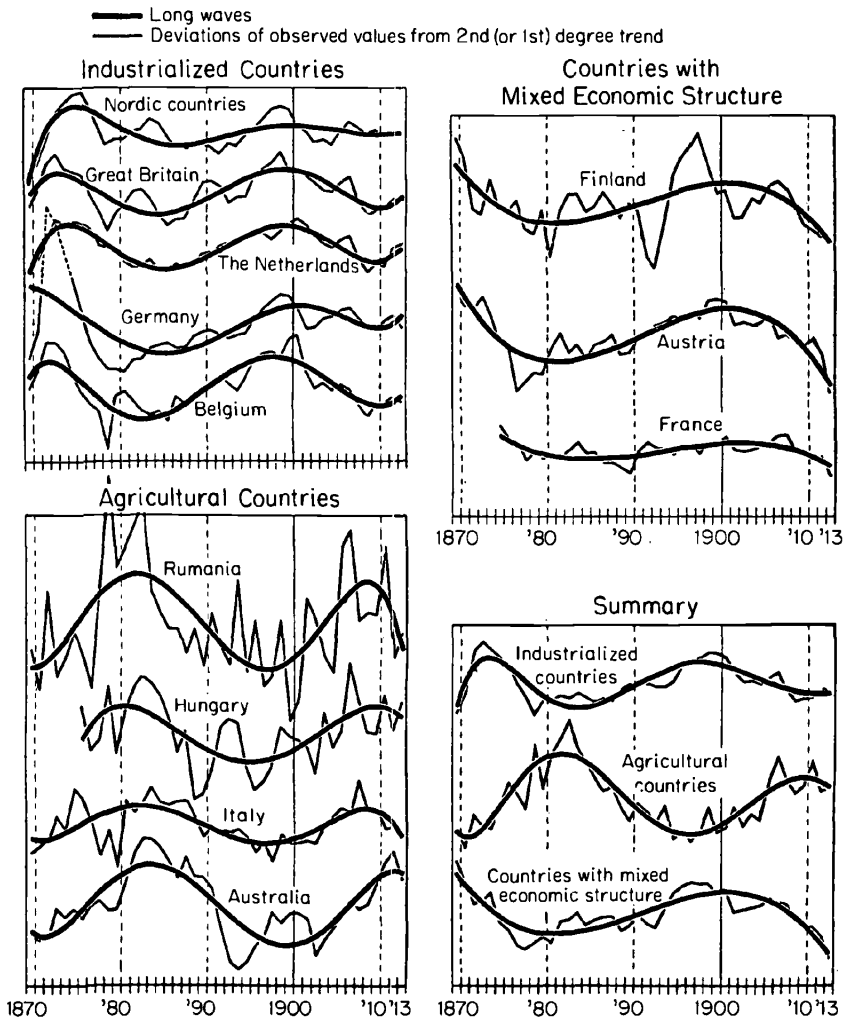
CHART 8-1
(Concluded)

Great Britain
Observed Values from 1870 to 1913
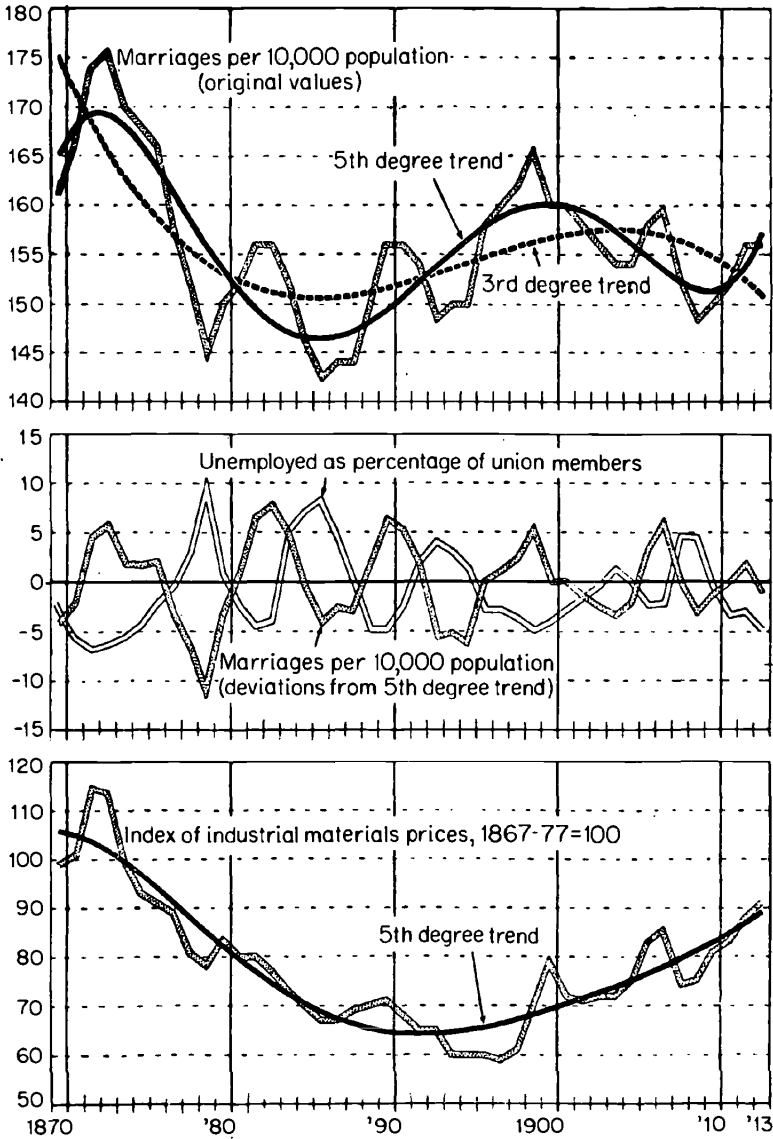
with an index of .29 [176, pp. 68f.]. There seems little doubt that a definite inversion characterized the relationship of marriage rates between agricultural and industrial countries. Precisely this fact may give the clue as to why the United States, which was

CHART 8-2

Long Waves of Marriage Rates: Twelve Countries and Country Groups,
1870–1913

Industrialized Countries

Nordic countries

Great Britain

The Netherlands

Germany

Belgium

Agricultural Countries

Rumania

Hungary

Italy

Australia

Countries with
Mixed Economic Structure

Finland

Austria

France

Summary

Industrialized
countries

Agricultural
countries

Countries with mixed
economic structure

━━━ Long waves
─── Deviations of observed values from 2nd (or 1st) degree trend

1870   '80   '90   1900   '10 '13

SOURCE: Ernst Wagemann [275, p. 84].

developing both its industry and its agriculture over the sur-
veyed period, exhibits marriage series free from long swings of
any distinct character.

Since these marriage long waves were extracted by complex
mathematical methods, comparison with results reached by a
simple moving average—which leaves in long time trend but
excludes short fluctuations—may be interesting. Moving aver-

ages for five countries are shown in Chart 8-3. They show the same tendency to inversion between England and Australia, the same mild and ambiguous character of the French movement and the parallelism between the German and English movement. The wave patterns extracted by more complex methods are confirmed. We can then go on with the use of our standard techniques to determine amplitude, timing, and other characteristics of marriage wave patterns. The use of these techniques will make easier the comparison of wave movements in marriage

CHART 8-3

Marriage Rates: Five Western Countries, Per Capita Five-Year Moving Average, 1854–1913
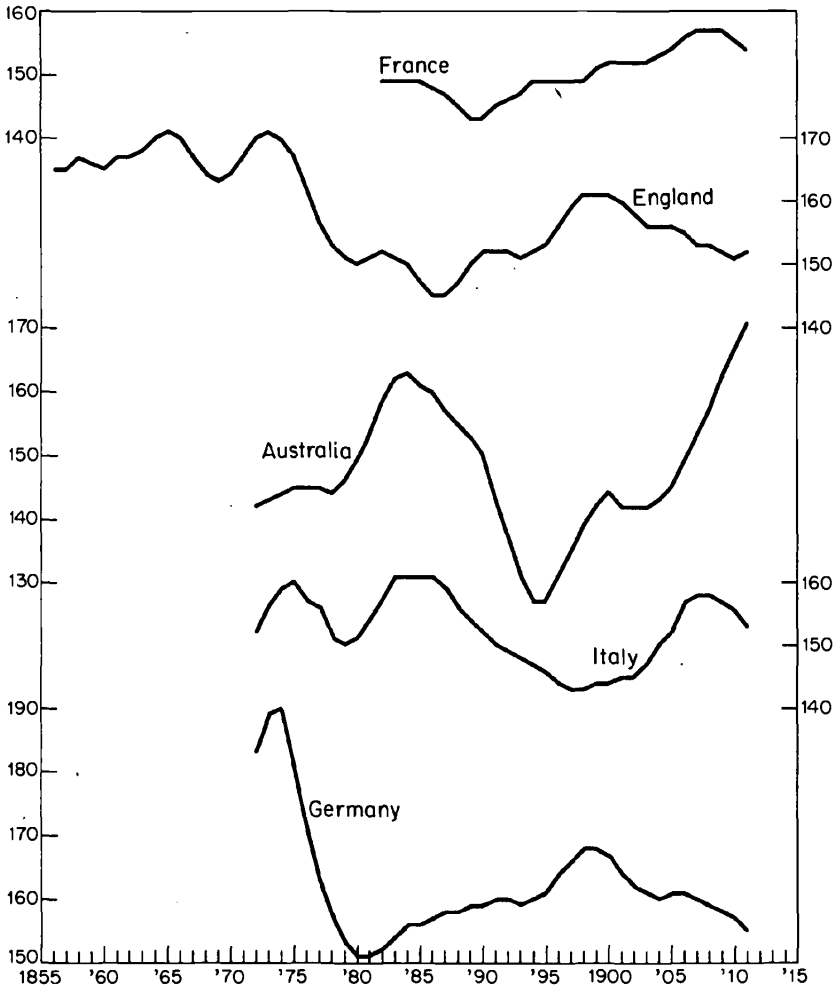
rates and other activities and will thus help to fit marriage wave movements into the complex of movements which make up the long-wave phenomenon.

Data on long marriage rate cycles for six countries are set forth in Table 8-1. Average cycle pattern charts are omitted since amplitude was so slight that patterns of movement are barely discernible. The correlograms are set forth in Chart 8-4.

For both America and England it will be noted that Table 8-1 contains two different sets of data. The English marriage time series runs without a break from 1785 through to 1913. Long-swing characteristics for two long waves after 1870 differ markedly from the two shorter waves between 1816 and 1843. The characteristics of the transition period are also ambiguous: hence separate presentation for the two sets of waves seemed indicated.

In the American case our statistical presentation reflects uncertainties about the validity of the underlying data. The act of marriage in the United States, as in other countries of European settlement, was enmeshed in documentation and ceremony arising from the Church prohibition of clandestine marriage in the Council of Trent and the 1754 English statutory requirement for standardized registry of marriage performances.[2] The tradition of church solemnization carried over to the New World but disestablishment of religion and secular attitudes fostered civil control over marriage. By the middle of the nineteenth century in nearly all of the states and territories a marriage could not take place except with a license issued for a fee by a local civil officer [293, p. 47]. In "nearly all states and territories," a written return of the marriage was required to be filed for legal recording purposes; and in twenty-one states an effort was made to maintain statewide registry or tabulation [293, pp. 61ff.].

Notwithstanding the requirement for written records in most states and territories by the middle of the nineteenth century, the first attempt in the late 1880's to measure marriage activity over a prior twenty-year period was unpromising. An attempt was made to canvass some 2,600 local centers of marriage recording or licensing activity over a twenty-year period, 1867–86. Returns for a third of the counties were not obtainable and there was evident confusion between returns of marriages consummated and licenses issued. Only for five states and the District of Columbia were the returns felt to be complete and fully satisfac-

tory; in nine other states returns were felt to be reliable but were less complete and less satisfactory. The entire marriage report was characterized as "thoroughly incomplete and unsatisfactory" [293, pp. 18, 134–139]. The next attempt at record keeping for the following twenty-year period, 1887–1906, contained a report of the number of marriages by years that was "fairly complete" [264, p. 7]. Still, doubts as to the validity of the statistics carried over, especially for the three decades prior to 1900 when the crude marriage rate "never fell below 8.6 or rose above 9.3," a performance characterized by an outstanding student as "unbelievable" [145, p. 22]. It is presumably because of this haze of statistical doubt that, in his recent study of demographic processes in long swings, Richard Easterlin [78] almost completely neglected statistical analysis of marriage activity.

While the original 1867–86 survey did not produce the desired nationwide enumeration over the twenty-year period, still the returns should hardly be cast aside as unusable. There were, for most of the twenty years, nearly complete returns for eleven states and there were usable partial returns for particular counties in twenty-one additional states.

The present national marriage rates analyzed in Chart 8-5 are derived from these usable returns, reduced by the National Office of Vital Statistics to a per capita basis for the covered jurisdictions. It would have been desirable in extending the partial returns to a nationwide basis that allowance be made for special characteristics of marital behavior by race, region, and degree of urbanization. We doubt, however, that either the level of the estimates or the pattern of fluctuation would have been much affected, though it has already been shown that during the depression of 1873–77 marriage rates had a wider range of movement for areas of greater industrialization [288, pp. 83f., 135f.]. Some differences in marriage rates could well persist because of changes during this period in the character of immigration, as well as the intensification of industrialization, and the offsetting marriage patterns among the agricultural and industrial populations. A very striking correlation was achieved between marriage rate activities over the years in question in a set of six states with preponderantly industrial populations and a suitable measure of business-cycle performance [248, p. 62]. A comparison of the two long-cycle patterns for the nationwide

TABLE 8-1

National Summary Measures, Long Cycles, Per Capita Marriage
Rates, Five Areas
(Series number given below area)

Item	Units	Total[a] or Mean	Italy (0280)
A. Totals			
1. Number of areas		5	
2. Number of specific long cycles		10.5	2.5
3. Number of turning points (TP):			
a. Matched		24	4
b. Unmatched		2	1
B. Mean values			
4. Full specific duration	Years	19.8	15.0
5. Specific cycle amplitude			
a. Full	Cycle relatives	36.52	35.0
b. Full per year	"	1.87	2.33
c. Fall per year	"	−2.30	−2.05
6. Full reference amplitude	"	16.70	10.0
7. Lead-lag (LL) TP:			
a. LL	Years	−1.07	2.25
b. Average deviation	"	2.02	2.75
8. LL reference pattern	"	− .20	3.80
9. Optimal serial correlation, trend adjusted			
a. LL	Years	−3.0	n.a.
b. Correlation coefficient		.716	n.a.
10. Per cent change Average annual rate successive average long cycle standings	%	− .9	−4.0

n.a.—not available.

[a] Exclusive of Ohio and counting Nationwide U.S. rather than 6 States where available.

[b] Reference cycles.

[c] For short specific cycles.

[d] Not marriage rates but number of marriages.

		England		United States		
Germany (0278)	*Australia* (0277)	*1854– 1914* (0282)	*1810– 50* (0302)	*6-States* (0281)	*Nation- wide* (0281-A)	*Ohio[d]* (0146)
2.5	1.5	2	2[b]	2	4[b]	3[b]
6	4	5		5		
0	1	0		0		
16.0	25.5	25.5		17.0		
21.2	57.7	28.7		40.0		
1.33	2.22	1.13		2.35		
−1.52	−2.74	−1.42		−3.76		
14.2	21.9	15.0	11.6	21.2	27.5	26.1
−1.33	−5.25	−1.80		.80		
2.00	1.75	1.76		1.84		
−2.30	−4.35	0	.90	.75		0
−3.00	−2.0	−4.0			−3.0	−1.0
.705	.855	.625			.679	.623
+2.1	+2.0	−4.7	−4.2	+3.5		1.427[c]

CHART 8-4

Correlogram of Marriage Rates, Five Countries (Trend Adjusted)
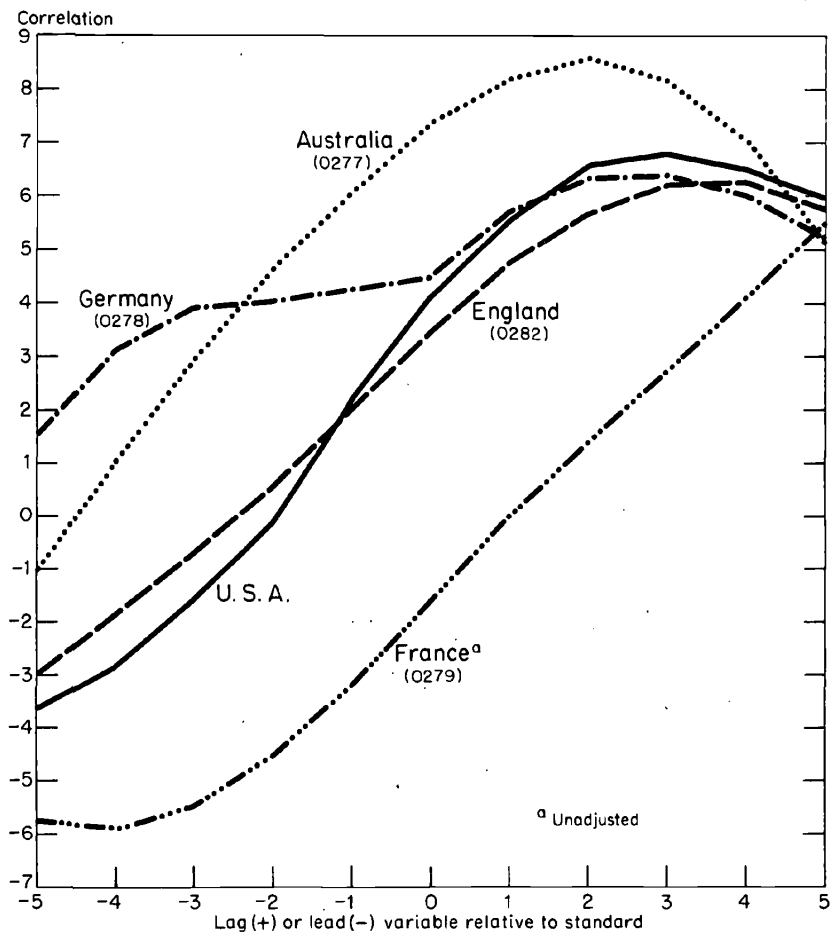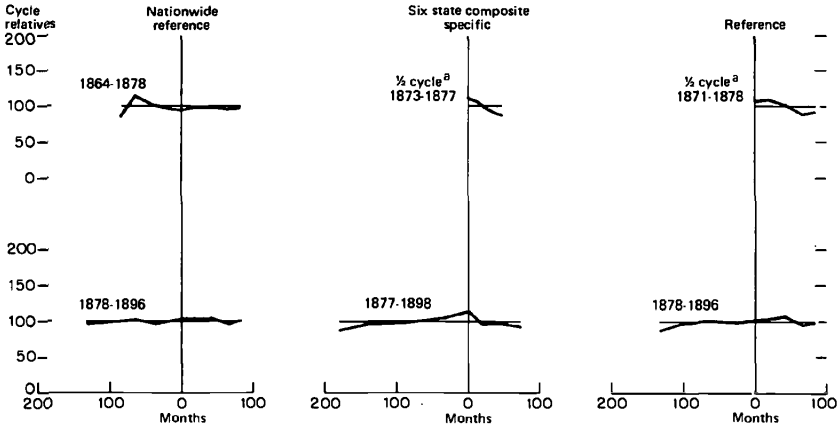

and six-state basis, as shown in Chart 8-5, shows nearly perfect stability in the nationwide index and a mild but clear-cut cyclical pattern in the six-state index. Other investigators, too, have noticed that in the more industrialized and urbanized regions a significant decline in marriage rates was exhibited during the 1870's [288, pp. 83f., 135f.].

On the agricultural side quite different patterns of movement were exhibited. So far as short cycles are concerned, investigators of the social effects on marriage and demographic phenomena have conclusively established that nuptiality rates of agricultural populations do not respond to short business-cycle

CHART 8-5

Patterns of Successive and Average Long Cycles, Per Capita Marriage
Rates, U.S. Nationwide and Six-State Composite

Cycle
relatives
| Nationwide reference | Six state composite specific | Reference |

200—
150—
100—
50—
0—

1864-1878

½ cycle[a]
1873-1877

½ cycle[a]
1871-1878

200—
150—
100—
50—
0L

1878-1896

1877-1898

1878-1896

200 100 0 100
Months

200 100 0 100
Months

200 100 0 100
Months

[a]Inverted base.

influences [275, p. 81; 249, pp. 107, 161; 125, p. 153, n. 5; 17, p.
100; 227, pp. 52-62; 76, 1, pp. 282–285, 527–532]. So far as
long-swing movements are concerned, for non-American popu-
lations the tendency for divergent rhythms of countries pre-
dominantly agricultural and industrial was clearly demonstrated
for the period 1870–1914 in the data depicted in Chart 8-2. Over
the same period we can document on the American scene the
tendency for inverted movements in agricultural and industrial
activity. During the two nationwide reference
expansions—1878–92 and 1897–1909—agricultural rates of
growth of land enclosed in farms, physical capital increments,
and income increments were retarded; and during two nation-
wide reference contractions—the 1870's and the
1890's—agricultural growth was accelerated.[3] Ohio farmers re-
sponded positively in their mortgage takings and building to long
waves (see Chap. 4, section D, p. 104). But nationwide agriculture
responded inversely. Patterns of farm agricultural activity must
have extended to vital processes of population composition and
renewal and thus been reflected in corresponding patterns of
marriage activity. The relatively large role of American farm
population even during the closing decades of the nineteenth
century—in 1870 and 1900 farm population amounted to 56.3 and
41.1 per cent of our total population and a higher fraction of

marriageable youth—would thus have ensured the near erasing in the nationwide index of marriage activity of any tendency to long-swing fluctuation exhibited by the industrial population. Quite possibly, these divergent and neutralizing tendencies for long-swing movements in agriculture and industry respectively were perhaps responsible for the striking finding of Simon Kuznets that "the difference in timing between the long swings of population-sensitive components and of other capital formation, which prevailed until World War I, resulted in so much cancellation that the comprehensive capital formation totals fail to reveal distinct long swings" [161, p. 351].

Our nationwide marriage rates were not only affected in all countries by the mixture of agricultural and industrial populations but also by the scale and nature of migratory movements. We have previously noted that migrating individuals increasingly through the nineteenth and twentieth centuries were in the main young unmarried adults (see Chapter 5, p. 114). As a migratory wave swept into a country it would enrich marriage potential. Conversely it would depress per capita marriage rates in the sending countries. A migratory wave thus shifts the locations of the marriage event even when it does not affect true marriage activity and dislocates the marriage patterns of two countries. Since migration tends to generate sex disparities in both sending and receiving countries, it would tend to reduce international net marriage rates; but by optimizing the fit of job opportunities and labor power it tends to increase net marriage rates. Perhaps the two "net" effects cancel off; in any case they have varied in importance over time and place. Certainly the magnitude of the effect of migration on gross rates will greatly overshadow the more variable influence of migration on net rates.

An effort was made for the United States and for Great Britain to gauge the quantitative influence of immigrant flow on marriage potential for the four decades between 1870 and 1910. The procedure of estimation differed with the two countries. For America it was convenient to attempt to estimate the relative contribution to the Census total population count at the 20–29 age bracket by persons arriving in the country by immigration in the particular decade.

Basic data were derived from the Census returns of the 20–29 age brackets adjusted to allow for aging and for distribution of foreign-born by decade of arrival. The form of the English data

permitted a direct comparison of the relative proportion of unmarried adult net migration to the stock of unmarried adults between 18 and 44 years of age. Details of estimation are presented in Appendix G and relevant results of estimation are presented in Table 8-2.

The results, I believe, indicate that waves of migration left a small imprint on marriage potential in both countries but that both absolute level and variation of the influence of migration on marriage rates were greater in the United States than in England and Wales. Over the four decades net immigration to the United States amounted to 12.1 per cent of resident population in the 20–29 age bracket; the corresponding share of net emigration in England and Wales to unmarried adult class was much smaller, 2.7 per cent. The absolute level of migration is not, in this

TABLE 8-2

Estimated Migration Net and Marriage Potential England and Wales and United States 1870–1910

(In thousand persons)

		1870's	*1880's*	*1890's*	*1900's*
I.	England and Wales unmarried adults aged 18–45:				
	1. Total estimated net emigration[a]	78	296	32	221
	2. Mid-decade population[b]	4,345	5,219	6,275	7,239
	3. Ratio line (1/2)	1.8%	5.7%	0.5%	3.1%
II.	United States population 20–29 age bracket:				
	4. Estimated net new immigrant arrivals[a]	693	1,440	1,144	2,307
	5. All other U.S. population[a]	8,475	9,985	12,661	14,848
	6. Ratio line (4/5)	9.6%	15.6%	10.0%	16.8%

[a] See Appendix G.
[b] Compiled from General Register Office [99, Summary Tables, pp. 126–127]. The returns for the 15–20 year bracket were distributed 3/5 to under 18 and 2/5 to 18–20.

context, important; important rather is the variation in the level. In the case of England and Wales variation in migration from one decade to another affected between 2.6 and 5.2 per cent of marriage potential. In the American case the range was somewhat greater, between 5.6 and 6.8 per cent. Since the total reference amplitude of English gross marriage rates was only 15.0 per cent, the influence of migration would appear to be limited to a fourth of reference variation. And this influence would be felt only if variations in emigration would induce proportionate changes in gross rates of marriage.

In the American case the relative influence of migratory waves on long-swing amplitude of marriage rates was greater both because the percentage range of decade fluctuation in migration was greater and because specific amplitude, so far as this is indicated, was less than in the British case. If we take the only two reference long swings unaffected by a major war and substantially coterminous with the migration waves with which we are here concerned—1871–1909—the indicated specific and reference amplitude of 23.0 and 12.2 respectively are appreciably less than corresponding English amplitudes. Recorded fluctuation in net migration additions to the most eligible age-brackets would have accounted for one-half the reference, and for a good third of the specific, American marriage rate amplitude.

While it was not feasible to attempt to gauge the quantitative importance of immigration flows in marriage rate long-swing amplitude for other countries, for both Germany and Australia an appreciable influence is indicated. This means that true amplitude of long-swing variation in marriage rates would be scaled down by some 10 or 20 per cent from the magnitudes shown in our table.

While scaled down in amplitude the variation in marriage rates over long swings tells an extremely significant story. Marriage rates are sensitive to changes in work and earning opportunities for dependent populations. Within a limited range, impairment of these opportunities leads to deferral; improvement, to acceleration of marriage decisions. Continued deferment over an extended period, such as the full length of long-swing contractions, would require an unusually strong impairment of living conditions and income deterioration. Hence even a slight persistent decline in marriage rates over a period as long as our reference contractions, with a mean duration of nearly eight

years, gives witness that these reference contractions have been associated with a significant impairment of mass urban opportunities for work and welfare.

B. MIGRATION

We have seen that nationwide marriage rates respond only slightly in absolute terms to the long-wave movement that runs through the industrial economy of the nineteenth and twentieth centuries. It is quite different, however, with migratory flows. As was the case in local cycles, these fluctuate in prominent long swings which develop extraordinary amplitude, rivaling that of building activity. The role that these migratory flows play in long swings has been intensively investigated in the work of Cairncross, Brinley Thomas, Kuznets, and Abramovitz. We seek to extend these investigations at this point in our study by bringing under formal analysis the migration experience of Germany, England-Wales, and the United States.

These countries were selected for detailed study partly because data for these countries is more readily available and partly because the real estate and building experience of these three countries has been consulted so frequently in this study. Two of the countries illustrate the way migration influences "senders" or countries of emigration; the other country, the United States, illustrates the way migration influences "receivers" or countries of immigration.

The English migration experience is grouped in two sets of years. During the first set, 1816–49, all outgoing passengers to extra-European countries leaving from all ports of embarkation in Great Britain including Ireland were included in the statistical returns, thus providing an all-British emigration series. From 1853 onward accurate annual statistics became available of the outward movement of residents of England and Wales and these statistics are used in our analysis. It would have been more satisfactory to have analyzed English migratory experience on a uniform basis. However, this duality of treatment proved expedient for a number of reasons. First, identification of national origin was only attempted in migration statistics in 1825 and identification was very imperfect. Up through 1843 American reports indicate that the Irish provided somewhat over two-thirds of the over-all British outward migration.[4] But the pattern

of movement of the Irish exodus paralleled that of the English.[5] Then, too, our reference cycle chronology for the earlier period closes with 1843, i.e., well before the burst of Irish emigration which would have grossly distorted our patterns. As it was convenient to use an all-British emigration series from 1816 onward so it proved convenient to shift to an English and Welsh emigration series for the period after 1854. The special secular drift of the Irish emigration in the last half of the nineteenth century would have impressed itself on our patterns though there was no corresponding influence felt in the English industrial economy. Our marriage and other data for the later years in Great Britain all referred to England in the narrower sense, including Wales but excluding Ireland and Scotland. For these reasons the less inclusive time series of British emigration statistics was analyzed for the second half of the nineteenth century.

The predominant receiving country for both the German and British emigration of the period concerned was of course the United States, which was, however, not the only area that attracted emigrants. As the nineteenth century advanced, other areas challenged the American lead partly through the aid of the mid-century Australian gold discoveries and the completion of the Canadian Pacific Railway in 1886 [254, pp. 178–192; 158, II, pp. 13, 95; 150].

In the earlier years of the nineteenth century, immigration not only responded to favorable industrial labor markets but also provided opportunities for experienced farmers to settle the fertile lands of the New World. Hence, Jerome found that before 1860 fluctuations in immigration were not "closely" aligned to changes in industrial conditions although there was "some tendency for the effects of a depression to be evident in immigration after a period of time somewhat irregular in duration" [146, p. 82]. His record of cycles in imports and immigration exhibits a wide range of relationships before 1870 ranging from the inverted to the positive [146, Chart 10]. We have calculated correlation coefficients by subperiods. It is indicated that before 1860 the correlation between immigration and imports was weak and inverted and involved immigration leading imports. After the Civil War timing increasingly became concurrent and quite strong.[6]

Using less comprehensive measures for a shorter period, Brinley Thomas also finds evidence of a "structural change" before and after the Civil War in the relation between immigration and economic conditions. Before the Civil War immigration lagged behind building and railway construction and was heavily influenced by conditions in Ireland and Germany as well as by the famous California gold discoveries.[7] Manifestly, before the Civil War the "pulling power" of America on immigration did not so closely correspond with changes in industrial labor markets as after 1870.

In any case American "pulling power" was supplemented by gravitational force exerted by internal conditions in migrating countries.[8] If these influences corresponded—so that the migrating country tended to expel at the same time that America attracted—then building and economic growth movements in the two countries would become inverted. Under such conditions reference cycle patterns of migration—analyzed on chronologies of the sending country—will be inverted, i.e., migration will fall in (domestic) reference building expansions and rise in (domestic) reference building contractions. The same migration, showing up as an in-migrant wave in the receiving country, would exhibit positive cycle patterns.

But if long-wave movements of countries of emigration and immigration are not inverted but are in phase then the gravitational field of migrational flows will be dispersed. When migrants are needed at home emigration signals will be favorable. And when conditions are more deteriorated at home, they may also look less favorable abroad. Under such conditions migratory movement will be governed by the relative strength of the respective pulls and pushes, by the momentum of past movements, by structural disparities in levels of living, and by special circumstances or events. There is no reason why these forces should be distributed over the decades according to a set pattern. Hence, when phase movements of building and growth waves of centers of emigration and immigration correspond, then actual migratory flows are likely to become irregular in behavior. This tendency to irregularity will be greater with regard to the considerable migration oriented to farm settlement or to exploitation of new mineral discoveries. Precisely this tendency toward aggravated irregularity was found by Allen

Kelly in his regression measure of the influence of unemployment conditions in England and Australia on Australian net immigration during 1865–1935.[9]

For the three countries—Great Britain, the United States, and Germany—for which detailed migration experience was analyzed, a comparison of in-step and out-of-step phase movements is provided in Table 8-3. To make this comparison, the all-construction U.S. chronology was utilized and the English chronology for the gap between 1843–57 was filled in by an estimated peak in 1852. Use of turning-point zones would have rendered the pattern of movement more accurately but delimitation of these zones involved questionable judgments and the simplest procedure seemed indicated.

Year-by-year phase comparison indicates that at no time were movements completely inverted or completely parallel. Divergences in timing and "extra cycles" generated by special conditions would produce out of phase alignment even for corresponding movements. German movements were shorter, since her ten turning points covered only 73 years, while the ten American and English turning points covered 91 and 87 years,

TABLE 8-3
Number of Years German and English Long Swings Were in Phase
with American—1821–1912

	1821–61		1862–1913	
	No.	Per Cent	No.	Per Cent
1. England:				
a. Years in phase	23	56.1	19	37.3
b. Years out of phase	18	43.9	32	62.7
c. Number of turning points used	6[a]		4	
2. Germany:				
a. Years in phase	7	31.8	24	47.1
b. Years out of phase	15	68.2	27	52.9
c. Number of turning points used	3[b]		7	
3. U.S.:				
Number of turning points used	5		5	

SOURCE: Chronologies listed in Chapter 1, Table 1-1, with British peak estimated for 1852. Tabulation was cut off with 1912 rather than 1913.

[a] Beginning with 1825.

[b] Beginning with 1840.

respectively. There was a tendency for shorter German waves *after* and shorter British waves *before* 1861 while American waves ran a more steady course.

But while conforming and opposing tendencies were inter-mixed there was a considerable shift after 1861 in both English and German patterns. Before 1861 English waves tended on balance to conform with the American and the German tended more nearly to invert.[10] After 1861 the German rhythm followed the American more closely while the English shifted to the predominantly inverted status. These long-wave synchroniza-tions bear little relationship to short cyclical synchronizations in which for the post-1870 period extraordinarily close German-English solidarity is indicated with divergent U.S. timing.[11]

Our tabular results confirm the well-established pattern of inversion between building and growth waves in the United States and the United Kingdom between 1870–1914 and a lesser degree of inversion and a more confused relationship for 1820–60.[12]

C. MIGRATION PATTERNS

We now examine the three sets of migration cycle patterns and associated tabular measures (Table 8-4). The British experience is detailed in Charts 8-6 and 8-7; the German and American experience, in Charts 8-8 and 8-9. As expected, the patterns indicate a disturbed field of long cyclical experience, especially for the earlier cycles. The British building boom and growth wave that came to a head in 1836 and reached a trough in 1843 found little reflection in records of American immigration, though there was some retardation with a quick pickup (Chart 8-9). So too the British migration patterns through the 1860's exhibit considerable diversity of form (see the cycle patterns in the charts for 1816–32, 1832-43, and 1854–73, and 1861–77). The tendency to inversion is predominant in British reference pat-terns but more consistently in domestic reference contractions than domestic reference expansions. In only three out of sixteen reference contraction stages did emigration turn down. If we had analyzed the 1843–59 transition with a likely cycle chronology, the whole of what would have been reference contraction would have shown a steady rise in emigration, which of course is the mark of an inversion pattern. But reference expansion periods

TABLE 8-4
Summary Measures, National Long Cycles, Migration

| Item	Units	Total or Mean	Germany (0310)	U.S. (0312)	Great Britain (0301)	England and Wales (0311)
Totals						
Number of series		4				
Number of specific long cycles		14	4	5	2	3
Number of turning points (TP):						
a. Matched		25	5	11	5	4
b. Unmatched		5	2	2	0	1
Mean values						
Full specific duration	Years	17.2	12.5	22.0	15.0	19.3
Specific cycle amplitude:	Cycle relatives					
a. Full	"	273.5	212.3	361.2	309.9	210.5
b. Full per year	"	16.61	16.98	16.42	22.13	10.89
c. Fall per year	"	−15.92	−14.58	−18.19	−22.71	−8.21
Full reference amplitude	"	155.2	120.6	177.5	173.7	149.1
Secular weighted average growth per year[a]	%		−3.329	−1.723	8.880[b]	n.a.
Lead-lag (LL) TP:	Years					
a. LL	"	−.41	−1.2[c]	−.90[c]	1.20	−.75[b]
b. Average deviation	"	2.03	2.16	2.08	2.64	1.25
LL reference pattern	"	.93	−.85[c]	−.75[c]	−.90	6.20

n.a.—not available.

[a] Per year change in mean annual standings long cycles, mean of positive and inverted bases.

[b] Taken from [97, p. 943].

[c] The correlogram with inverted timing optimized at zero lead-lag, r = .600.

CHART 8-6
Long Cycle Patterns, Migration to Non-European Countries, Great Britain, 1816–1843
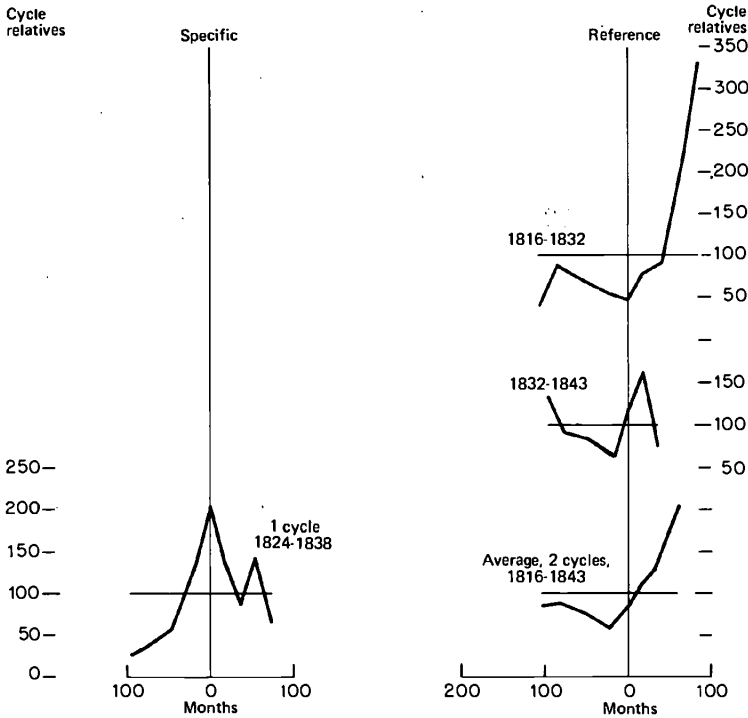
were not so consistent. In only six out of fifteen stages was behavior conforming as it would have been through part of the expansion period of an 1843–59 chronology. This indicates possibly that in reference contractions domestic expelling influence is potent but that in reference expansions attractive power is less potent and easily offset by overseas opportunities. The one reference expansion that ran most of its course in opposition to the American movement—1886–99—readily exhibits a truly inverted emigration cycle pattern.

The German patterns (see Chart 8-8) also exhibit a disturbed course of migration experience with a predominant tendency to inversion. The locus of disturbance seems to fall more in reference contractions than expansions. In only four out of twelve expansion stages was there a conforming movement; while there were conforming movements in seven contraction stages. Apparently domestic expansions exerted attractive

, **CHART 8-7**

Patterns of Successive Specific and Reference Long Cycles and Their Averages, British Emigration Overseas, 1859–1913
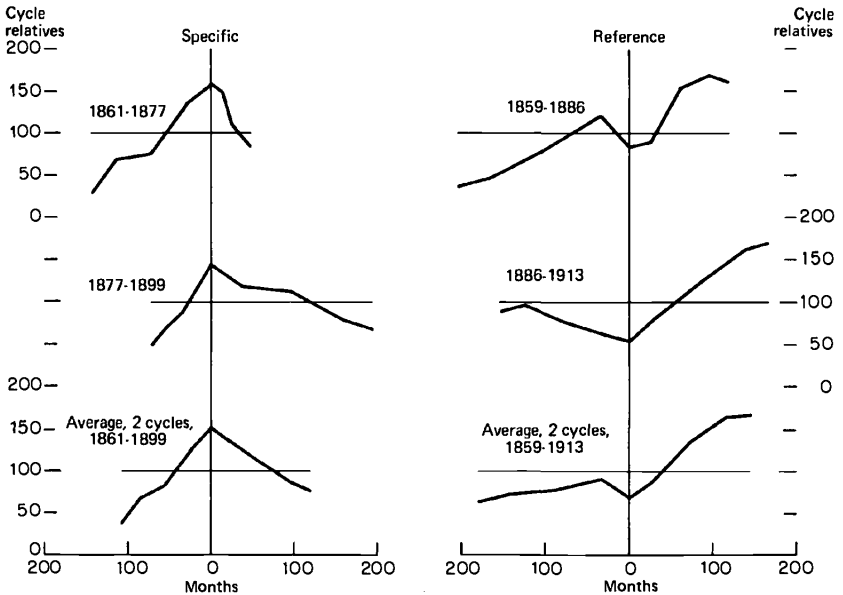

power while domestic reference contractions had relatively weak expelling power. These inferences regarding primacy in migration experience of Germany and England are made on the basis of simple rankings of stage directions of movement. Possibly, influence could be more successfully decomposed by multiple correlation.

The wide diversity of shapes assumed by the American reference—and even the specific—patterns illustrates the disturbed field of migration experience as it impacts on a receiving country with mixed agricultural and industrial growth trends. We note the very short decline in the first cycle pattern, the long lead both at peak and trough of the second pattern, and in general the individualized character of all the patterns. Some remnant, however, was preserved of that marked decennial rhythm which bifurcated our local and citywide reference patterns, particularly between 1878 and 1918 (see pp. 117 ff.). The average six-cycle reference pattern is consequently very unrepresentative.

CHART 8-8

Patterns of Successive Specific and Reference Long Cycles and Their
Averages, German Overseas Migration, 1862–1913
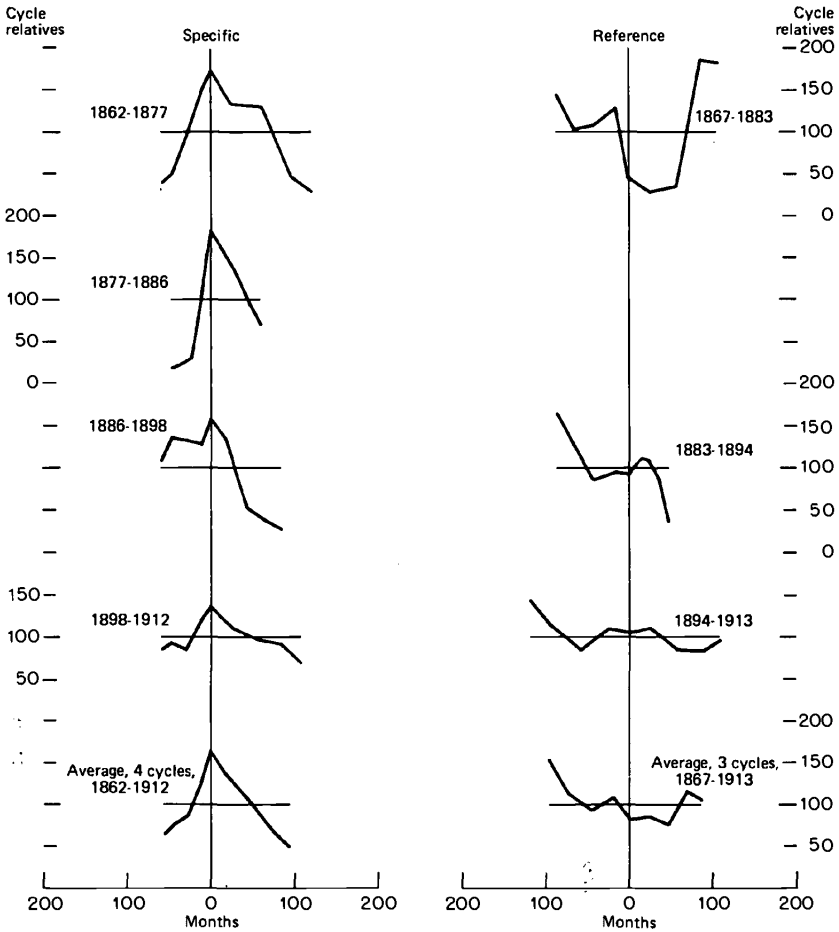
D. SUMMARY

Rates of per capita marriage for twelve countries between
1870 and 1914 were found in 1931 by Ernst Wagemann to exhibit
in systematic clear-cut form our long waves in positive form for
predominantly industrial, and in inverted form for predomin-
antly agricultural, countries. His technique of time series
decomposition—by use of orthogonal functions—was confirmed
by use of other techniques including correlogram and National
Bureau nine-stage cycle patterns. Specific total amplitudes were

CHART 8-9

Patterns of Successive Specific and Reference Long Cycles and Their
Averages, U.S. Immigration, 1823–1933
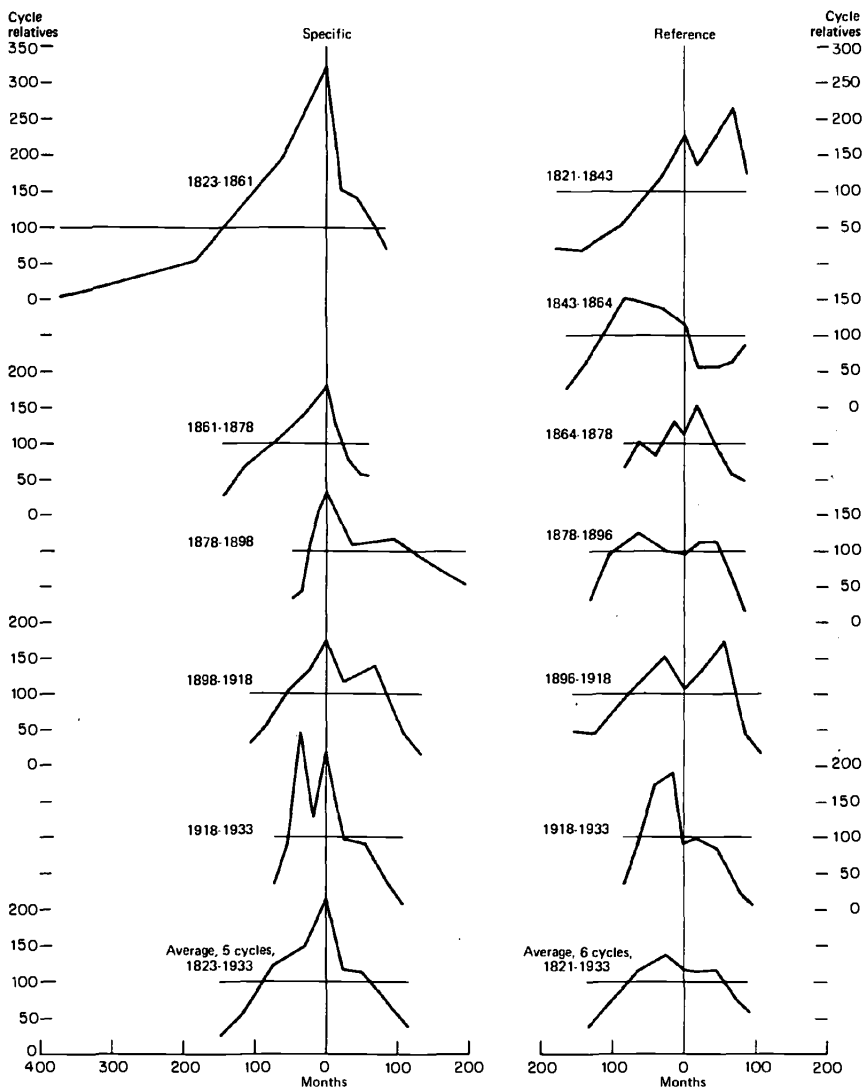
exceptionally low, averaging only 36.5 relative cycles for 10.5
long specific cycles, and due to timing variability this amplitude
eroded by more than half, to 16.7 cycle relatives on a reference
basis. Except for an agricultural country such as Italy the
tendency to lead between two to four years was exhibited by all
the surveyed areas.

The low amplitude is in part the result of elimination from the marriage series of the upward trend resulting from population growth; and in part it reflects the influence in the nationwide aggregate of the agricultural populations. Changes in agricultural conditions dominated nationwide marriage rate statistics for all major countries at the beginning of the nineteenth century and were important factors for America, France, Italy, and elsewhere at the close of the century. Economic advance in American agriculture on a nationwide basis was retarded when industry spurted ahead and vice versa. Hence, any mixture of agricultural and industrial influences would dampen American amplitudes.

Some of the marriage amplitude is derived from the migration of young unmarried adults seeking improved conditions of life. Analysis of the interplay of migration and marriage behavior for the United States and England and Wales between 1870 and 1910 indicated that perhaps one-half and one-quarter, respectively, of the total reference marriage amplitudes could be traced to migration. Because of the resistance to continued deferment of marriage even this slight sensitivity of marriage rates in our industrial-agricultural composites is significant.

Nationwide migration, unlike marriage rates, exhibits long-wave movements that developed extraordinary amplitude rivaling that of building activity proper. Domestic building expansions are associated with growing cities and expanding employment opportunities. Hence, it was assumed that in reference expansions industrial emigration is discouraged and immigration attracted and vice versa in reference contractions. If countries invert in their building patterns, then "push" and "pull" are synchronized; if countries move together in their building cycles, then "push" and "pull" conflict and the resultant net flow will measure the stronger influence on industrial populations. Migration oriented to agricultural settlement will respond to other influences including crop conditions, land distribution programs, and land settlement facilities. Before 1860, American immigration was predominantly oriented to agricultural settlement; after 1860, the industrial influence became paramount.

Our analysis of gravitational influence of "push" and "pull" for the United States, United Kingdom, and Germany was made partly by counting the years of corresponding phase. Taking the American chronology as standard, between 1821 and 1861

English long swings were out of phase with the American swings 44 per cent of the time; and German long swings, 68 per cent of the time. After 1860 tendencies to inversion became more important in England and less important in Germany. Since long swings both before and after 1860 ran separate courses with different durations in the three countries, they were never completely in or out of phase and gravitational influence on migration was usually more or less dispersed. In English or German cycle phases where dispersion was minimized the reference cycles showed a clear-cut inverted form with near concurrent timing or a short lead. At stages or in phases where dispersion was maximized, the tendency to inversion was impeded and our cycle patterns became irregular in timing and form. So also the American reference patterns for immigration responded weakly to our first reference contraction during 1836-43 because the course of agricultural settlement and immigration oriented to it was not adversely affected. Because of these composite irregularities, total reference amplitude for our three countries was only 57 per cent of its total specific amplitude. Also one turning point out of six was unmatched. However, despite disturbance, a primary tendency to lead shows up on most of our measures.

NOTES

1. The technical methods used to extract the short and long patterns were set forth in [176]. On orthogonal functions generally, see [68, pp. 434 f.].

2. See [92, 229ff.; 160, p. 384].

3. I cite the following decade increments collected from Alvin S. Tostlebe [255, pp. 50–51, 101, 135].

	Unit	*1910*	*1870's*	*1880's*	*1890's*
1. Additions to physical capital, real estate	billions of dollars	10–14	8.1	5.9	6.6
2. 5-year average gross farm income	billions of dollars		1.30	.98	1.25
3. Land in acres	million acres		128.4	87.1	40.2

4. British statistics did not distinguish nationality of passenger regardless of port of embarkation but before 1850 between 71 and 72 per cent of American immigrants of British nationality were of Irish extraction. This percentage shows up by annual count from 1820 to 1843 of incoming passengers to the

United States [see 262, p. 57]; for the distribution of foreign-born counted in the 1850 Census, see [250, p. 96].

5. See charts of emigration from the United Kingdom and separately from England and Wales in [51, Diagram B, C, pp. 21, 22].

6. *Coefficient of Correlation Immigration and Commodity Imports (Standard Deviation Units from Trend):*

	1823–60	1866–1900	1901–23
Concurrent timing	.108	.755	.670
Immigration leading 1 year	.373	.557	.000
Immigration lagging 1 year	.254	.124	.000
Regression coefficient			
highest correlation	–.297	.767	.826
	(.115)	(.113)	(.188)

7. [245, pp. 93 ff., 116 f., 159 ff.]. Timing relationships at turning points (p. 93 f.) was confirmed by lead-lag correlation analysis (p. 159 f.) which clearly showed the 1870 breaking-point (really 1864–90 zone). (See his detailed Appendix 2, pp. 253–262.)

8. [278, p. 198]. For a generalized evaluation of "push" and "pull" in international migration, see [237, pp. 45 f.].

9. [150, p. 342.]. W. D. Borrie in his illuminating report noted that "until about the 1860's the "push" of land scarcity in Europe was strongly reinforced by the "pull" of cheap land in the New World . . . " [26, p. 4].

10. This burst of German migration in three years alone, 1853–55, carried almost half a million persons out of Germany annually. In some regions of the Rhineland, population diminished (Hesse, Würtemberg, and Baden). The German migration wave took off in 1843 and reproduced the pattern of the U.S. growth wave of that period. See [88, II, pp. 334ff., 347f.]; German building waves before 1867 are only tentatively suggested on the basis of behavior in Berlin, Bremen, and in the price series.

11. See on this score the intensive investigation of Oscar Morgenstern [194, Chap. 2]. He found that in 90.2 per cent of the 419 months between September 1879 and August 1914 German and English short cycle phases were in unison while each was in unison with the American phase 64.9 per cent and 62.3 per cent, respectively (p. 49). For interest rates short and long the phase coordination is more equal (see pp. 113, 456). If interest rates are not merely compared at turning points but over their full range by correlation analysis, German-English solidarity and American "isolation" is again indicated (pp. 165, 395); for comparison in "share" prices, see p. 533.

12. Though this inversion was indicated by Cooney and Cairncross, it was classically elucidated by Brinley Thomas [245, Chap. 11]. Thomas thought that inversion could be traced back to 1847 and other writers have suggested it goes back to the 1820's. For discussion of these claims see [117; 66]. Our tabulation suggests, however, that a degree of inversion and convergent movement persisted and that only the relative balance shifted. The pattern of experience between 1832 and 1850 was generally shared. Since Britain experienced three wave movements between 1816 and 1859 while the United States experienced

only two (1821–1861), tendencies to overlap and inversion shifted. Then, too, in the 1850's a plateaued movement developed in both countries. Thus we agree with Habakkuk that "there was no regular alternation between British and American building fluctuations" [116, p. 204] before 1870 but with Lewis we shy away from finding in Britain only standard business cycles and not long swings.