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Demographic Cycles and Economic Growth: The Long Swing Reconsidered

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*Demographic Cycles and Economic Growth:
The Long Swing Reconsidered*

FOR many Western countries the history of the last two centuries reveals both a sustained rise in per capita output and a tendency toward a more equal distribution of the economic product. The experience has been characterized, however, by repetitive fluctuations in the levels and growth rates of aggregate production and its components. The length of the shorter of these fluctuations, the business cycle, ranges from the 40- to 45-month inventory cycle to the so-called Juglar of seven to ten years.¹ Two other classes of interruptions in the secular trend have also been singled out for study by economic historians. The first is the Kondratieff cycle, a movement of roughly fifty years which has been primarily identified in price series.² The second is the Kuznets cycle, or "long swing," which in length is between the Juglar and the Kondratieff.³ The long swing constitutes the primary theme of this study.⁴

In preparing this study the author received significant research assistance from Richard H. Keehn. Comments on an earlier version of the study by Moses Abramovitz, W. D. Borrie, Jack Dowie, R. A. Easterlin, Duane T. Kexel, Simon Kuznets, Peter Lindert, N. B. Ryder, and Jeffrey G. Williamson were also most helpful. An earlier version of this study was presented at the Fourth Congress of the International Economic History Association, Bloomington, Indiana, September 1968.

¹ Controversy exists over the exact length of the business cycle. See R. C. O. Matthews, *The Trade Cycle* (Cambridge, [Eng.]: The University Press, 1959), ch. 12.

² For an excellent review of the Kondratieff cycle literature, consult George Garvy, "Kondratieff's Theory of Long Cycles," *The Review of Economics and Statistics*, XXV (Nov. 1942), 203-20.

³ Professor Kuznets describes long swings as follows: "By long swings we mean up and down movements extending over periods substantially longer than those associated with business cycles (i.e., four to eleven years). But these periods must be sufficiently brief so that these swings can be detached in series extending over secular stretches observable in social data—at most over a century and a half to two centuries. It follows that the duration of the swings so defined is limited to a range

To date, the analysis of long swings has been based mainly on American experience, in which long waves in investment, output growth, migration, capital flows, and population change have ranged from fifteen to twenty-five years. It is generally agreed that demographic factors and, in particular, changes in birth and migration rates form an important element in American long swings. For example, Kuznets emphasizes the role of population growth in generating waves of "population sensitive" and "other" capital formation. The differential productivities of these two investment components in turn influence the rate of expansion of *aggregate supply*, and thus economic growth.⁵ Abramovitz, on the other hand, stresses the prominent role of swings in *aggregate demand* which arise from the tendency of private long-run expenditure decisions to cluster—a phenomenon largely due to surges and lapses in household formations, births, and migration. He forcefully argues that the stability of secular expansion depends on the balance between long-run supply and demand, and that imbalances can cause major interruptions in economic growth in the form of long swings.⁶ Recently Easterlin, building largely on the Abramovitz interpretation of the role of demographic factors in the long swing, has developed a theory describing this relationship; he has additionally applied the model to past and projected future American long swings.⁷

While the regular duration of long swings suggests that they may be self-generating in nature, scholars have been reluctant to advance self-generating or "cyclic" interpretations of these movements. Neither the empirical literature nor the theoretical analyses have thus far revealed factors which yield a "cycle" or, for that matter, systematic influences explaining the turning points of the identified Kuznets cycles.⁸

from over a decade to not much longer than a half a century." Simon Kuznets, "Long Secular Swings in the Growth of Population and in Related Economic Variables," *Proceedings of the American Philosophical Society*, CII (Feb. 1958), 25.

⁴ An extensive bibliography of the long swing literature has been compiled by Richard A. Easterlin, "Economic-Demographic Interactions and Long Swings in Economic Growth," *American Economic Review*, LVI (Dec. 1966), 1100-4.

⁵ Simon Kuznets, *Capital in the American Economy* (Cambridge: Harvard University Press, 1961), ch. 7.

⁶ Moses Abramovitz, "The Nature and Significance of Kuznets Cycles," *Economic Development and Cultural Change*, IX (Apr. 1961), 225-48.

⁷ Easterlin, "Economic-Demographic Interactions."

⁸ For a particularly skeptical view of the "cycle" interpretation of the long swing, consult Irma Adelman, "Long Swings—Fact or Artifact?," *American Economic Review*, LV (June 1965), 444-63.

One possible model of cyclical long swings that has received relatively little attention is based jointly on the demographic concept of the "generation" and the economic concept of the "life cycle." In this model, demographic cycles stemming from a variety of causes play an *active* role in determining output swings, rather than responding passively to economic change. This concept of major cycles is hardly new; it was proposed as early as 1937 by August Losch in his description of war-induced swings in German economic growth.⁹ The relatively minor role which has been assigned to the self-generating demographic mechanism¹⁰ in explaining long swings is due largely to the focus of research on American experience. For example, Easterlin has argued:

... fluctuations in demographic variables have typically arisen from movements in immigration or the "rate" components of change rather than from an echo effect of a surge in births, operating through the aging and mortality component. Such demographic fluctuations were induced by, rather than initiated, changes in economic activity, although in turn they had important feedback effects.¹¹

Even in the American case, however, Easterlin notes that the post-war baby boom, with its accompanying demographic echo effects, may play a significant role in altering the course of future Kuznets cycles.¹²

If we shift our attention from American historical experience as the prototype of Kuznets cycles and concentrate instead on factors other than war losses which might produce a major change in the age structure of a population (in particular, migration), a demographic mechanism could well emerge as a central element in explaining long swings. It is the thesis of this article that demographic factors, specifically changes in the age distribution, play a critical role in the long swings of several countries.¹³

⁹ A. Losch, "Population Cycles as a Cause of Business Cycles," *Quarterly Journal of Economics*, LI (Aug. 1937), 649-62. See also A. R. Hall, "Some Long Period Effects of the Kinked Age Distribution of the Population of Australia 1861-1961," *The Economic Record*, XXXIX (Apr. 1963), 43-52.

¹⁰ The use of the term "self-generating" does not refer to amplitude considerations (i.e., whether the amplitude increases, decreases, or is constant over time); rather, it refers to an explanation of the turning points of cycles.

¹¹ Easterlin, "Economic-Demographic Interactions," p. 1086.

¹² *Ibid.*, pp. 1086-92.

¹³ A question may arise regarding the somewhat longer cycles implied by the model developed here when they are compared to the durations of long swings identified by Kuznets, Abramovitz, Easterlin, and others. Two points should be made. First, the concept of the cycles in this study is wholly consistent with Kuznets' and other researchers' boundaries of major waves denoted as long swings. Second, the distinc-

We begin with a brief discussion of the theoretical connections between demographic change and selected elements of economic behavior, highlighting household behavior over its life cycle. We argue that changes in the age structure of the total population solicit life-cycle responses which, in turn, influence aggregate economic performance. Since the changing age structure is "cyclical" in nature, the economic performance will also tend to form long cycles. Next we present a case study of this mechanism. Empirical findings are examined for Australia, a country which illustrates well how major changes in the age distribution of the population can influence the course of aggregate economic growth. A theoretical analysis of these economic-demographic interactions is presented in the following section. Finally, in the last section we present extensive evidence which reveals major structural changes in the age distribution of the population in a wide range of countries and regions. Furthermore, it is shown that these age-compositional movements have resulted in cycles of considerable duration and amplitude. The evidence supports the view that the economic-demographic framework developed in this article may provide an explanation of variations in secular economic growth in general, and of the long swing in particular.

A LIFE-CYCLE BEHAVIOR OF THE HOUSEHOLD

Even though there are numerous life-cycle patterns of economic behavior, the *homo economus* considered here is characterized as playing just three major economic roles during his lifetime: (1) he participates in the labor force, (2) he establishes a separate residence, and (3) he allocates his income between savings and expenditures. The justification for focusing the analysis on these three variables is based on their aggregate economic importance and on their prominent role in the two analytic elements of the long swing—long-run supply (savings and labor force additions) and long-run demand (residential construction). A representation of household life-cycle decisions is found in Chart 1.

Labor force entry, which is described by age-specific participation rates, is the first major phase of life-cycle activity. Labor force participation rates vary over time for several reasons: the emer-

tion between "long swings" and "other" major cycles should lie not in a single statistic summarizing their character but rather in their theoretical bases. Since a comprehensive model of the long swing has not yet been developed, a debate on cycle length cannot be resolved at this stage of the research.

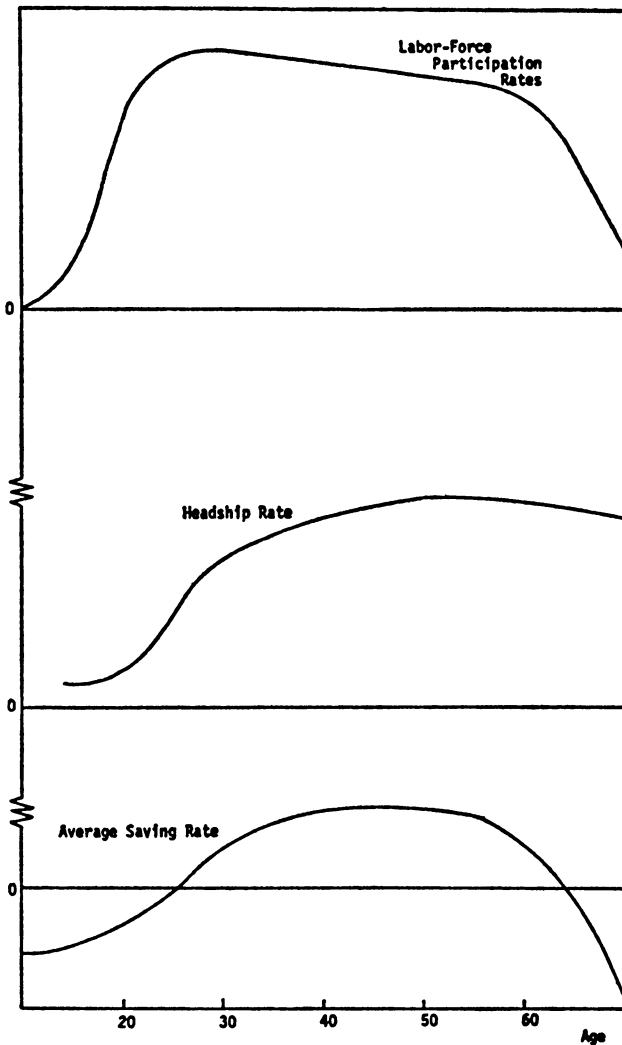


CHART 1. Selected elements of life-cycle behavior.
 Source: See text.

gence of new laws and social customs, the changing role of women as economic development takes place, and the changing educational requirements of the workforce. Chart 1 presents a characterization of labor force behavior which illustrates the “typical” pattern found in the countries we are considering.¹⁴ The peak level of participa-

¹⁴ Even though the male participation rate reaches its peak in the 35 to 50 cohort, the peak in the *total* labor force rate occurs sooner since the female rate reaches a maximum much earlier. The pattern of labor force participation rates depicted in

tion occurs in the 20 to 24 age group, while the greatest change in the participation rate is found between ages 15 and 19.

The next major reflection of life-cycle behavior by the economic man is the establishment of a separate household. A proxy for this household decision is the "headship rate,"¹⁵ a measure which represents the proportion of household heads by age and sex in a population. In Chart 1 the headship rates reveal a systematic pattern, rising to a peak in the 50 to 54 cohort.¹⁶ Changes in the rate reach a maximum in the 25 to 29 cohort. While headship rates may change with economic development, Campbell has found that for the United States this statistic has remained remarkably stable for long periods of time.¹⁷

Finally, the course of life-cycle savings is presented as the third panel in Chart 1. The pattern describes an individual who attempts to maintain a roughly constant standard of living throughout his lifetime and whose average income rises to a peak at middle age. A peak in average savings occurs at ages 40 to 55.¹⁸

In summary, we are postulating that life-cycle patterns of economic behavior produce a regularly timed sequence of major household decisions. A peak in workforce additions occurs at ages 15 to 20, new residential construction demand centers on ages 25 to 29, and average savings reaches a maximum around ages 40 to 55. In the aggregate, the presence of major changes in the age-distribution of the population will result in surges and lapses in savings, labor force additions, and residential construction. Before considering the theoretical implications of these economic-demographic interactions, we will consider briefly an illustration drawn from Australian economic history in which these types of interactions significantly influenced the course of economic growth.

Chart 1 was derived from the male and female rates for "semi-industrialized" countries, as compiled by the United Nations, *Demographic Aspects of Manpower*, Report I, Population Studies No. 33 (New York, 1962).

¹⁵ For a detailed discussion of headship rates, together with an analysis of their role in residential demand in the United States, consult Burnham O. Campbell, *The Housing Cycle and Long Swings in Residential Construction: A Statistical and Theoretical Analysis* (unpublished Ph.D. dissertation, Stanford University, 1961).

¹⁶ The rates shown in Chart 1 reflect those found for the United States by Campbell. *Ibid.*, p. 407.

¹⁷ *Ibid.*

¹⁸ Optimal saving decisions rely on maximization of utility by appropriate discounting of expected future income and assets bequeathed, employing standard marginal equations. While the Modigliani-Brumberg formulation utilizes the assumption that the individual strives to maintain a constant standard of living over his lifetime, plausible modifications of this hypothesis which conform to age-specific,

DEMOGRAPHIC AND ECONOMIC CHANGE IN AUSTRALIA, 1851-1914

A dramatic change in the Australian age structure occurred in the 1850's, a period of phenomenal population expansion based largely on a massive influx of gold-seeking migrants. Between 1852 and 1861 the population increased by more than 150 percent. Chart 2, which presents annual estimates of the proportion of the total

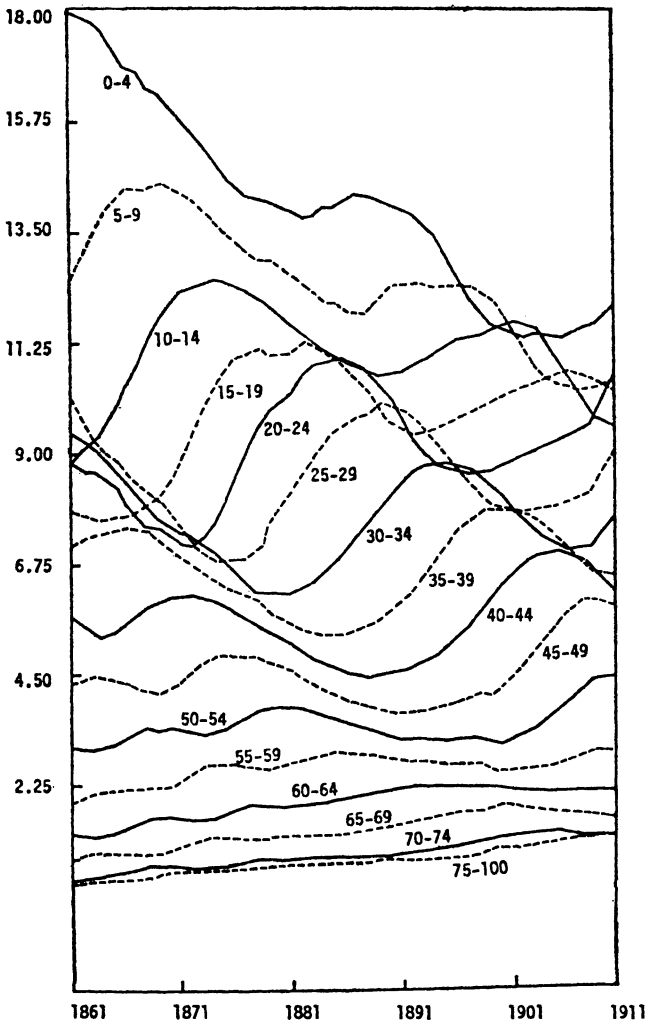


CHART 2. Selected cohorts as percent of total population: Australia.
 Source: Allen C. Kelley, "Demographic Change and Economic Growth: Australia, 1861-1911," *Explorations in Entrepreneurial History*, V (Spring/Summer 1968).

population in individual quinquennial cohorts, depicts the impact of this "demographic shock."¹⁹ Not only are the echo effects in the individual cohorts prominent, but the amplitude of the swings is significant. For example, the average range between the maximum and minimum growth rates of the 20 to 24 and 25 to 29 cohorts throughout two complete cycles exceeds 11 percent. The enormous magnitude of these cohort-specific growth rates is underscored when it is noted that total population showed a comparable increase of only 2.2 percent, or about one-fifth of the variation which was generated in major components in the total. Therefore, based on the life-cycle formulation of household behavior as presented in the previous section, one would expect Australia to experience long swings in labor force additions, residential demand, and household savings.

A useful way of summarizing these demographic influences on aggregate economic growth is to measure the impact of the changing age structure on each of the three economic variables. The calculations necessary to derive these measures are presented in considerable detail elsewhere.²⁰ Thus, we shall forego a discussion of the

empirically determined consumption patterns would not alter the basic average savings pattern described in Chart 1.

The savings rates in Chart 1 are calculated from Australian age-specific earnings profiles using the assumptions outlined in the text. For a detailed discussion of the estimates, together with a review of the theoretical literature, consult Allen C. Kelley, "Demographic Change and Economic Growth: Australia, 1861-1911," *Explorations in Entrepreneurial History*, V (Spring/Summer 1968), 256-60.

¹⁹ The demographic model producing the annual age-specific estimates of the Australian population is found in *ibid.*, pp. 215-25.

²⁰ *Ibid.*, pp. 228-46. Two individual sets of projected additions to the potential labor force were generated: the labor force *inclusive* and the labor force *exclusive* of all distributional changes. Each series was based on a pattern of age-specific labor force participation rates relevant to Australia during the period.

In computing the labor force series exclusive of changes in the age distribution, we used the age profile prevailing in 1881 and applied it to each year from 1861 to 1911. Experimentation with alternative age profiles did not provide results which differed significantly from those found using the 1881 series. The *difference* between the two labor force series represents additions to the labor force due entirely to shifts in the age distribution of the population.

An analogous calculation was made for changes in residential construction demand. Finally, for average household savings we experimented with a simplified version of the Modigliani-Brumberg model which uses information on Australian age-specific earnings profiles to generate a hypothetical average savings pattern for the economy as a whole.

The aggregate average savings ratio, $APS(t)$, can be taken as the sum of age-specific savings ratios, $S_x(t)/Y_x(t)$, each weighted by the proportion of total income earned at age x in year t , $Y_x(t)/Y(t)$. Thus,

$$APS(t) = \sum_x \frac{S_x(t)}{Y_x(t)} \cdot \frac{Y_x(t)}{Y(t)}. \text{ This may be rewritten as}$$

estimation procedures and focus instead on the results relevant to the present analysis. These results are presented in Chart 3. Each series represents changes in an economic variable based *solely* on the varying age distribution of the Australian population.

Cycles of approximately a generation in length are clearly revealed in all three series of Chart 3. The importance of these cycles can be deduced by examining the influence of age-distributional change on *total* change in each measure of economic performance. For example, alterations in the age distribution explained in excess of 20 percent of the total change in workforce additions throughout the fifty years. An even greater impact was apparent in residential demand where the comparable overall age-compositional effect exceeded 30 percent; it periodically reached in excess of 75 percent. Finally, variations around the average household savings rate due to comparable demographic factors ranged up to 40 percent.²¹ In three important economic aggregates, these results clearly indicate that demographic change played a major role not only in the total growth of each series but also in the generation of long swings of prominent amplitude and regularity.

AGGREGATE IMPLICATIONS OF DEMOGRAPHIC-ECONOMIC INTERACTIONS

The potential importance of age-compositional changes on the performance of three major economic variables has been argued on

$$APS(t) = \sum_x APS_x(\text{base year}) \cdot \frac{WF_x(t) \cdot P_x(\text{base year})}{\sum_x P_x(\text{base year}) WF_x(t)}$$

where,

$APS_x(\text{base year})$ is an age-specific average savings ratio for a base year;

$P_x(\text{base year})$ is the average labor productivity by age of the employed workforce in the base year;

and

$WF_x(t)$ is the workforce of age x in year t .

Thus, for any time t , and any age distribution of the workforce $WF_x(t)$, the aggregate savings ratio will be determined by the equation.

As a separate experiment we employed empirically determined life-cycle household savings rates to isolate the impact of age compositional changes on average savings. This measure is similar to that used to analyze labor force additions and residential demand. Both the Modigliani-Brumberg approach and the empirically determined rates produced similar aggregate savings patterns.

²¹ For example, if average household savings were 10 percent, a 40 percent variation would correspond to a range of 6 to 14 percent.

The experiments with the life-cycle model yielded savings with much greater cyclical amplitude than did the experiments using empirically determined savings rates. Since the savings data were available only in very wide cohorts, the resulting series contained considerable implicit smoothing. The savings rates in Chart 3 are thus likely to represent an *understatement* of the amplitude of the swings.

theoretical grounds and illustrated by Australian historical data. We now consider the implications of these demographic-economic connections on aggregate economic growth. Rigorous analysis of the interactions would require a comprehensive economic growth model incorporating the relevant demographic variables; however, the presentation of such a model is beyond the scope of this article. Consequently, we will present an analysis of the impact of demographic change on economic growth, with feedback occurring primarily through migration.

There are two connections between demographic and economic change at the aggregate level. First, the age-composition of the population influences the *level* of economic activity through its impact on average savings, average productivity of investment, and labor force size. Second, demographic change affects the *stability* of economic growth by altering the balance between the growth rates of long-run supply (savings and labor force additions) and long-run demand (new residential construction).

When considering the first of these connections, one would expect, *ceteris paribus*, that the level of economic activity would vary directly with the amount of household savings. Long swings in this variable would thus imply that aggregate output could be similarly influenced. Added realism can be achieved, however, by considering the remaining components of aggregate savings—government, foreign, and other domestic savings—and exposing their relationship to the household variable.

One might plausibly assume that governments generally pursue a balanced-budget policy and that saving and dissaving, calculated as budget surpluses and deficits, are small and insensitive to demographic change. However, certain elements of government spending may be quite responsive to population variations.²² This would be particularly true of public housing, social overhead capital associated with residential construction, and public education facilities. Since each of these three components possesses an age-specific determinant, changes in government savings may in fact result from alterations in the age structure of the population. (This assumes, of course, that other components of public spending are insensitive to age-specific demographic change.) In this case one would expect

²² Kuznets places considerable emphasis on the role of long swings in "population sensitive" capital formation. His definition of the "population sensitive" components includes, among other items, investment in railroads.

government saving to move inversely with the life-cycle demands of residential construction.²³ It thus follows that swings in household and government savings will move together since, as is shown in Chart 3, swings in household residential demand and average saving due to demographic factors move in opposite directions over the Kuznets cycle.

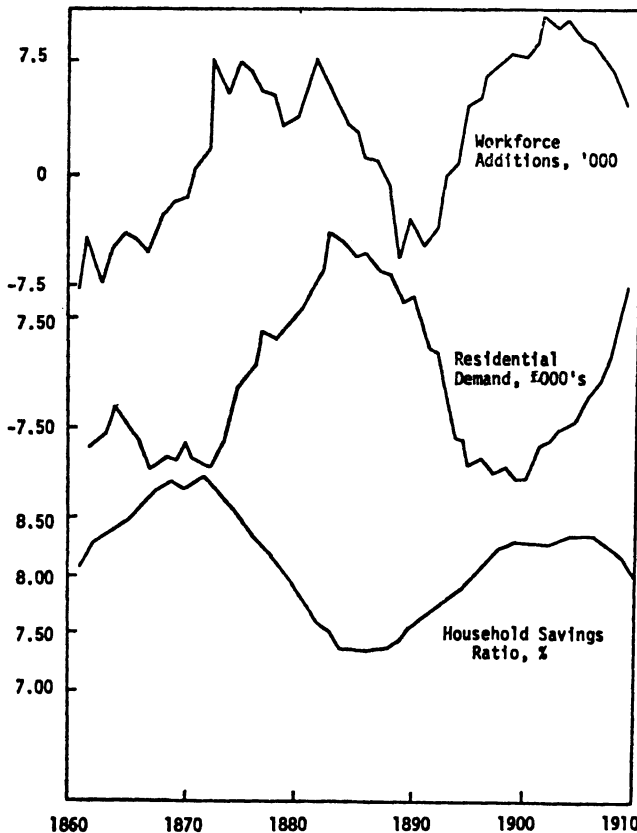


CHART 3. Age-compositional effects of workforce additions, housing demand, and average household savings ratio: Australia, 1861-1911.

Source: Allen C. Kelley, "Demographic Change and Economic Growth: Australia, 1861-1911," *Explorations in Entrepreneurial History*, V (Spring/Summer 1968).

The relationship of other domestic saving²⁴ to the life-cycle model is more difficult to determine. Profits, the source of business saving,

²³ Swings in the demand for education facilities lag behind those of residential construction by approximately one generation.

²⁴ "Other domestic saving" includes saving in the commercial, manufacturing, and agricultural sectors.

may in part be independent of domestic factors, relying on foreign market conditions which are exogenously determined. A priori, one would not expect these exogenous changes to be correlated with domestic life-cycle interactions. Profits, however, are additionally determined by domestic conditions which, in turn, are influenced by life-cycle connections: Labor costs are changed by demographic factors affecting labor force additions; product prices are influenced by swings in demographically induced demand. The precise manner in which these demographic elements affect levels of other domestic saving is complex and can be ascertained only by reference to an aggregate economic model.²⁵

It can be postulated that foreign and domestic savings are inversely related due to their substitutability. Thus, as domestic demand for investment exceeds the available domestic saving, interest rates will rise and induce an inflow of foreign funds. Insofar as demographic change is a determinant of the rate of domestic savings, it will also influence the foreign component of investable resources.

A final factor relating demographic influences to aggregate economic performance concerns the productivity of investment. Since residential structures and accompanying social overhead capital possess relatively high capital-output ratios, alteration in the composition of domestic investment, caused in part by variations in the population age structure, affect the aggregate output rate. Indeed, variations in total investment productivity due to "inverse" movements of "population sensitive" and "other" capital formation play a prominent role in Professor Kuznets' explanation of long swings.

We next turn to the stability of economic growth. The analysis, following Abramovitz, hinges on the maintenance of a balance between the growth of long-run supply and long-run demand. The life-cycle theory reveals an inverse relationship between the demand for investable resources (residential additions) and their supply (saving). In a country which, like Australia, has experienced a "demographic shock," an "imbalance" in the long-run supply-demand relationships can materialize at the aggregate level of economic performance. For example, a demographically determined expansion in demand will move the economy toward capacity production. *Ceteris paribus*, an inflationary situation may ensue. In an

²⁵ It should be noted that the business and commercial sector may be subject to its own life cycle through the impact of replacement demand on investment and output.

open economy, rising interest rates and high utilization rates will attract both capital and labor, thus mitigating the inflation and prolonging the expansion.²⁶ At some point, however, residential demand will likely decline due to demographic factors which originated *independently* of current economic conditions. Unless new elements of demand arise concurrently with diminished residential construction, excess aggregate supply may emerge and result in a deflationary impact on prices, migration, and foreign capital flows. Thus, the long-swing turning points can be *endogenously* explained by demographic factors.

Migration may accentuate the instability of long-run growth. During an expansion, migrants add to the supply of labor; but at the same time they generate a demand for additional residential structures and, given their age distribution, migrants will supply relatively limited financial resources to meet this demand. Additionally, migrants will *reinforce* the already abnormal age distribution, thus increasing the likelihood that self-generating demographic cycles will continue through time.

Although the connections discussed in this section comprise neither a model of the long swing nor a comprehensive analysis of the impact of demographic factors on aggregate growth output, two points have been established. First, using the same general framework employed by Abramovitz and Kuznets, it is possible to develop a model of long swings which, in contrast to their analyses, predicts long cycles and endogenously explains turning points. Second, the long swing may be based partially on a life-cycle framework of household behavior in which changes in the age structure of the population play an important role in secular economic expansion. On this point, however, we must confront the findings by Easterlin and others that demographic variations, at least for the United States, tended to play a *passive*, rather than an *active*, role in Kuznets cycles. Since this conclusion is largely founded on empirical considerations, we next turn to evidence which reveals the nature of demographic change in a large number of regions and countries.

EVIDENCE ON THE ORIGIN AND NATURE OF DEMOGRAPHIC LONG SWINGS

An examination of evidence of the origin and nature of long swings in the population age distribution serves several purposes:

²⁶ Allen C. Kelley, "International Migration and Economic Growth: Australia, 1865-1935," *THE JOURNAL OF ECONOMIC HISTORY*, XXV (Sept. 1965), 333-54.

First, it permits a preliminary appraisal of the applicability of the life-cycle demographic framework developed in this study. Second, an analysis of the relative timing of the cycles in different countries may lead to the formulation of hypotheses based on an international theory of development in which systematic migration and capital flows play important roles. Finally, the type of analysis undertaken for Australia might be repeated for other countries in an attempt to substantiate, refine, or refute the life-cycle demographic model of secular swings.

The choice of countries and areas to be examined for demographic long swings is based on two criteria: a priori knowledge of the likelihood of major demographic change in the form of migration or war losses and the availability of census data over sufficiently long periods. While the following list is far from exhaustive, the areas selected provide a representative cross section of the various causes of demographic cycles. They include the United States, the United Kingdom, New Zealand, Australia, South Africa, California, Canada, Israel, Ireland, the U.S. South, Mississippi, France, Germany, Sweden, Japan, Brazil, and Argentina.²⁷

The cross-country results are presented in charts giving the age profile of the population at several consecutive census periods. For each country the charts show a series of index numbers representing the percentage of the population in quinquennial cohorts at census years, divided by a comparable percentage for a base period. (The base period is typically the average of all years in the sample.) Thus the age profile at each census is compared with the "average" age distribution over a long period to determine whether major deviations from the population average through time are revealed. The charts further permit a direct comparison of cyclical amplitudes. (It should be noted that some charts are presented in one-half scale.)

The charts for many of the countries reveal two major trends which are largely unrelated to the demographic phenomenon of primary concern here. First, there is usually a decline in birth rates at some point in the period; and second, there is a reduction in mortality rates. These trends, when combined, show a general aging of the population which appears on the charts as a counterclockwise shift of the lines over time.

²⁷ A bibliography of data sources, prepared as an appendix, is available from the author upon request.

To facilitate a systematic treatment of the different cases, we have somewhat arbitrarily assigned each of the geographic areas to one of the following categories: (a) no demographic cycles, (b) demographic cycles originating from migration, and (c) demographic cycles originating from war losses. We conclude with a separate treatment of countries and regions which either fail to conform to one of these three categories or in which the data are not adequate to provide a satisfactory quantitative analysis.

No Demographic Cycles

It appears somewhat paradoxical that the two countries experiencing the largest immigration (United States) and emigration (United Kingdom) in the nineteenth century should be those in which the demographic cycles do not appear to be important.²⁸ Closer analysis, however, reveals that while the U.K. had heavy emigration in the 1800's, and the United States received a large influx of migrants, these flows never constituted more than a small percentage of the population base in either country. Furthermore, although immigration to the United States moved in waves, it was continuous and quite heavy for extended periods of time.²⁹ Thus, for migration to initiate demographic cycles it must be large relative to the size of the total population and be concentrated in a short time span. In neither the United States nor the United Kingdom were these joint criteria met.

A measure which highlights the impact of migration on total population change is presented in Table 1. In selected quinquennial periods net migration is compared with the size of the total population at the beginning of the period. In contrast to the United States and the United Kingdom, major deviations from the long-run trend are found for several countries including Canada (1901-1910), Argentina (1881-1890 and 1906-1915), Ireland (1846-1855), New Zealand (1856-1865), South Africa (1901-1905), and Australia (1851-1860).

²⁸ Our observations for the United States apply to the period after 1870, since quinquennial population data were not available before this date. The impact of the heavy migration of the 1840's on the age structure of the population may have been partially offset by Civil War losses.

²⁹ Richard H. Keehn has identified "demographic shocks" due to migration in many of the newly settled states after 1850. He is also studying the speed with which the population approaches a "normal" age and sex distribution.

TABLE I
 CUMULATED NET IMMIGRATION OVER QUINQUENNIAL PERIODS AS A PERCENT OF TOTAL POPULATION
 (BEGINNING-OF-PERIOD), FOR SELECTED COUNTRIES, 1846-1920

Period	Country										
	U.S. ^a	U.K. ^b	N. Zea-lands	Austra-lia ^c	S. Af-rica ^c	Cali-fornia ^d	Can-ada ^d	Ire-land ^d	Argen-tina ^d	Bra-zil ^d	Swe-den ^d
1846-1850								-11.2			
1851-1855	7.3			{ 126.5 }			{ -5.2 }	-11.4			-0.6
1856-1860	3.0							-6.9			-0.2
1861-1865	2.4		116.6	8.0		{ 28.6 }	{ -5.9 }	-8.0			-0.6
1866-1870	3.9		10.7	5.7				-6.8			-2.9
1871-1875	3.8		32.9	3.7		{ 30.7 }	{ -2.3 }	-6.7	8.0	0.8	-1.3
1876-1880	1.9	-1.3	14.5	6.8				-4.9	5.2	1.2	-1.8
1881-1885	5.1	-2.7	5.9	9.9		{ 29.4 }	{ -4.7 }	-8.0	11.0	1.1	-3.6
1886-1890	4.0	-2.2	-1.5	5.8				-6.0	20.6	3.0	-3.7
1891-1895	3.3	-1.2	2.4	0.7		{ 14.7 }	{ -3.7 }	-5.1	6.5	4.5	-2.6
1896-1900	2.2	-0.7	1.5	0.0					10.3	2.9	-1.0
1901-1905	5.0	-1.4		-0.4	26.4	{ 52.0 }	{ 13.3 }		11.3	1.6	-2.3
1906-1910	5.6	-2.1		1.4	7.0				22.8	1.9	-1.3
1911-1915	4.3					{ 37.0 }	{ 3.2 }		14.6	2.5	-0.7
1916-1920	0.7								2.3	0.2	-0.0

^a The migration figures represent immigration only. Imre Ferenczi and C. Wilcox, *International Migrations*, Vol. I (New York: National Bureau of Economic Research, 1929), p. 236; U.S. Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1957* (Washington, D.C., 1960), p. 7, Series A1-3.

^b Migration is to extra-European countries only. B. R. Mitchell and Phyllis Deane, *Abstract of British Historical Statistics* (Cambridge, 1962), pp. 12, 50.

^c Ferenczi and Wilcox, *International Migrations*, pp. 236-37; *Statistics of the Colony of New Zealand for the Year 1897* (Wellington, 1898).

^d Allen C. Kelley, "Demographic Change and Economic Growth: Australia, 1861-1911," *Explorations in Entrepreneurial History* (Spring/Summer, 1968).

^e The 1904 total population figure was used for both comparisons. Transvaal and Orange Free State were excluded from the calculations. *Census of the European or White Races of the Union of South Africa* (Capetown, 1911); Ferenczi and Wilcox, *International Migrations*, p. 1053.

^f Margaret Gordon, *Employment, Expansion and Population Growth* (Berkeley: University of California Press, 1954), p. 6.

^g Decennial statistics are presented since a quinquennial breakdown of the data was not available.

^h The Keyfitz migration figures were used. Ferenczi and Wilcox, *International Migrations*, pp. 236-37. M. C. Urquart and K. A. H. Buckley, *Historical Statistics of Canada* (Cambridge, 1965), p. 23.

ⁱ The migration figures represent immigration only. Ferenczi and Wilcox, *International Migrations*, pp. 265, 730; Mitchell and Deane, *Abstract*, p. 12.

^j Only three censuses were available throughout this period, 1869, 1895, and 1914. To obtain beginning-of-period total population changes, interpolation between census figures was carried out by assuming a constant rate of natural increase. The migration figures represent immigration only. Ferenczi and Wilcox, *International Migrations*, p. 236; *IV Censo General De la Nacion, Tomo I, Denso De Poblacion* (Buenos Aires, 1946), p. 1.

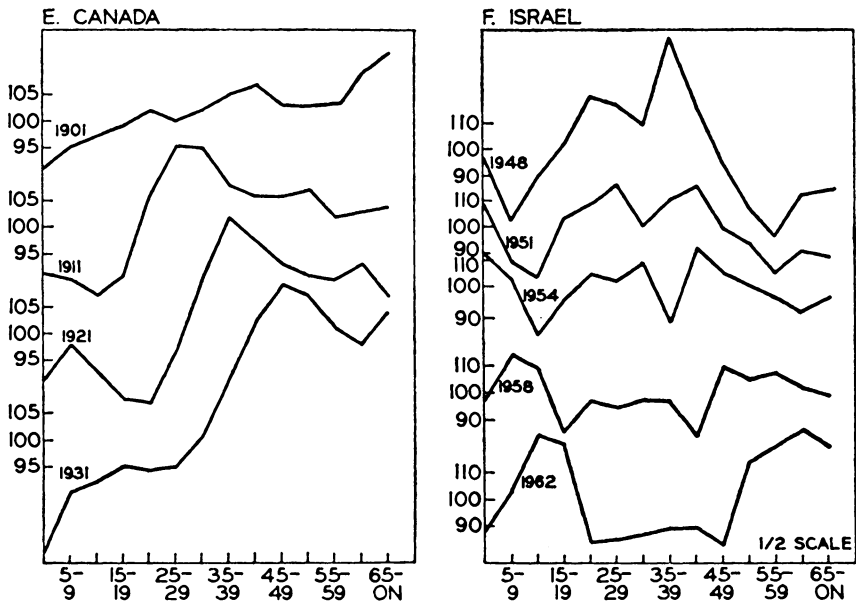
^k Estimation procedures are identical with those used for Argentina. Ferenczi and Wilcox, *International Migrations*, p. 236; *Apndice Do Anuario Estatístico Do Brazil 1960* (Rio De Janeiro, 1960), p. 8.

^l Ferenczi and Wilcox, *International Migrations*, pp. 230-31; *Historisk Statistik for Sverige 1 Fefolkning 1720-1950* (Stockholm, 1955), pp. 3-4.

Demographic Cycles Originating from Migration

Several areas in which demographic change appears to play a significant role are shown in Chart 4 A to F. The first four, New Zealand (A), Australia (B), South Africa (C), and California (D), represent relatively empty regions which attracted a large and concentrated influx of migrants in response to major gold discoveries.³⁰ All but the last region were members of the British Commonwealth, and thus received migrants primarily from the United Kingdom. The Canadian migration (E) occurred shortly after the turn of the century, resulting in a movement which, as seen in Table 1, terminated a long period of net emigration.³¹

Australia, New Zealand, and California appear to have sustained the greatest "shock" to their age profiles. The contrast in impact on the age structures of Australia and New Zealand, on the one



³⁰ Additionally, the Boer War had a major impact on the flow of migrants to South Africa.

³¹ Long swings in Canada before the turn of the century have been identified by D. J. Daly, "Kuznets Cycles in Canada," a paper presented to the Canadian Political Science Association, March 13, 1962 (mimeographed), p. 16. The timing of the swings was quite similar to that found by Abramovitz for the United States. The major exception appears at the turn of the century when, as noted above, the role of demographic change may have entered more prominently into the Canadian long swing.

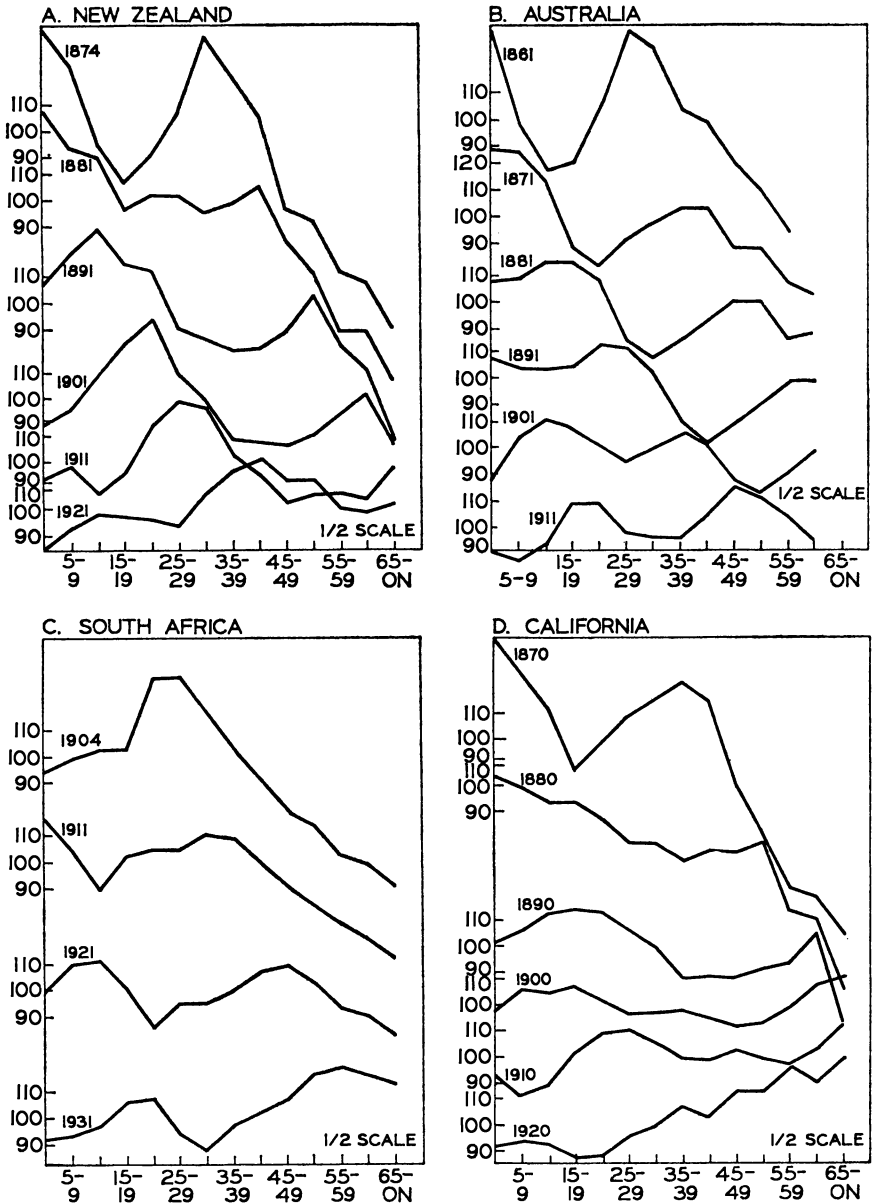


CHART 4. Percent of total population in quinquennial cohorts relative to a base cohort ($\frac{P_{1x+5}}{P_{1x}} \cdot 100$): selected countries and census years.

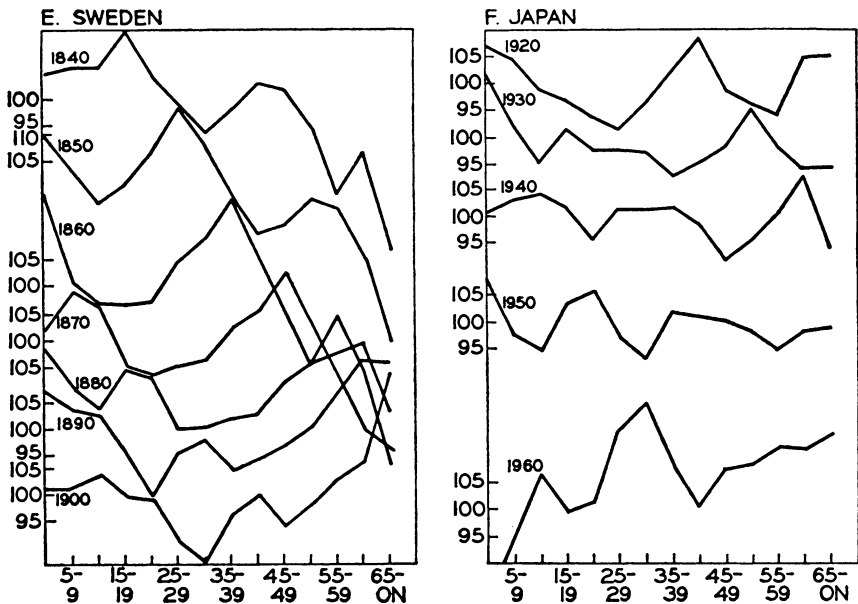
hand, and California, on the other, is delineated in the charts, and partially explained by the results shown in Table 1. While Australia

and New Zealand experienced subsequent periods of low migration relative to the initial major influx, California experienced several periods of high and sustained migration throughout the period. These recurrent surges, each quite substantial, tended to attenuate the amplitude of cycles that otherwise would have occurred.

Israel (Chart 4F) illustrates a contemporary case in which migration dramatically altered the demographic structure. From 1948 to 1951 Israel's population more than doubled as a result of massive immigration from the European displaced persons camps. The Israeli migration possessed at least two somewhat unusual features. First, it reinforced an already skewed age distribution of the population. Second, it had a relatively balanced sex distribution. These facts markedly influenced the subsequent cycle in births which, as noted in Chart 4F, became extremely pronounced by the census of 1958. In fact, the echo effects of Israeli migration are stronger than those of any other country we have examined.³²

Demographic Cycles Originating from War Losses

There are two phenomena in modern history which generally



³² Taiwan represents another case of migration similar in many respects to the Israeli case. Unfortunately, data constraints preclude a quantitative examination of the impact of migration on Nationalist China.

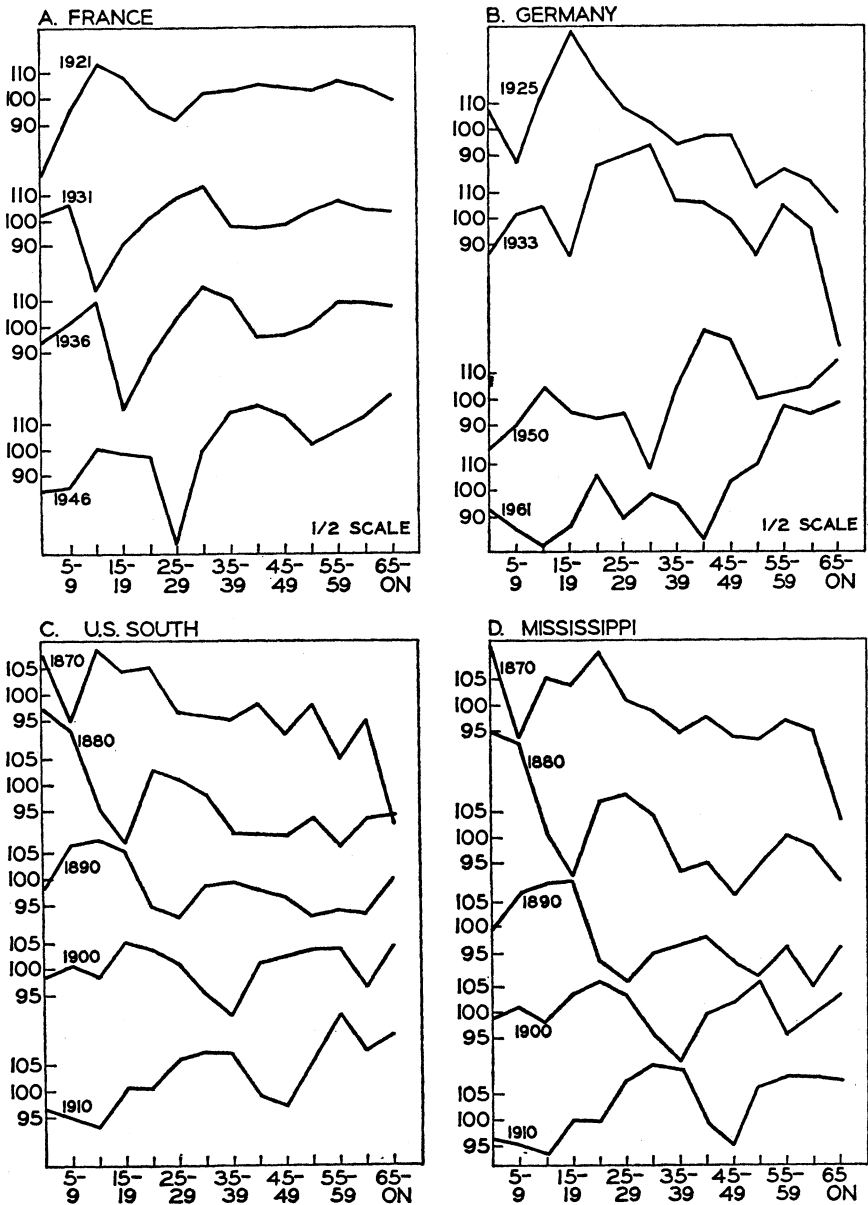


CHART 5. Percent of total population in quinquennial cohorts relative to a base cohort $(\frac{P_{1x+5}}{P_{1x}}) \cdot 100$; selected countries and census years.

account for massive age-specific population losses: war and concentrated emigration. Four examples of the former are provided in

Chart 5 A to D for France, Germany, the U.S. South, and Mississippi, respectively. Irish demographic fluctuations illustrate the impact of emigration.

In the French experience the demographic effects of World War I are clear. As shown in Chart 5A, war losses are revealed in the 1921 census by a relative dearth in the 0 to 10 and 20 to 30 cohorts. The typical postwar baby boom, clearly seen in the 1931 and 1936 censuses, tended to establish firmly the population cycles deriving from the initial shock to the age structure. World War II, occurring approximately one generation after World War I, reinforced the pattern and resulted in a cycle of sufficient strength to have a pronounced effect on the growth and development of France in later decades. The German (East and West, Chart 5B) and Russian cases (not presented here) are in most relevant dimensions quite similar to that of France.

The American South (Chart 5C) and several of the individual states (of which Mississippi [Chart 5D] is representative) experienced significant Civil War losses which initiated a pattern of long swings which continued for many decades. Since the swings in this region are not reflected in the U.S. total, an argument can be made that without disaggregation the nature and significance of the American long swing may be partially obscured. Thus, major segments of the United States *did* possess demographic cycles which plausibly played a role in surges and lapses of income and output. The importance of this hypothesis lies in its apparent contradiction of the findings that demographic change played a passive role in the American long swing. The issue cannot be resolved here, but clearly future research is required to assess in greater detail the nature of possible regional demographic-economic interactions and their impact on long swings in aggregate U.S. performance.

Additional Evidence

The Japanese case, depicted in Chart 5F, merits separate treatment. As distinct from the long swings described for many of the other countries, Japanese major cycles do not appear to be the result of an initial shock. Also, the expected wartime drop in the youngest age bracket did not occur, although a large decline does emerge in 1955—possibly reflecting the impact of general economic progress and legalized abortion. Furthermore, immigration and emigration seem to provide little explanation of the results, since

these flows were never very large relative to Japan's immense population base. Rather, the cycles seem to be based on strong, concentrated fluctuations in birth and/or death rates.

The Swedish experience, depicted in Chart 5E, is similar to that of Japan. Here again conspicuous cycles are evident. While one would expect emigration in the last half of the nineteenth century to have an effect on the age distribution of the population, the demographic cycles were evident beginning in early to mid-nineteenth century. As in Japan, the cycles appear to be more sensitive to changes in birth and death rates than to external shocks. The effect of emigration was to reinforce the preexisting pattern.

While data constraints for several countries prevent a meaningful examination of demographic long swings, there is substantial evidence supporting the existence of these cycles. Ireland, for example, sustained a very large negative shock in the age structure during the decade following the famine. However, significant errors in the census data preclude a quantitative appraisal of the impact of Irish emigration.

Similarly, while quinquennial age-specific census data on Argentina are unavailable, a concentrated influx of migrants in the periods 1881-1890 and 1906-1911 (see Table 1) add plausibility to the hypothesis that swings in the age structure played a role in the economic expansion of this nation. In contrast, even though Brazilian migration was *absolutely* large during several periods, its impact places Brazil in a category with the United States and the United Kingdom, in which migrant-induced alterations in the age structure were not of major long-run importance.

Conclusion

While elements of demographic change have always played an important part in explanations of long swings, endogenous echo effects in births have frequently been assigned a passive role. And while speculative explanations of long-swing turning points have been abundant, the theory is conspicuously void of elements which would characterize these movements as "cyclical" phenomena.

In this article we argue not only that echo effects in births may be a relatively prominent feature of long swings, but also that self-generating cycles may theoretically follow. This argument is based on a systematic pattern of life-cycle behavior, occurring jointly with aggregate variations in the population age structure. The manner

in which life-cycle behavior interacts with demographic change to affect aggregate output and employment is also considered.

In an attempt to appraise the applicability of this framework, we show that variations in the age structure are produced by a large number of causes and are widely experienced. Age-specific demographic long swings are manifested under a variety of conditions: in regions of heavy emigration, in regions ravaged by internal or by international war, in regions both with and without a substantial demographic shock, and in historical or contemporary settings. Even for selected areas of the United States, demographic long swings in the nineteenth century are identified.³³

The evidence we have presented, while necessary, is not sufficient to demonstrate the existence of long swings in aggregate output in the regions considered or the significance of demographic factors in those swings which did occur. However, a case has been made on both theoretical and empirical grounds that age-specific demographic change was an active determinant of trends and variations in secular economic expansion in many countries and regions. The final appraisal of the role of demographic change in the process of economic growth clearly will require the development of aggregate growth models incorporating relevant demographic elements and the confrontation of these models with the historical economic and demographic record.³⁴ The returns from this ambitious undertaking in economic and demographic history may be high indeed.

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³³ Furthermore, as Easterlin notes, the demographic pattern established by the postwar baby boom may emerge as an important influence on future secular variations of American economic performance.

³⁴ A model in which age-specific factors, births, and migration are endogenous is currently being developed by the author.