POPULATION CYCLES AS A CAUSE OF BUSINESS CYCLES[1]

SUMMARY

Effect of population developments not well understood, 649.— I. Population growth shows great waves, mainly caused by great wars, 650. — The German figures since the Napoleonic Wars, 651.— II. Co-variation with business cycles, 654.— III. Population growth requires new capital equipment, 657.— Such expansion involves less risk than that inspired by technical progress or by the opening of new markets, 658.— The theory explains well-known phenomena of the business cycle, 659.— Limitations of the theory: intentional simplification, 660; uncertainty as to other countries, 660; cycles differ widely in details, 661.

Most of the more important factors by which economic life is determined have been pretty satisfactorily dealt with. We have a fairly well established stock of knowledge of these relations. Some matters, however, are less clear. Population, for example, is usually included among the main factors of economic consequence. But how well do we understand it?

The prevailing opinion still regards changes in population as *results* of economic developments, as Malthus did, and as all those do who point to such facts as the familiar one that marriages and births reflect the business cycle. No doubt there are such reflections, but their range of size makes most of them negligible. The thesis of the present paper is that the relation between population and business is just the other way round: changes in population are among the main *causes* of economic changes. Let us disregard the secular movements of population and confine ourselves to the last hundred years, or even to the problems of our own times. In this sphere there are three developments of population that concern our economic situation most deeply. These are (1) the increase in the expectation of life, which has nearly doubled within less than a century, raising many economic problems, of

1. Paper read at the annual meeting of the Econometric Society in Chicago, December 1936.

which the burdens for old-age pension systems are but a foretaste; (2) the increase in birth control, with its sweeping effect on the capital market; and (3) fluctuations in the increase of population. It is upon this last point that I wish to enlarge here. I maintain that, at least in Germany, these fluctuations were the main cause of business cycles. The proof of this will be in three steps: first that large cycles of population movement exist, secondly that they fit fairly well with production series, and thirdly the explanation of this co-variation.

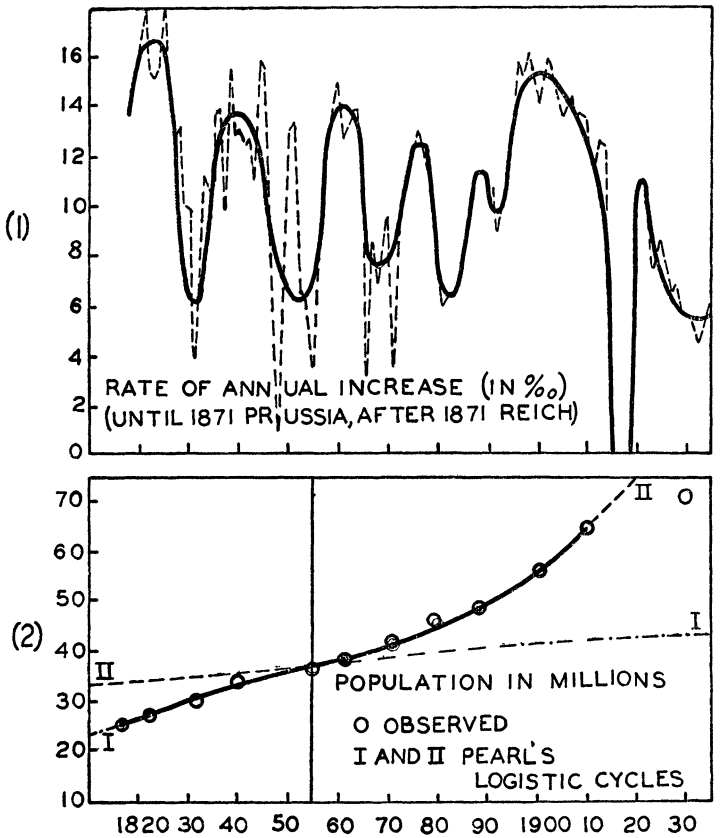
I

Population Cycles

While the movement of population shows unimportant and irregular fluctuations which seem to be mere reflections of economic, sanitary and other conditions, we find quite clearly great waves, the main cause of which are the great wars. The deficit of births during a war and the surplus of births in the immediate postwar period repeat themselves about thirty-three years later, when the new generations are at their time of highest fertility. For the same reason thirty-three years later a third wave occurs. Of course these subsequent waves become broader and broader, flatter and flatter, and after a hundred years entirely interfere with each other, so that it may roughly be said that a war calls forth a set of three full cycles of a hundred years duration in all. Two things usually happen to these cycles: they are either reinforced or disturbed by cycles resulting from later wars. For the first possibility Sweden is an excellent example. There it happened again and again that at the end of a cycle a new great war renewed the waves, with the result that there was a continuous succession. The regularity is so great that in each century about the same quinquenniums fall into the same phase. There was for instance a peak of births in 1720–25, 1820–25, 1920–25; again in 1650–55, 1750–55, 1855–60; few children were born around 1635–40, 1735–40, 1835–40, and probably around 1935. In other cases cycles interfere with each other, so that shorter fluctuations arise.

A good example of this is the development of the German population after the Napoleonic Wars, which is shown on the first graph.

GROWTH OF THE GERMAN POPULATION



Sources: Chart 1: Free hand trend. Original data from A. LOSCH, Bevolkerungswellen u. Wechsellagen (1817–1910), and Statistiches Jahrbuch fur das Deutsche Reich (1911–1935).
Chart 2: R. Pearl, Biology of Population Growth, 1925, pp. 21 and 221.

It may be of some interest to compare this with Mr. Pearl's logistic curve of population growth. In Mr. Pearl's opinion[2] the German population received an impulse towards

2. R. Pearl, Biology of Population Growth, 1925, p. 20.

increase twice during the last century, each increase following a logistic curve as on chart 2. He draws the dividing line around 1855. But a comparison with chart 1 makes it clear that the downswing of the increase in population preceding this dividing year was just a repetition of another downswing thirty-three years before which was due to bad harvests and above all to the war of 1813. In Mr. Pearl's interpretation, however, this low rate of increase from 1846–57 would be a sign that economic possibilities were close to being fully used — an explanation which seems to me to be more difficult and harder to support. As in Pearl's theory the fact that our

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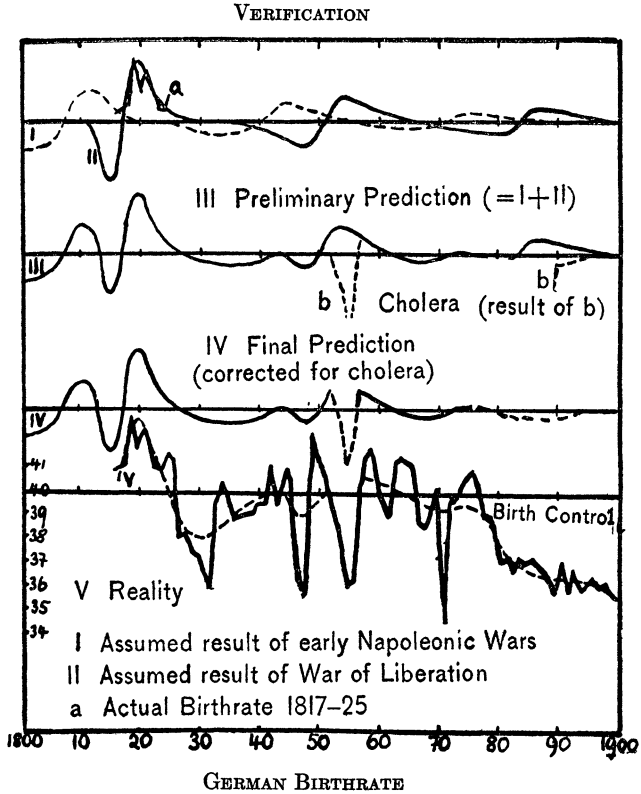


Source: A. Lösch, Bevolkerungswellen u. Wechsellagen, Jena 1936.

means of living are limited results in diminishing the rate of population growth, so in Corrado Gini's theory[3] a decrease in reproductive powers has the same effect. Whether or not both these most stimulating ideas are right, most of the available data cover too short a period of time to be sufficient for the verification of such secular laws. It is still very difficult to separate satisfactorily the secular trend, to which these laws apply, from those fluctuations due to wars, and for the last decades also from some other disturbances. Mr. Pearl will find it hard to prove that the trough of the 'fifties is more than a mere repetition of a previous trough. And so too Mr. Gini's task of showing that reproductive powers are definitely declining is rendered difficult by the fact that not only age distribution[4] but, strangely enough, specific fertility as well is fluctuating in consequence of the wars.

In order to determine whether the somewhat complicated movement of the German birth-rate during the last century can be sufficiently explained as a result of the Napoleonic Wars I took the actual figures from 1817–25 (curve *a* on chart 3), together with the history of those wars, and made an extrapolation on this basis for the rest of the century. Curve I shows the fluctuations of the birth rate as they ought to have resulted from the early Napoleonic Wars — if the theory is correct. Curve II shows similar fluctuations following the war of 1812–15. By adding both curves we get a preliminary forecast represented by curve III. Its troughs and crests coincide fairly well with those of the actual series, with two exceptions: the great cholera epidemic in the 'fifties and the widespread birth control since the 'eighties could not possibly be foreseen. But on the whole it seems to be well established that the great wars are the main cause of the large fluctuations in the increase of population. There may be some minor disturbances too, such as the cholera epidemic just referred to, but very few are primarily economic, and

3. C. Gini, The Cyclical Rise and Fall of Population, in Population Problems, Harris Foundation Lectures, Chicago, 1930.

4 The first to explain a wave in age distribution by war was, as far as I know, Eilert Sundt in his book Om Giftermaal i Norge, Christiania 1855.

this is my main point. More especially, the fluctuations of marriages during the business cycle, which are so often pointed out, are usually not important enough to have any considerable effect on the birth rate. Even the heaviest drop in marriages, which occurred during the depression of 1902, was only 4 per cent of the couples married at the peak of the preceding boom, and it is doubtful whether the birth rate was at all affected by this factor. In comparison with this the world war cut down marriages by nearly 50 per cent and births even more. This makes it clear that the effects of business fluctuations on population are, at least before the great war, negligible. Hence the waves of population may be compared as a nearly independent series with the waves in business activity, and I shall make that comparison in the second part of my paper.

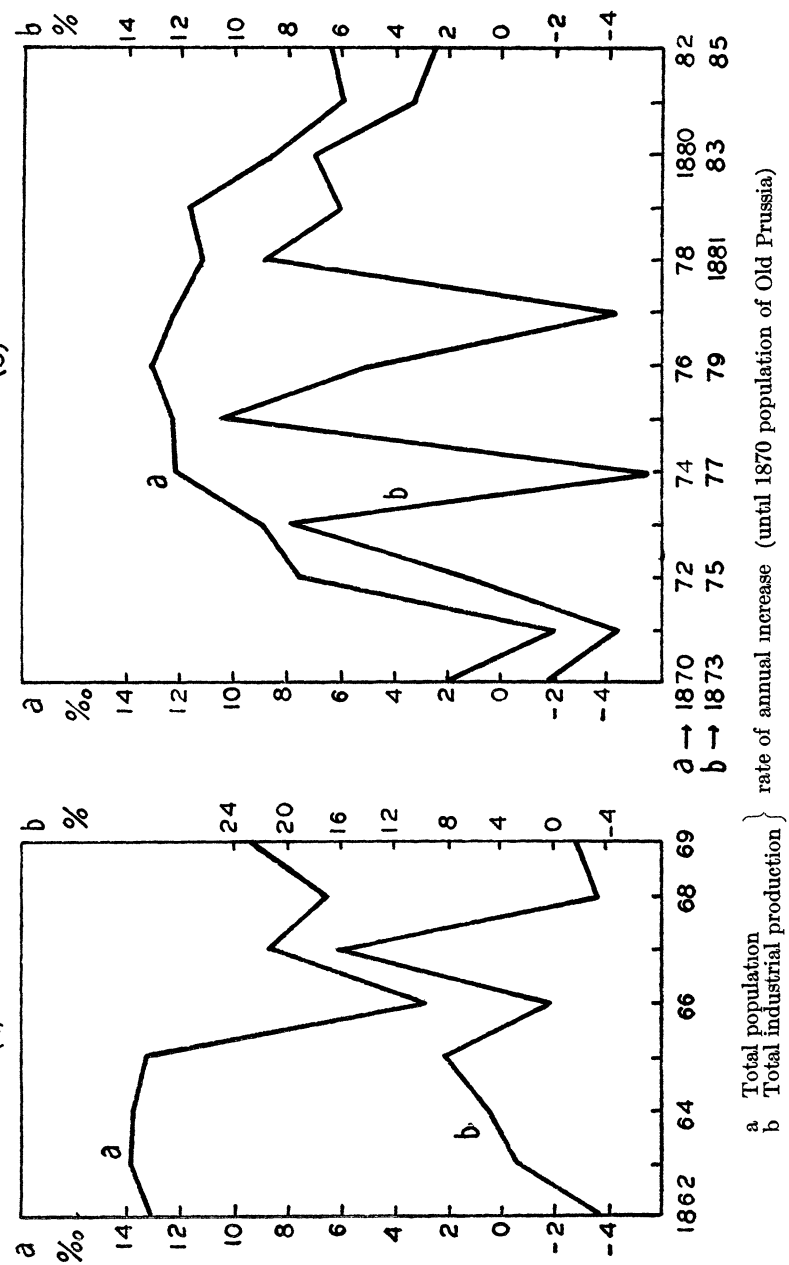
II

Co-variation with Business Cycles

All the time series which I am going to compare represent the annual rate of variation that is derived from the original data. Before Germany entered the highly capitalistic stage, its labor supply[5] (which approximately reflects the fluctua-

5. My method of calculation was roughly this: Before 1871 I took the number of male Prussians between fifteen and sixty-five years of age as representative. From 1871–1910 I figured out the German population for each year, classified by age and sex, on the basis of the annual number of births and deaths, and making allowance for emigration. The census of 1882, 1895, 1907 shows the percentage of each age group and sex that was willing to work at that time. The interpolation of these percentages for the intermediate years gives far less cause for discussion than one might expect. By multiplication I got the employables for each year. Their number — as calculated — depends upon births, deaths, marriages, migration, willingness to work. Wars are consequently only one, altho a main, factor influencing this number. For some of the items mentioned economic conditions are obviously of some consequence. However, they belong either to a former date, or a foreign country, and insofar as they belong to the country and time in question (marriages and business cycle), they are of little importance. This alone is vital, that population be independent of that business cycle which it should explain. For details see August Lösch, Bevölkerungswellen und Wechsellagen, Jena 1936, where I tried to show the importance of each factor separately. A summary of the theory involved is given in my paper "Wirtschaftsschwankungen als Folge von Bevölkerungswellen" in Schmollers Jahrbuch, Jahrg. 60, 1936.

CO-VARIATION OF POPULATION AND PRODUCTION IN GERMANY



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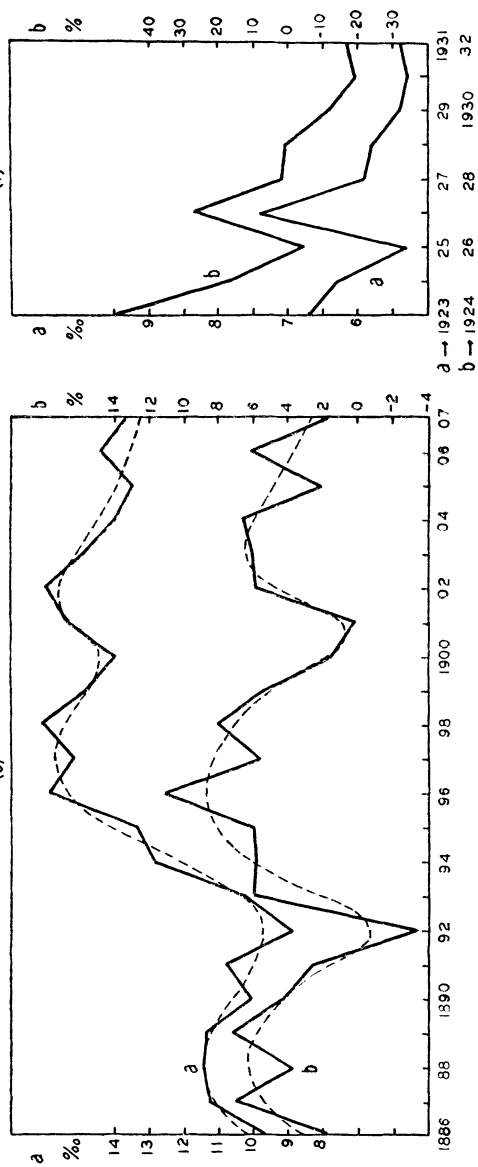

a Total population
b Total industrial production } rate of annual increase
(until 1870 population of Old Prussia)

tions of the total population) and its crops had every important trough and peak in common. I am confining myself, however, to industrial cycles. The co-variation between building and existing marriages is not surprising, and the only comment I wish to make is that it is not the variations in weddings but only the variations in the number of families — not necessarily the same — which are of consequence for building activity. Even more remarkable is the co-variation between labor supply and producers' goods. Most striking, however, is the simple co-variation between total population and total industrial production which is shown on graph 4–7. This shows only two time-lags of similar origin between 1862 and 1932: the war of 1870 and the severe crisis of 1873 break the connection for a time, and only after a three years' lag do the facts of population movement make themselves felt again. And there is a one year's lag after the world war; again population is going ahead, and it is production that follows. But during the rest of the period there is a parallel tendency, not only on the whole but from year to year as well: both series rise and fall concomitantly, altho to a different degree. Hence a pretty close correlation between population and production cannot be denied, and I shall next endeavor to explain this striking fact.

III

Explanation

Whereas an increase in labor supply led directly to higher activity in the pre- and early capitalistic period, the effect of population movements on industrial cycles is an indirect one. The economic development of growing nations consists essentially in making it possible to increase population by providing the necessary capital goods and corresponding consumers' goods. In such an economy, which is primarily adapted to extensive growth, and only in a secondary way to expansion by means of technical progress, it is natural that the rhythm of population should govern the rhythm of business. It is natural that business leaders should take courage again just when a great increase in population guar-

antees them cheap labor and a reliable extension of markets, especially for buildings and machinery.

Most people will find it obvious that an increase in population stirs up building activity. But why should an addition to the labor supply increase anything else but unemployment? Why should it stir up the activity of the firms producing tools and machinery? The answer is that the situation is exactly the same as for building. Just as it is a pretty safe guess that the additional population will not live in tents, so it is equally unlikely that they will go barefoot. If, therefore, the producers of additional houses see a fair chance of selling them profitably, the same must be true for the producers of additional shoe machines. By building the houses and by producing the machines they create the purchasing power which is needed to pay for the shoes and to hire the apartments, thus justifying their production. It is essential to see that unemployment among the old population, whose capital equipment already exists, is an entirely different thing from the case where there comes an increase in labor supply for which buildings and machines must first be constructed. The former is simply a sign of depression; the latter, however, is a stimulus to recovery.

Once the upswing has begun the entrepreneurs also venture upon new methods and new goods, but the very essence of my argument is that it is the upswing of population which sets the pace. For compared with technical progress and with the opening of new markets, which likewise expand production, the absorption of the increase in labor involves a smaller risk. It requires neither adjustment for new goods and new methods (as technical progress does) nor exploring unknown markets (as may be necessary in order to increase exports). It requires nothing but expanding along the old lines, nothing but producing for a highly probable increase in demand. No exceptionally capable entrepreneurs are necessary for this, tho it does not exclude the importance of the pacemaker in the sense Spiethoff and Schumpeter imply. It remains a question of fact whether the leading entrepreneur does venture upon his bolder projects, which give the swing proper

to the revival, before he has a certain indication and strong position in the optimism of the average; or, if he goes ahead, whether he does carry the bulk of the entrepreneurs along with him before they see possibilities suitable for *them*, that is to say, less difficult and less risky ones. In any case, an unusual increase in the labor supply is likely to bring about an upswing of business activity for two reasons: because it offers more and safer possibilities to the producers of capital goods.

It is one of the best established results of research that the capital goods industry is much more affected by the business cycle than the consumption goods industry. My theory easily explains this. Let us take a yearly increase in the labor supply of 100,000 men, and let us assume their average yearly income to be 1,000 dollars, and the average capital equipment for each additional worker to amount to 10,000 dollars. Then total consumption increases by 100 millions, and capital goods by 1,000 millions.

If in the following year labor increased by 120,000 men, in the third year by 140,000 men, and in the fourth year by 160,000 men, most people would conclude that the increase in the fifth year was likely to be 180,000 men, and that is just what the entrepreneurs do. If the *actual* increase in the fifth year is only 90,000 men, then breakdowns must follow. Of course a question arises here. Are the fluctuations really so large; and even if the increase in labor supply is cut by a half, will the difference be of sufficient importance to bring about a crisis for the capital goods industry? My answer is in the affirmative for several reasons. First of all, as Professor von Haberler has pointed out, business is so sensitive at the end of the upswing that it will react even to comparatively small disturbances. The fluctuations in new labor supply are, moreover, sometimes very considerable. It has happened more than once that the annual rate of increase dropped by more than 50 per cent within a few years. And, above all, nearly half of the German capital goods industry has so far been entirely dependent upon the increase in population, and only the remainder was working for replacement and

technical progress. For this very reason technical innovations alone are as a rule unlikely to bring about an upswing or to support it any longer in face of a decrease in new labor supply. For this decrease in population growth results in heavy losses for nearly half of the capital goods industry. If the firms concerned could foresee this turn in population, they might perhaps be able to change their line of production in time and work for technical progress instead of producing houses and old-fashioned machinery. Unfortunately, however, they do not become aware of the *decrease* in new labor supply until they try to sell the equipment for an *increase* in labor that turns out to have existed only in their imagination. No prospective increase in population can change the crisis that results from its present stability. No transposition can make good the losses that result from this mistaken investment that has already occurred. Even if such a transposition were possible, which in many cases it is not, it would mostly come too late. Failures have already begun; the depression has started.

These are the outlines of my explanation of the business cycle. I am, however, well aware of the fact that there are limitations to its validity. First, the argument has been intentionally simplified by not mentioning the well known, tho in my opinion only supplementary, rôle played by the rate of interest and by wages, in so far as they are likewise affected by the fluctuations in labor. Secondly I do not know if my explanation holds true for other countries besides Germany. Yet the fact that all European states must have in common a similar movement of population, since all of them were involved in the Napoleonic Wars, would be in my favor and could help to explain why Europe shows more or less the same fluctuations in business activity. As for the United States there is little hope of getting reliable annual data for the natural rate of population growth, and more particularly for the increase in labor supply. But if any fluctuations in natural growth exist at all, they are very likely to be by far surpassed by the fluctuations in immigration. These have hitherto been regarded as a *result* of the changes in business

activity. But there is much similarity between the German increase in labor supply, which accumulates in the villages until it is large enough to encourage the entrepreneurs, and the potential European emigrants, who accumulate there until American business recovers, at least partly *in anticipation of new immigration*. The production of capital equipment for these additional workers helps to bring about revival in both cases, and parallel to it these additional men immigrate into the United States as they do into the German towns. While this immigration seems to follow revival, it really is its *cause*. Yet there may be one important difference between Germany and the States. It is true that a large part of the American durable goods industry is engaged in producing the capital equipment for additional workmen and settlers, and hence depends upon immigration; but we do not know to what extent the fluctuations in American immigration are due to fluctuations in European business activity and population growth. If this connection is unimportant, if the European reservoir could supply a pretty constant stream of immigrants, the conclusion would be that (just the reverse of the German situation) it may be intermittent possibilities of technical progress, or whatever else may be regarded essential, which give the lead to American business activity. Immigration, tho still one cause of growing optimism, would in this case not turn the scale, or at least not as decisively as in the German industrial centers. It would merely strengthen the effects brought about by technical progress.[6] However, our knowledge of the facts is insufficient to make clear the rôle played by population in American business cycles. This involves a third limitation of my theory. Professor Spiethoff in Bonn, who suggested this investigation of mine, always stresses the point that altho all the business cycles of which we know have their important features in common, they differ widely in their details. The beginning of

6. Factors that work intermittently of course have the precedence in the explanation of business cycles. May I add, however, that even where no such factors determine human optimism, business cycles are quite conceivable. The mere fact of population growth, even if it were at a constant rate, is likely to involve economic fluctuations.

a boom, for instance, is necessarily characterized by an increase in the demand for capital goods. This demand may result from innovations, large replacements, the developing of backward countries. I merely add to this list population, not claiming that it is the only cause of the cycles. All I maintain is that the timing and the form of most of our German business cycles have been determined primarily by waves in labor supply. Limited as this result is, it strengthens the proposition that among the most decisive factors in the economic life of a country is its population — its people, their number and quality.[7]

AUGUST LÖSCH.

7. I wish to call attention to a forthcoming book by Mr. Constantine E. McGuire who confirms the point of view presented here.