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ENTREPRENEURSHIP AND THE
LONG RUN PRODUCTIVITY RECORD

by

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Abstract

More than a century of historical data on productivity and GDP per capita for a number of countries are shown to suggest profound implications for the role of entrepreneurship in economic growth. The paper proposes a classification of entrepreneurs into three types: rent seeking, initiating and imitating. It is suggested that the acceleration of productivity with the advent of the industrial revolution in part is ascribable to narrowing of rent seeking opportunities, which forced entrepreneurs to turn to innovation in production. The convergence of productivity levels which encompasses a great many of the world's countries is ascribed to imitative entrepreneurship which, according to the data, seems to flourish in centrally planned as well as market economies.

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William J. Baumol*

"[Ferdinand de Lesseps] was the entrepreneur extraordinaire with all the requisite traits for the role: nerve, persistence, dynamic energy, a talent for propaganda, a capacity for deception, imagination."
(McCulloch [1977], p. 58)

Despite the importance usually ascribed to entrepreneurship as a prime contributor to economic growth, no one to my knowledge has actually been able to measure the phenomenon empirically, much less to evaluate analytically its influence on productivity growth, output per capita or any other pertinent measure of economic activity. In this paper I, too, will offer virtually nothing in the way of quantitative technique and formal analysis. Nevertheless, using long-term historical data and a few admittedly grand generalizations, I hope to provide at least some deductive support for the widespread, intuitive belief that entrepreneurship is vital to productivity growth.

The analysis here will proceed in terms of several central hypotheses. First, I will suggest that the outburst of innovation that occurred in the mid-1800's, and sparked the Industrial Revolution, was not part of an unprecedented wave of entrepreneurship, but, rather, represented a refocussing of entrepreneurial activity. Second, using Schumpeter's division of entrepreneurial activity into (initiating) innovation and imitation, I will argue that the growth of imitative entrepreneurship was crucial to the patterns of global economic growth in the nineteenth and twentieth centuries. Third, I will offer the hypothesis that imitative entrepreneurship is far less sensitive to socio-political circumstances than is innovative

entrepreneurship. In other words, some types of political arrangement may tend to thwart innovation but still allow imitation to thrive. This seems to preclude such nations from assuming the lead in economic growth but allows them to enjoy the benefits that innovation can offer, albeit imperfectly and with some delay.

1. Entrepreneurship: Toward Empirical Testing

Before turning to the central theses of the paper we must first pin down a workable definition of entrepreneurship. The concept has generally eluded both precise definition and, thus, empirical measurement. The reason is to be found in the very nature of entrepreneurship. If we take it to refer exclusively to activities that have never been undertaken before or have never before been done in just the same way, then no one description can encompass more than one such act. If heterogeneity and lack of precedent are the crucial attributes, then any homogeneous characterization, which is the essence of generalization, must miss the point. Just as soon as one is able to describe systematically what an entrepreneur does, that description is automatically rendered obsolete and inapplicable, because it will describe something that once may have been entrepreneurial but no longer is.

The problem for empirical evidence is related. How can one hope to measure the quantity of entrepreneurial input when, as mere input, it is not readily distinguishable from garden variety management? Economic historians, quite understandably, have often tripped up on the distinction. For example, in the extensive discussions of the part played by entrepreneurship (or its absence) in the relative slowdown of the British economy near the beginning of

the twentieth century the evidence that is offered frequently relates primarily to managerial efficiency.

Here, following Schumpeter's lead, I will restrict my definition of entrepreneurship to activities associated with innovation (where innovation includes new products, new productive techniques, new marketing arrangements, and so on). It will also be convenient to subdivide general entrepreneurial activity into three broad categories: (a) innovative entrepreneurship, whose connotation is fairly clear (though it is well to note that I restrict it to activities that enhance the value of the economy's output rather than just the income of the entrepreneur alone); (b) imitative entrepreneurship, which refers to the activity of persons who, whether systematically or not, pay attention to innovations undertaken elsewhere and who undertake to profit from those innovations by direct copying, by the design of close substitutes, by licensing of their use, or by any other means. Thus, imitative entrepreneurs are the agents of the diffusion of new productive ideas, transforming them from the exotic to the routine; and finally (c) "rent-seeking entrepreneurship," which encompasses a wide range of activities including those of the Medieval robber baron who introduced more effective means to extort payments from travellers, the seventeenth century courtier who improved the procedures for acquiring grants of monopoly by the sovereign, and the twentieth century firm that comes up with a new argument to induce a regulatory commission to block entry into its market. All of these rent-seeking activities can clearly be innovative and profitable, but they are obviously not productive in the sense of contributing to the flow of goods and services or to the efficiency with which they are produced.

As a first step toward measurement and empirical analysis of the role of entrepreneurship I will suggest that, if the product of entrepreneurship is innovation¹ (or its imitation and diffusion), then one can measure entrepreneurship in terms of its product, that is, in terms of the amount of innovation that is observed. While it is, of course, hardly obvious that the level or rate of innovation can be quantified even roughly, as we will see, this viewpoint does offer us a usable handle for some qualitative insights.²

2. Entrepreneurship During the Middle Ages and Renaissance

The pre-capitalist era certainly was not devoid of economically significant inventions. Among the important innovations of that time were the medieval guilds, international banking, new and better methods of bookkeeping (that is, the instruments of the commercial revolution emphasized by de Roover [1953]), and improvements in the technology of architecture, in the design of ships and in the methods of agriculture. Indeed, many respected economic historians now accept the view (primarily associated with the work of Lopez [1953]) that, at least in Italy, the late Middle Ages were far more innovative, and probably more prosperous, than the following two or three centuries that we take to constitute the Renaissance. What distinguished medieval entrepreneurship from the innovative behavior of the post-industrial era was its focus on "rent-seeking" rather than "productive" entrepreneurial activity. As we will see next, the economic innovations of the Middle Ages produced wealth for the individuals involved, but often added little to the general welfare and, in many cases, actually detracted from it.

Before the rise of the cities and before monarchs were able to tame the nobility, wealth and power were pursued primarily through military activity. Since land was the medieval form of wealth most highly valued and most avidly sought after, it is easy to interpret the bellicose activities of the barons in good part as the pursuit of an economic objective. Almost any period of medieval history offers an abundance of examples. During the period of William The Conqueror (see, e.g., Douglas [1964]), the attempts at land grabbing by the barons in Normandy and neighboring portions of France and the obvious aspirations for lands which served as a prime incentive for William's supporters in his conquest of England, illustrate the economic objectives of much of medieval warfare. More than that, violent means also served to provide more liquid forms of income which the nobility used to support both private consumption and investment in military plant and equipment, where such items could not simply be produced on their own lands and therefore had to be purchased from others. In England, with its institution of primogeniture, younger sons who chose not to enter the clergy often had no choice other than warfare as a means to make their fortunes, and in some cases they succeeded spectacularly (thus, note the case of William Marshal, fourth son of a minor noble, who rose to be one of the most powerful and trusted officials under Henry II and Richard I and one of the wealthiest men in England).

Of course, the medieval nobles were not purely economic men. No doubt many of the turbulent barons enjoyed fighting for its own sake and success in combat was undoubtedly an important avenue to prestige in their society. But no modern capitalist is a purely economic man either. What I am saying here is that warfare, which was of course pursued for a variety of reasons, was

also undertaken as a primary source of economic gain. This is clearly all the more true of the mercenary armies that were the scourge of fourteenth century France and Italy.

This economic activity, moreover, was characterized by frequent and profound innovation. Castle-building evolved from wooden to stone structures, from rectangular to round towers (which could not be made to collapse by undermining of their corners); armor and weaponry became much more sophisticated, with the introduction of the crossbow, the longbow and, ultimately, artillery based on gunpowder; military tactics and strategy also grew in sophistication. All of these changes may be interpreted as innovations contributed in part by private entrepreneurs at least partly in pursuit of private economic gains.

However, this type of entrepreneurial undertaking differs vastly from the sort of modern activity that we usually associate with entrepreneurship. That is, if a present-day manufacturer introduces a cost-saving process or a valuable new consumer product, it undoubtedly contributes to the economy's output and to the economic welfare of the society. On the other hand, an individual who seeks to acquire wealth through the forcible appropriation of the possessions of others surely does not add to the magnitude of national product, and if the violence of the process actually destroys social assets and impedes economic activities (as medieval warfare often did) the net effect may not merely be a transfer but a net reduction in social income and wealth. This is why I use the term "rent-seeking" to describe the medieval entrepreneurial activity of the sort under discussion. It seeks to enrich those who carry it out by transferring to themselves the rents and other assets possessed by others.³

Thus, entrepreneurship hardly made its first appearance with the arrival of capitalism. What happened, rather, was a change in its form after the triumph of the monarchy, and with it, law and order. The reign of the Tudors in England pretty well ended the opportunities for independent baronial entrepreneurship despite the brief turbulent incidents that occurred at the accessions of Mary and Elizabeth. After the War of the Roses this sort of activity was largely foreclosed in England. In France it petered out after the Hundred Years War, was largely suppressed under Henry IV and was finally wiped out early in the reign of Louis XIV. Rent-seeking entrepreneurship hung on in other forms, notably in the quest for grants of land and patents of monopoly from the monarch. But now enterprise was forced to seek avenues other than the pursuit of rents for its most promising means of acquisition. What capitalism brought with it, even the early capitalism of the late Middle Ages, was the form of entrepreneurship that sought its fortune by providing improved goods and services and more efficient production processes. The early merchant and banking princes did just that -- they prospered by introducing commercial techniques that were more efficient and offered better services than any that had been known before. It was entrepreneurship of the sort that founded the House of Medici and underlay other even wealthier financial empires of that era. And with this the preeminence of rent-seeking entrepreneurs drew to an end, though in other forms it survives and prospers even today.

3. The Record of Economic Prosperity in the Capitalist Era

The Schumpeterian model, it will be recalled, involves a two-stage process. In the first stage, an initiating entrepreneur carries out a successful innovation that enables him to capture customers from his rivals and constitutes a source of supracompetitive profits. His success becomes a two-pronged stimulus for imitators. First, the lure of the high profits of the innovation is an irresistible magnet to the imitators and, second, the competitors whose very survival may be threatened by the innovator's success may have little choice but to turn to the search for substitutes. Thus, initiating entrepreneurial acts always spawn the interventions of imitative entrepreneurs who ultimately drive profits back toward competitive levels, thereby passing all of the remaining benefits of the innovation on to the general public in the form of lower prices and an enhanced national output. To prevent a decline in their stream of earnings the original, initiating entrepreneurs are driven to seek yet another innovation with which to start the entire process over again. This, according to Schumpeter, is the dynamic mechanism underlying the capitalist growth process.

The recapitulation of this familiar story serves to introduce the central concern of this paper: How has the presumably crucial role of initiating and imitating entrepreneurship manifested itself in the historical evidence about the course of capitalism since the Industrial Revolution? I shall argue that the nineteenth and twentieth centuries have witnessed a number of remarkable and unprecedented developments that are, I believe, extremely difficult to explain without the assignment of a critical role to both initiating and imitative entrepreneurship. First, in the last 100 years productivity and per

capita output have grown at rates to which no period in previous history seems to offer the slightest comparison. Second, and less widely recognized, the levels of productivity and output per capita in the free market industrialized countries have steadily converged, with the laggards in the group moving closer and closer to the attainments of the leader. The third development for this group of countries is the related fact that since 1870 the lower a country's initial per capital GNP the more rapidly this figure has grown for that country over the 110 years considered in our analysis. Indeed, the statistical relationship is so strong that it seems to account for a country's 1979 GNP per capita with about 90 percent accuracy, using the 1870 figure for that country as the only predictor variable. And, fourth, the Soviet economies along with countries on the borderline of industrialization have tended to take part in the convergence process just described, with only the less developed countries seeming to be untouched by it. I will describe these four phenomena in somewhat greater detail (for a fuller discussion see Baumol [1985]) and will then turn to the heart of my central thesis: the role of entrepreneurship in each of these economic developments.

a. Unprecedented Growth. The spectacular economic growth achieved in the two centuries following the Industrial Revolution is, of course, widely recognized. But most casual observers do not seem to be aware of its astonishing magnitudes (I was certainly surprised by the figures). Table 1 (Maddison [1982]) shows for 16 free market industrialized economies the percentage increase in output per capita, output per work hour and exports between 1870 and 1979 (all measured in 1970 U.S. prices). Using weighted

averages (the arithmetic mean of the 1870 and the 1979 value of a pertinent variable), we learn that average per capita income in these countries rose 730 percent, output per work hour rose 1230 percent, and exports rose 96,500 percent over the 110 year period.⁴ The incredible multiplication that each of these variables has undergone, while perhaps not astronomical, is, nevertheless, so large as to be beyond easy grasp. A comparison may be illuminating: We see from Table 1 that for the U.S. in 1870, output per capita (the slowest growing of our three magnitudes) was about one eighth of what it had become by 1979. This means (using the carefully worked out international comparisons of Summers and Heston [1982]) that in 1870 real per capita income in the United States was about the same as that of the Phillipines today, and slightly below that of Egypt. Anyone who has visited either country knows what that means.

So far as it is known, rates of growth anywhere near those that have just been described had never before occurred, except perhaps in England in the early nineteenth century. Despite the innovations of the late Middle Ages (and those of the Renaissance) which have already been noted, neither productivity nor income per capita had increased much at all during the hundreds of years between the height of Roman prosperity and the beginning of the Industrial Revolution (thus see, e.g., Colin Clark [1957], p. 677, who on the basis of various data suggests that real Roman incomes in the third century A.D. were comparable to those in Britain in 1850, Germany and France in 1870 and Japan in 1955). In other words, the growth in productivity and in living standards which occurred in the nineteenth and twentieth century are quite unprecedented and represent a profound break with the past.

b. Convergence of Free Market, Industrial Nations. The second historical phenomenon crucial for our analysis is the sharp convergence in per capita output and productivity levels that occurred in the 110 years to which Maddison's data pertain. Figure 1 is a semi-logarithmic graph representing per capita output in six of Maddison's 16 countries over the period, including the country with the highest 1870 output per capita in this group (Australia), the country with the highest 1979 figure (U.S.) and the country with the lowest value of this datum (Japan in 1870, Italy in 1979). There is a dramatic narrowing of the range between the highest and lowest country with the passage of time. Indeed, that ratio fell from 5.5:1 in 1870 to approximately 1.7:1 in 1979. Figure 2 shows the time path of the ratio of the standard deviation to the mean, and confirms that except for a sharp but temporary reversal during World War II this convergence has been quite persistent throughout the 110 year period. More detailed measures, all showing the same pattern, are presented in Table 2.

Not only per capita incomes but also average labor productivity levels have exhibited this pattern of convergent behavior, with the low performance countries all approaching ever closer to the leading economy's productivity level. Output per work hour of the leader country in 1870 was about eight times as high as the lowest ranked among Maddison's 16 countries (Japan), but by 1970 that of the leader (U.S.) was only about twice the laggard's (still Japan).⁵

c. Predicting Growth from the 1870 Data. The third key observation on which I will base my analysis is really a corollary of the convergence phenomenon. It follows tautologically that if the less affluent countries are catching up to the wealthier countries in per capita income, then per capita incomes in the former must be growing more rapidly than those of the latter. That is, the poorer a country (in Maddison's sample) was in 1870, the more rapidly its per capita income has grown ever since.

This is shown in Figure 3 in which each data point is numbered to indicate which country it represents.⁶ The horizontal axis indicates the countries' 1870 per capita income, i.e., the initial income level. The vertical axis gives the corresponding growth multiple, i.e., the ratio of a country's 1979 per capita income to its 1870 level. It is clear that the data form a rather tight, negatively sloping curve, indicating that the countries that were poorer initially did indeed grow more rapidly in the following 110 years. Thus we obtain the regression equation $\text{GDP per capita, 1979/GDP per capita, 1870} = 43.31 - 8.51 \ln (\text{GDP per capita, 1870})$ $R^2 = 0.90$. The apparent tightness of the relationship, as confirmed by the regression equation, seems to tell us that a country's economic growth since 1870 depended almost entirely on its initial income level.⁷ Nothing else seems to have mattered much -- not its propensity to save, or the openness of its economy, or its growth policies, or its cultural attributes. It is as though the poorer nations simply had been fated to approach ever closer to the richer, and neither mistakes in a country's policy nor any extraordinary efforts had made any difference in the inexorable process. Once again, exactly the same phenomenon manifests itself in the data on labor

productivity, where we obtain the regression $\text{GDP per WorkHr 1979} / \text{GDP per WorkHr 1870} = 54.9 - 10.6 \ln (\text{GDP per WorkHr 1870})$, meaning that an 1870 prediction based exclusively on the regression equation, the data on 1870 output per work hour and nothing else would seem to have predicted the absolute 1979 productivity level with some 87 percent accuracy, on the average. The apparent implication that nothing else besides a country's initial position mattered for subsequent growth is, of course, quite implausible. As we will see, even if it were beset by no statistical problems, it would nevertheless probably be incorrect. However, the attempt to explain what was really going on will also throw some light on the central issue of this paper, the part that entrepreneurship played in the growth process of the last century.

d. The Convergence Phenomenon and the Rest of the World. We come, finally, to the last of our four basic observations. As we will see now, both the centrally planned economies and other (slightly less) industrialized economies with free markets (that is, other than Maddison's 16 countries) have also participated in the convergence process. Only the less developed countries have manifested no such convergence pattern.

For most of these countries we have no data going back anywhere near 1870. However, Summers and Heston [1982] provide excellent information on 72 countries starting in 1950 and extending to 1980. I have used these 30 years of data to plot diagrams analogous to Figure 3. Figure 4A shows the 30 years of data for Maddison's 16 countries. Figures 4B, 4C and 4D, respectively, give the data for 19 intermediate industrialized countries (here referred to

as the "intermediate countries"),⁸ for nine centrally planned economies,⁹ and 28 less developed countries.¹⁰ Figure 4E combines the data in a single graph. We see that Figures 4A-4C all exhibit the characteristic negative slope of Figure 3. This means that each of these three groups of countries has experienced internal convergence, with the poorest country in each group approaching closer to the wealthiest. For example, for Maddison's 16 countries the ratio of GDP per capita of the richest to the poorest country fell 70 percent from 5.6 in 1950 to 1.7 in 1980. For the other industrialized countries that ratio declined 50 percent from 7.1 to 3.5. For the centrally planned economies it fell 33 percent from 7.3 to 4.9.

Moreover, the same phenomenon manifested itself for all three groups combined, the ratio just discussed falling from 15.2 to 7.1 for the combined highly industrialized, intermediate free market and the centrally planned economies (for more details see Table 3). These countries are all members of the convergence club (even if some of them are only second or third class members). (See also Figure 4F which shows all countries combined but separates out the four groups.)

Matters are quite different for the less developed countries. It is clear from inspection of Figure 4D that the data points constitute no clear-cut pattern and certainly show no sign of the negative slope characteristic of all the other Figure 4 graphs. As a matter of fact, a linear regression fitted to the points of Figure 4D has a tiny positive slope (though the R^2 is, of course, negligible [$R^2 = .00015$]). The ratio of the highest to lowest GDP per capita for countries in the group almost doubled from 5.8 in 1950 to 11.6 in 1980. All of this indicates that, on the average, rather than converging,

the poorer LDCs are in fact growing poorer and the relatively rich LDCs are getting richer.

A few other numbers confirm the difference in the performances of the various groups. Using a somewhat different classification from mine, Summers, Kravis and Heston ([1984], p. 254) provide Gini coefficients by decade from 1950-1980. For the industrialized countries this coefficient falls precipitously from 0.302 in 1950 to 0.129 in 1980, indicating a sharp drop in intercountry per capita income inequality in this group. For the centrally planned economies the drop is much smaller -- from 0.381 to 0.301. The middle income group exhibits an even smaller decline, from 0.269 to 0.258. But among the low income countries there is a small rise over the period, from 0.103 to 0.112, and for the world as a whole there is a tiny rise from 0.493 to 0.498.

There has also been little convergence among the groups. For the period as a whole Summers, Kravis and Heston report (p. 245) that average annual growth rates in per capita real gross domestic product were 3.1 percent for the industrialized countries, 3.6 percent for the centrally planned economies, 3.0 percent for the middle income market economies and only 1.5 percent for the low income groups, yielding a world average growth rate of 2.7 percent. (The "middle income economies" show less convergence and less of a tendency to catch up with the industrialized countries than do the "intermediate economies" in Figure 7 because the Summers, Kravis and Heston middle income group includes a considerable number of countries classed as LDC's in my taxonomy.)

4. Initiating and Imitating Entrepreneurship in the Nineteenth and Twentieth Centuries

I come, finally, to the heart of this paper: an examination of the part that entrepreneurship played in the four historical phenomena just described. I will take each in turn and will offer some straightforward and, I believe, compelling conclusions about the crucial role of entrepreneurship. But I must emphasize again that the elusive nature of the concept dictates that any conclusions reached here are, strictly speaking, little more than conjectures. If my conjectures are false, however, these global patterns of economic growth become extremely difficult to explain.

a. Initiating Entrepreneurship and The Explosion of Growth. The most obvious remarks that will be offered in the remainder of this paper relate to the role of entrepreneurship in accounting for our first historical observation: the spectacular and unprecedented growth in productivity and per capita output during the nineteenth and twentieth centuries. No doubt, growth in productivity is influenced by a multiplicity of variables, but there seems to be little reason to doubt what is apparently the consensus view, that investment and innovation are the two prime contributory influences.

Now, there is a good deal of evidence suggesting that, in at least some time periods, investment rates have played a key role (see, e.g., Abramovitz and David [1973], Norsworthy and Malmquist [1985], Williamson [1984]). Yet it is hard to believe that the spectacular acceleration of productivity that has taken place since the Industrial Revolution can be accounted for largely by an (unprecedented) rise in propensity to save and invest.¹¹ Put the other way, it seems impossible to believe that the growth in output per capita and in

productivity would not have been substantially lower had the path of investment been just as it was, but had there been none of the stream of the period's spectacular inventions: the chronometer and the steam engine in the eighteenth century, the metallurgical processes, the steamship, the telegraph and telephone of the nineteenth, and the automobile, truck, airplane and computer of the twentieth. A number of econometric studies have suggested similar conclusions, though often, because of the difficulty of measuring innovation, they reach their results by default -- showing that the other plausible major contributors to economic growth leave a substantial proportion of that growth unexplained. When all is said and done, one is left with the same argument -- the economic history of the period just makes no sense unless innovation played a major role. (For a similar view for the case of the U.S., see David [1977].)

Assuming that it is true that innovation was a major component of the growth of the last century, it follows that initiating entrepreneurship must have played an important role. Innovation is, by definition, the output of initiating entrepreneurship. And if, as has been proposed here, initiating entrepreneurship is to be measured in terms of its output, it follows that this sort of entrepreneurship must indeed have made a major contribution to growth. In other words, there must have been a burst of entrepreneurial activity that was both productive (not rent-seeking) and initiating.

Why it occurred when it did, why it occurred first in England and other similar questions can, of course, not be answered convincingly. It is plausible that the narrowing of the opportunities for rent-seeking entrepreneurship that accompanied centralization of governments in the hands

of monarchs forced ambitious individuals to look elsewhere. The emergence of laissez-faire probably made it easier for entrepreneurial talent to be exercised. It has even been suggested that the English institution of primogeniture helps to account for the earlier advent of the industrial revolution in that country, since the presence of a large number of younger sons of noble families, who had to turn to business activities for lack of other sources of support, imparted early respectability to that type of activity. Of course, there was much more -- a myriad of elements which one can never hope to disentangle -- the widening quest for knowledge which came with the Renaissance, the encouraging effect of success of a few inventions upon other prospective inventors. The search for "the causes" is, ultimately, a hopeless task which for us is not crucial, in any event. The key conclusion here is that there was indeed a rise in initiating entrepreneurial activity, as demonstrated by the unprecedented stream of profound innovations that has continued throughout the period of remarkable growth in productivity and per capita incomes. It is hardly plausible that this entrepreneurial activity did not contribute significantly to those growth rates, for otherwise no reasonable explanation for their unprecedented magnitude seems to be available.¹²

b. The Convergence Phenomenon and the Imitating Entrepreneurs. Our second historical observation, the marked convergence of the levels of productivity and prosperity of the leading industrialized nations, must surely involve one crucial explanatory element. It must be possible for laggard nations to learn more from the leaders than the leaders can learn from the

laggards (for a careful and illuminating discussion, see, e.g., Abramovitz [1985]). In part, this is obvious enough, since their very position implies that the leaders must have accumulated a stock of pertinent knowledge involving both basic principles and techniques of execution, which the laggards have not yet acquired. If both sets of countries possess a cadre of imitating entrepreneurs similar in capability, and avidly engaged in the importation of proven innovations from wherever they can be found, it is only to be expected that in a given period the imitating entrepreneurs in the laggard countries are likely to gain more in the process. Such a scenario by itself can account for the convergence phenomenon, unless there is a considerable lag in the transfer process and the leaders continue to innovate so much more quickly than the laggards that the latter's more rapid rate of imitation cannot entirely offset these advantages of the leaders.

Several other developments of the past century seem to have played an important role in the convergence process, encouraging the imitating entrepreneur and greatly facilitating his task.

1) Since 1870, in each of Maddison's 16 countries, exports have grown far more rapidly than GDP per capita or even labor productivity (see Table 1). Indeed, a straightforward calculation from Maddison's data (Appendix A and pp. 24B-253) indicates that in 1939 exports constituted for an average country three to four times as great a share of GDP as it did in 1870. This means that a 1979 producer in one of these countries was correspondingly more likely to find foreign firms among the rivals for its markets than it was in 1870. This puts the producer under far greater pressure to keep up with the productive techniques of its foreign competitors. In effect, it constitutes

a direct source of growing demand for the services of those imitating entrepreneurs who include foreign techniques in their domain of activity. That is, the penalty for failure to engage in this entrepreneurial activity must have increased considerably. (Yet it was important in earlier periods too. For a discussion of sixteenth and seventeenth century cases, see Rapp [1975].)

2) Over the course of the century the means to communicate the information required for success in imitative entrepreneurship have increased dramatically. Telecommunications and satellite technology are, clearly, just the prime examples.

3) Freedom to interchange technological information has increased sharply (except for military technology and closely related knowledge). Under the sway of mercantilism countries adopted laws prohibiting the revelation of industrial information to foreigners and the emigration of skilled craftsmen (see, e.g. Rapp [1975], pp. 505-506). Though these laws were evaded regularly (helped in part by the outflow of knowledgeable refugees), such attempts to interfere with the exchange of ideas and skills must surely have increased the length of time involved in the process and the cost it entailed. Today, in contrast, multinational firms, joint ventures and licensing arrangements speed up the transfer process. International conferences of scientists and engineers are a commonplace affair, encouraged by private industry and governments, and they often involve participation of delegates from free market and centrally planned economies.

4) There has been an explosion in the number of persons specializing in the production and distribution of knowledge. Figure 5 describes the

distribution of the U.S. labor force from 1800 to 1980 among four sectors: agriculture, industry, other services and information services. According to these data, employment in the information sector has grown from near zero percent of the total in 1850 to a staggering 45 percent in 1980. Of course, such figures cannot be taken literally, dependent as they are, for example, on classification of activities. Yet other observers have reached qualitatively similar conclusions, which for our purposes tells us that imitative entrepreneurship has at its disposal a growing army of persons specialized and trained in gathering the information needed to carry out this task. The secrets of foreign innovations undoubtedly have become increasingly difficult to keep as the body of potential investigators has grown.

c. Entrepreneurship and the Prediction of Economic Performance from 1870 Data. These facts not only help to explain the convergence phenomenon and the critical role of imitative entrepreneurship. The argument is, I believe, also strengthened considerably by its ability to provide a simple explanation for our third historical observation: the somewhat puzzling fact that 1979 levels of productivity and output per capita can be predicted so successfully, country by country, using only the corresponding figures for 1870. While this seems to imply that differences in policy among nations hardly made any difference for their relative 110 year growth records, there is an alternative explanation which seems to me far more plausible. Pervasive and effective imitative entrepreneurial activity during the period would have enabled a poor growth country quickly to obtain benefits very similar to those enjoyed in the leader country. Thus, suppose country A with much initiating entrepreneurial

activity invents a revolutionary electronic process. Within a few years imitative entrepreneurs in countries B, C and D will enable their own industries to use the process itself or will offer them access to some close substitutes. The rapid international diffusion of a variety of inventions -- the computer, the transistor, the jet airplane, television and many many others, confirm that this must be so. Imitative entrepreneurial activity clearly permits all industrialized countries to enjoy, rather quickly, the fruits of a successful growth policy in any one of their number. That is why an effective growth policy makes little difference for the relative growth of productivity and per capita income in these countries. Imitative entrepreneurship makes an international public good of any one nation's innovating activities -- one from which it is almost impossible to exclude other industrialized nations.

d. Imitating and Initiating Entrepreneurship in Different Economic Systems. From the fourth of our historical observations -- the fact that the centrally planned economies exhibit a convergence pattern at least as pronounced as that of the second rank of industrialized countries -- it follows (if the arguments of the preceding sections are valid) that absence of a free market is not a major impediment to the exercise of imitative entrepreneurship. The Soviet Union, the Balkan countries and Poland have achieved growth records consistent with convergence toward Czechoslovakia and East Germany in terms of per capita incomes (Figure 4C). This implies success of the imitating entrepreneurs in following and adopting the superior productive techniques of other centrally planned economies. Moreover, the

fact that as a group they have been drawing somewhat closer to the leading free market economies implies at least limited success in imitating the innovations of the free market nations as well. Where the centrally planned economies seem to have failed, and to have failed markedly, is in initiating entrepreneurship. One can think of few new consumer or industrial products, few new productive techniques now used or sought after in the industrial world which have originated in any of the centrally directed economies.

While it is not surprising that central planning, and the bureaucratization that seems inseparable from it, is a serious and even fatal impediment to the free wheeling, unroutinizable entrepreneurial spirit needed to seek out untried ideas and put them into operation, perhaps a bit more heterodox is the implication that centralization of economic control is less of an impediment, and perhaps no impediment at all, to imitative entrepreneurship, an activity also vital for rapid growth of an economy's productivity and prosperity. One noteworthy inference is that the centrally planned economies have benefitted substantially from the opportunity to act as free riders upon the free market's growth vehicle. If Soviet economies do indeed prove to be inherently deficient in the one type of entrepreneurship but not in the other, such free ridership will prove to be no transitory phenomenon. The irony then is that whatever success the planned economies have managed to achieve in their economic growth will have come to them as an inadvertent gift from the economic system that is their determined rival.¹³

e. The Two Types of Entrepreneurship and the Less Developed Countries.

The fact that the LDCs taken as a group have achieved little or no

participation in the convergence process suggests that they and they alone have failed to produce a corps of imitating entrepreneurs. They have provided little innovation of their own and have not made much use of the innovations of the developed countries or, at any rate, have not adopted them at a rate sufficient to overcome the advantage the developed nations continue to derive from the flow of novel processes and products.

Once again, an exhaustive list of reasons is a chimera. However, it is worth suggesting that two contributory influences are limited educational attainment and incompatible product lines. Success in imitative entrepreneurship requires the availability of skilled persons capable of analyzing, dissecting and replicating the inventions of others. Paucity of engineers and technicians can be a fatal handicap to imitative entrepreneurship, for obvious reasons. Similarly, a country which produces few electronic products can benefit little from the introduction of a new component such as the transistor after it has appeared in other economies. A nation which has few automated production processes can gain little by following others in using a new computerized technique for control of such processes. As a result, the opportunities for profitable exercise of imitative entrepreneurship are severely circumscribed in an economy which produces few of the goods and services to which sophisticated technology can readily make a substantial contribution.

On that view, the priorities for an economy seeking to break away from poverty and stagnation may indeed include facilitation and stimulation of entrepreneurship, as is so often said; but it would seem that here imitative entrepreneurship may well have considerably more priority than entrepreneurship of the initiating variety.

5. Concluding Comments

The superficiality and conjectural nature of many of the propositions that have been proposed here is, perhaps, an inevitable consequence of the subject of the paper. Despite all the historical evidence, both narrative and quantitative, that has been cited few if any of those propositions can qualify as much more than hypotheses. Yet the evidence, if far from conclusive, is certainly suggestive, and it does not seem to have been looked at before in the way that has been done here. More to the point, the introduction of the three types of entrepreneurship with which we have primarily been concerned -- rent-seeking, initiating and imitating -- is more than mere taxonomy, for it has offered us a new way of looking at and interpreting the economic performance of entire epochs and of major groups of economies. In this process the approach seems to help explain significant phenomena which have seemed puzzling, and may even offer some stimulating clues to those who formulate public policies.

Footnotes

*Princeton and New York Universities. I am extremely grateful for the support of the Center for Entrepreneurial Studies of the Graduate School of Business Administration of New York University, and the Division of Information Science and Technology of the National Science Foundation. Much of the analysis rests on the results of an earlier paper of mine [1985] to which the reader is referred for further details on matters that are discussed here only cursorily.

1. This does not commit us to a wholly Schumpeterian view of the matter. This view is for example consistent with Kirzner's illuminating observation that entrepreneurship can serve as the instrument for the elimination of disequilibria (see [1973], pp. 69-75) rather than, as in the Schumpeterian story, the means that undermine equilibria. Either case involves recognition by the entrepreneurs that circumstances have provided an opportunity to earn profits through acts that change the current state of affairs.
2. It may be noted that this expedient -- the measurement of entrepreneurial input in terms of its output -- is the inverse of that often adopted in measurement of the output of some services whose magnitude cannot be observed directly. For example, for lack of a better indicator, the output of government is normally measured via an index of the value of its input, an expedient that clearly precludes or at best severely impedes evaluation of productivity growth in the public sector.
3. In saying all this I must not be interpreted to take the conventional view that warfare is an unmitigated source of impoverishment of any economy, which unquestionably never contributes to its prosperity. Careful recent studies have indicated that matters are more complicated. (On this, see, e.g., Milward [1970].) Certainly the unprecedented prosperity enjoyed afterward by the countries on the losing side of the Second World War suggests that warfare need not always preclude economic expansion, and it is easy to provide earlier examples. The three great economic leaders of the Western world preceding the U.S. -- Italy in the thirteenth to sixteenth centuries, Holland in the seventeenth century and England in the nineteenth century, each attained the height of their prosperity after periods of enormously costly and sometimes destructive warfare. Nevertheless, the wealth gained by a medieval baron from the adoption of a novel bellicose technique can hardly have contributed to economic growth in the way that resulted from adoption of a new steel making process in the nineteenth century or the introduction of a product such as the motor vehicle in the twentieth.

4. The fact that output per capita rose considerably more slowly than average labor productivity (output per work hour) is explained largely by the fact that the number of working hours per worker year fell by some forty to fifty percent during our period.
5. More details on the convergence of productivity levels are provided in Baumol [1985].
6. The countries and their identifying numbers are given in Figure 3.
7. Actually, at least two serious statistical biases (in the nontechnical sense) account for part of the apparently strong result. First, trend figures were used in the process of estimation of the earlier data, imparting a correlation between the two. Second, the independent variable in the regression is the denominator of the dependent variable, also making for a (negative) correlation. It is only the convergence phenomenon which indicates that the entire relationship is not spurious. I am grateful to Moses Abramovitz and Vincent Crawford for these observations.
8. The intermediate countries and their numbers are given in Figure 4B.
9. The centrally planned countries are listed in Figure 4C.
10. The LDC's in the sample are listed in Figure 4D.
11. As a matter of fact, the first half century of the Industrial Revolution in England apparently involved surprisingly small rates of investment (see, e.g., Landes [1969], pp. 64-65, Feinstein [1978], pp. 40-41, and Williamson [1984], pp. 2-7). But, then, in that early period the economy's overall rate of growth of productivity was also quite low, perhaps because so large a share of its initial effects was confined to the production of textiles which, while far from unimportant, were also far from being the primary component of the country's predominantly agricultural economy.
12. Of course, this period also brought with it the accumulation of enormous amounts of capital, but this phenomenon is surely far from being a completely autonomous manifestation. By increasing national incomes, innovation surely provided the wherewithal -- the resources -- with which investment could be carried out. And while, as already noted, the earlier innovations, largely affecting textiles, required surprisingly small amounts of investment, later, with the advent of railroads, steamships, motor vehicles, and electrification, amounts of capital previously unheard of began to be called for. Thus, innovation and initiating entrepreneurship no doubt stimulated enormously the demand for capital and simultaneously helped substantially in providing the resources needed to supply it.

13. Marx, of course, argued that capitalism's unprecedented productivity contribution is necessary to provide the means to make a communist society possible: "[The capitalist] forces the development of the productive powers of society, and creates those material conditions, which alone can form the real basis of a higher form of society" (Marx [1867] [1915], p. 649).

He does not, however, seem to have foreseen a world divided into free market and communist states, in which the latter would continue to benefit from the continuing growth of the former. As a matter of fact, he felt that capitalism had pretty well exhausted its productivity contribution (presumably before the last quarter of the nineteenth century!) and that it was instead becoming a serious impediment to growth. "The monopoly of capital becomes a fetter upon the mode of production, which has sprung up with, and under it (Marx [1867] [1915], p. 837).

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TABLE 1

Percent Growth from 1870 to 1979Productivity, GDP Per Capita,16 Industrialized Countries

	<u>Real GDP*</u> <u>Per Capita</u>	<u>Real GDP* per</u> <u>Person Hour</u>	<u>Volume of Exports</u>
AUSTRALIA	221.0%	398.0%	---
U.K.	325.0	585.0	930.0%
SWITZERLAND	472.0	830.0	4,400.0
BELGIUM	411.0	887.0	6,250.0
NETHERLANDS	423.0	910.0	8,040.0
CANADA	754.0	1,050.0	9,860.0
U.S.A.	691.0	1,080.0	9,240.0
DENMARK	650.0	1,090.0	6,750.0
ITALY	493.0	1,220.0	6,210.0
AUSTRIA	642.0	1,260.0	4,740.0
GERMANY	1,396.0	1,510.0	3,730.0
NORWAY	872.0	1,560.0	7,740.0
FRANCE	694.0	1,590.0	4,140.0
FINLAND	1,016.0	1,710.0	6,240.0
SWEDEN	1,084.0	2,060.0	5,070.0
JAPAN	1,653.0	2,480.0	293,060.0

Source: Angus Maddison, Phases of Capitalist Development, New York: Oxford University Press, 1982, pp. 172-77, 182-87, 212, 248-53.

*In 1970 U.S. Dollars.

TABLE 2

GDP Per Capita: Dispersion Measures,16 Industrialized Countries

	<u>1870</u>	<u>1880</u>	<u>1890</u>	<u>1900</u>	<u>1913</u>	<u>1929</u>	<u>1938</u>	<u>1950</u>	<u>1960</u>	<u>1970</u>	<u>1979</u>
Max	1.39	1.69	1.75	1.58	1.83	2.36	2.09	3.21	3.72	4.83	6.06
Min	0.25	0.31	0.35	0.41	0.48	0.70	0.93	0.58	1.20	2.89	3.58
Max/Min	5.53	5.48	5.03	3.88	3.83	3.39	2.25	5.54	3.10	1.67	1.69
Mean	0.66	0.76	0.85	0.95	1.16	1.42	1.50	1.83	2.50	3.67	4.63
StdDv	0.27	0.34	0.35	0.33	0.38	0.43	0.34	0.61	0.55	0.49	0.55
Stdv/Mn	0.42	0.44	0.42	0.35	0.32	0.30	0.23	0.33	0.22	0.13	0.12

Based on data in Maddison [1982], Appendices A and B. For the list of countries, see Table 1.

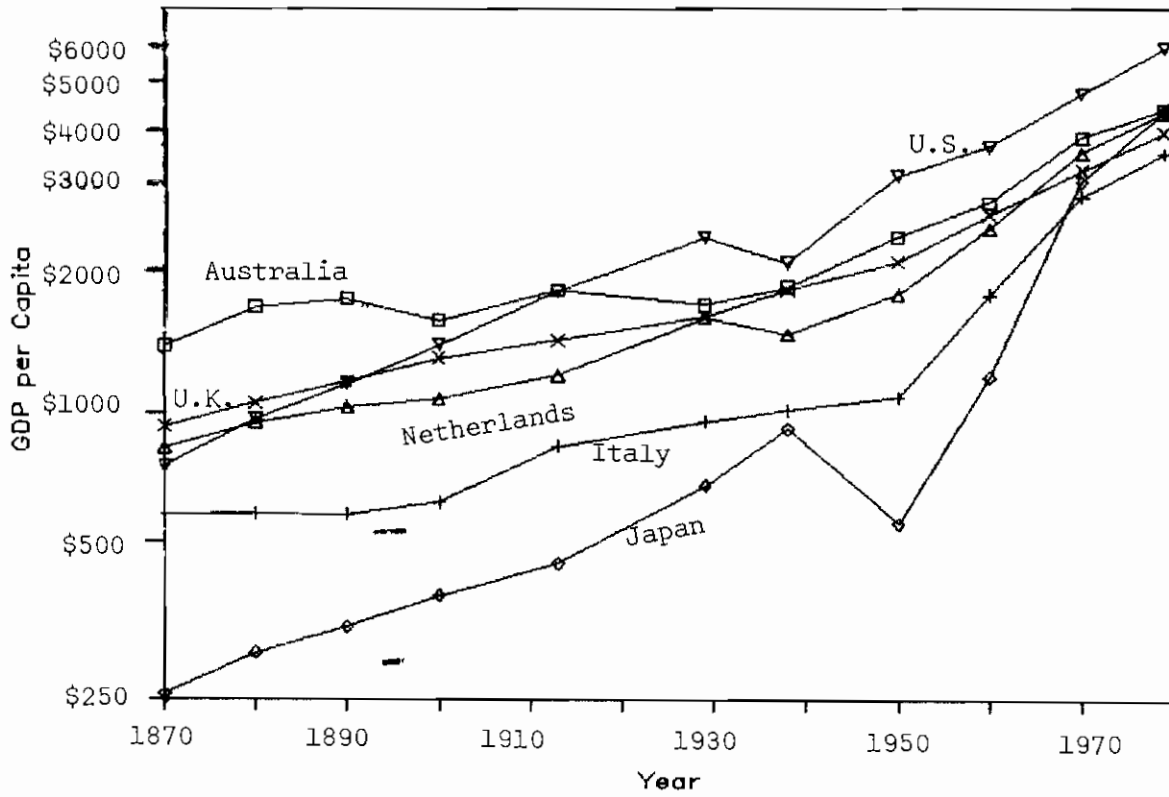
TABLE 3

Convergence Measures, RGDP

	<u>16 Industrialized Countries</u>	<u>Intermediate Countries</u>	<u>Centrally Planned Economies</u>	<u>LDCs</u>
Max				
1950	4550.00	3595.00	2182.00	1036.00
1980	8089.00	6634.00	5532.00	3437.00
Min				
1950	810.00	508.00	300.00	178.00
1980	4661.00	1882.00	1135.00	296.00
Max/Min				
1950	5.62	7.08	7.27	5.82
1980	1.74	3.52	4.87	11.61
Mean				
1950	2531.13	1461.68	1238.75	651.00
1980	6417.19	3506.53	3621.50	1268.83
StdDv				
1950	888.50	801.51	556.68	237.16
1980	837.58	1192.87	1249.26	747.82
StdDv/Mn				
1950	0.35	0.55	0.45	0.36
1980	0.13	0.34	0.34	0.59

Source: Summers and Heston [1984]. For lists of the countries, see Figures 3 and 4.

GDP per Capita 1870–1979, in 1970 US \$*
 semilog scale. Source: Maddison



*Some earlier data points are interpolated.

Figure 1

GDP per Cap. 1870–1979, Std. Deviat./Mean

16 Indust. Countries. Source: Maddison

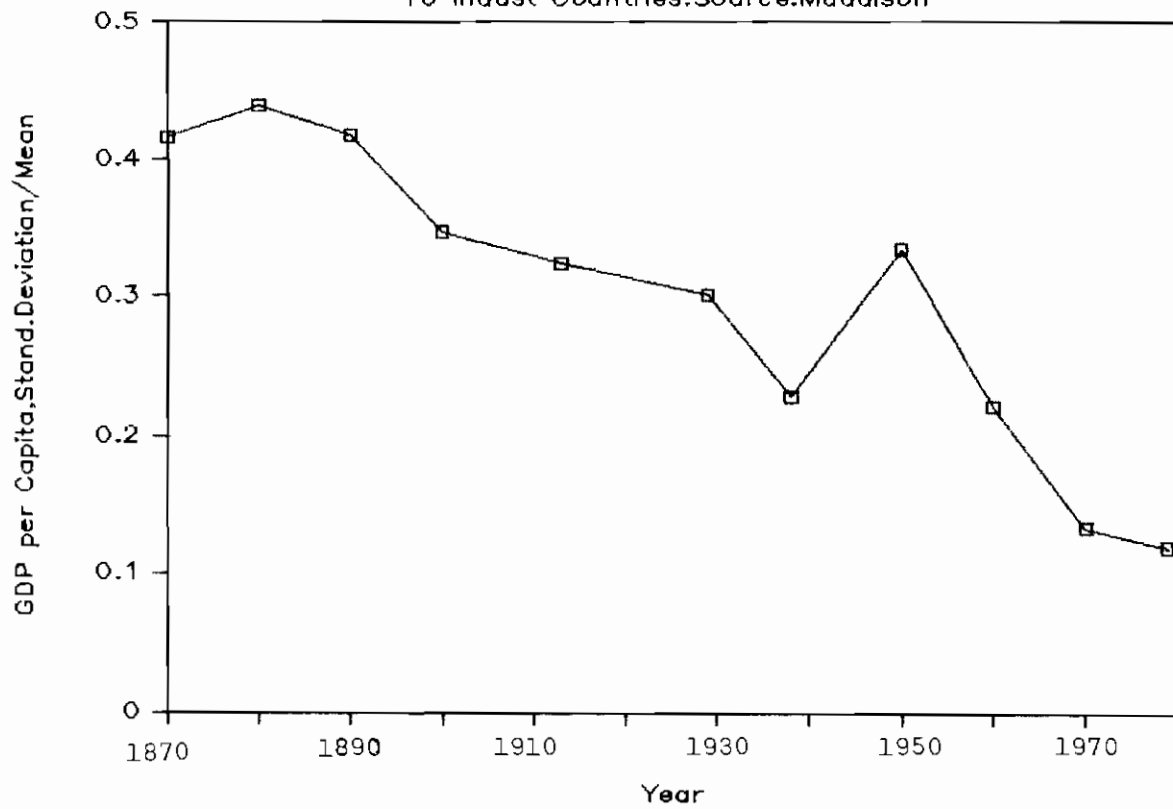
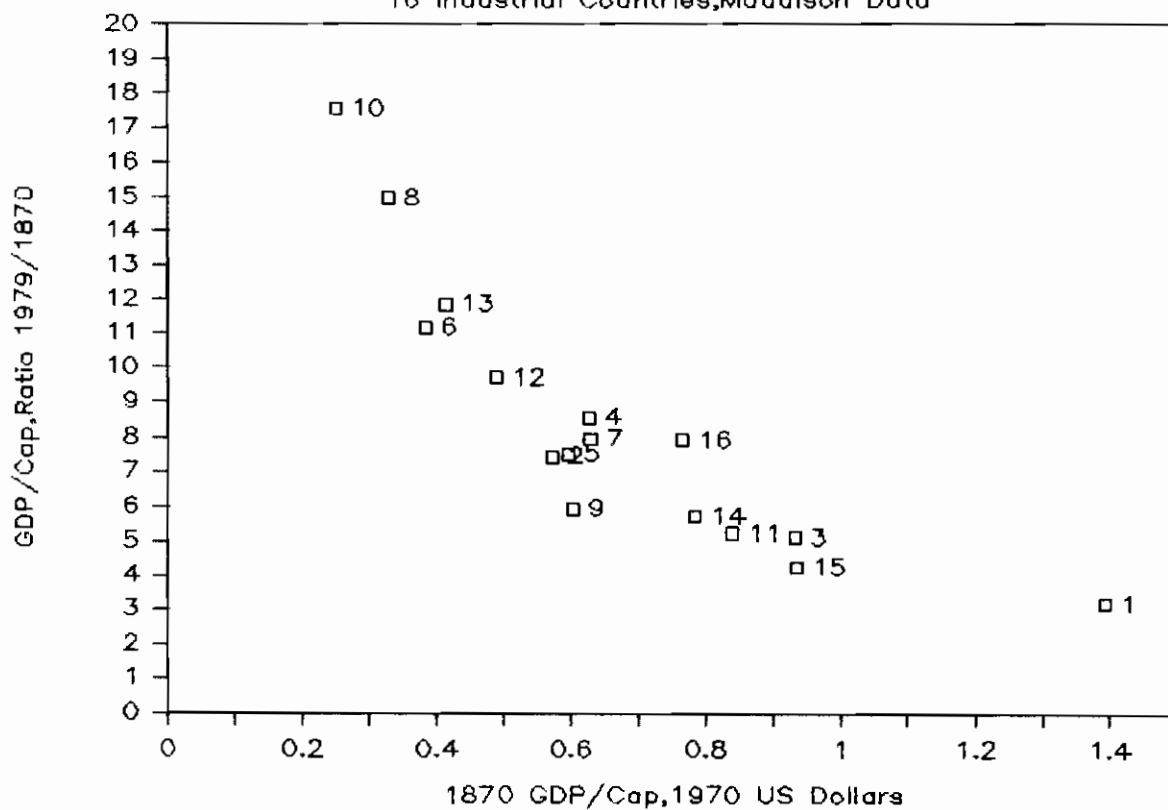


Figure 2

GDP/Cap:1979/1870 *Ratio v 1870 level

16 Industrial Countries; Maddison Data

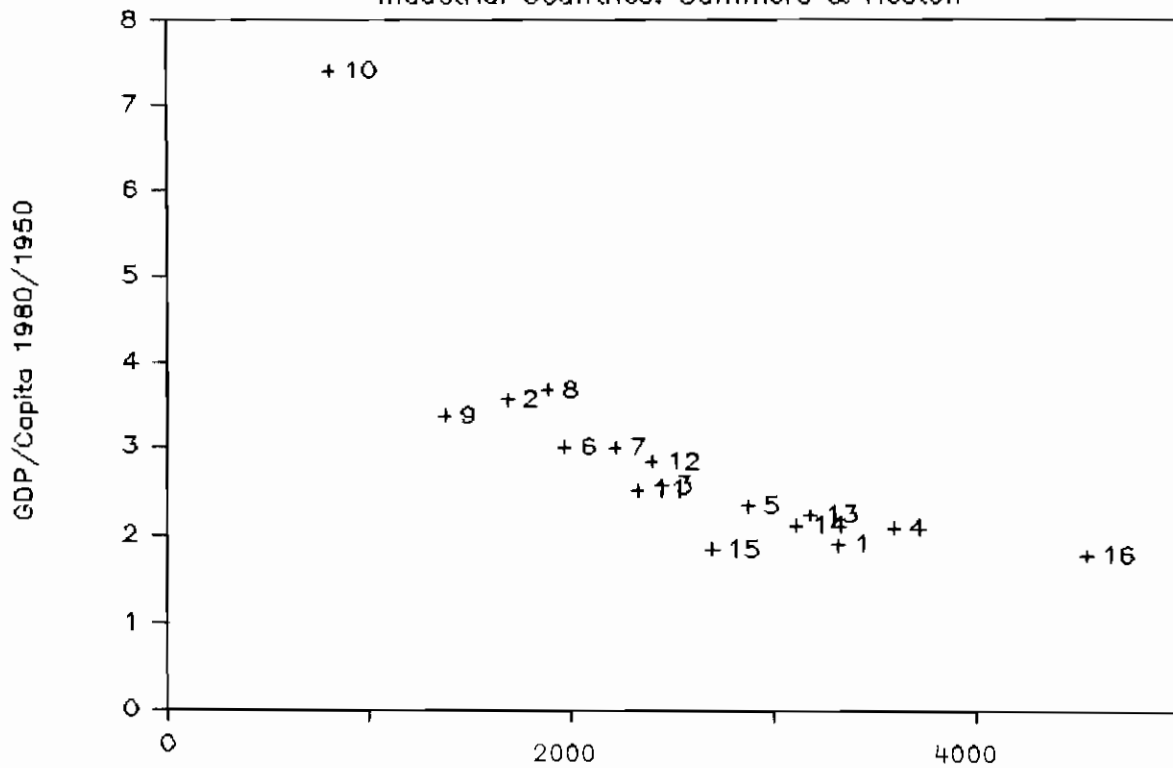


*The countries and their identification numbers are:

1 Australia, 2 Austria, 3 Belgium, 4 Canada, 5 Denmark, 6 Finland, 7 France, 8 West Germany, 9 Italy, 10 Japan, 11 Netherlands, 12 Norway, 13 Sweden, 14 Switzerland, 15 U.K., 16 U.S.

Figure 3

GDP/Cap, Ratio, 1980/1950 v 1950 Level
 Industrial Countries: * Summers & Heston



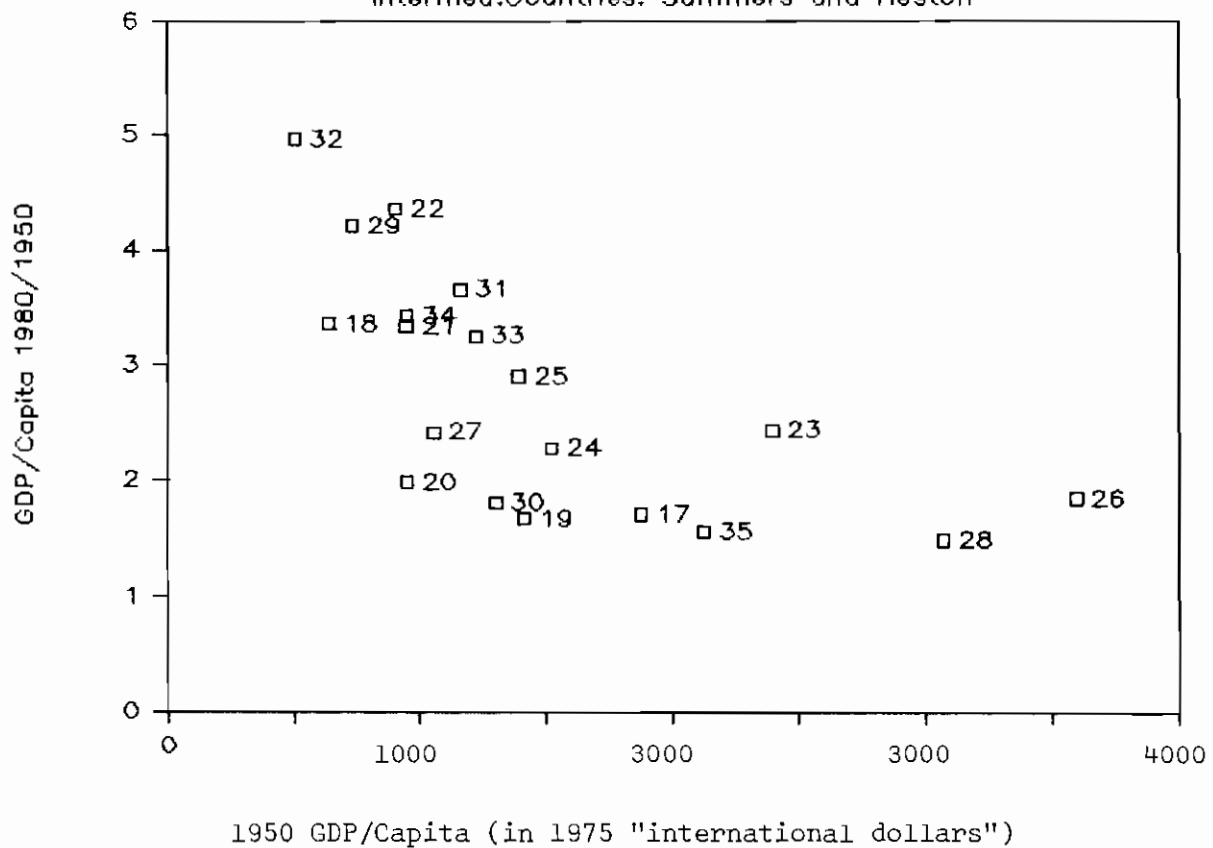
1950 GDP/Capita (in 1975 "international dollars")

*For identification of the countries, see Figure 3.

Figure 4a

GDP/Cap, Ratio, 1980/1950 v 1950 Level

Intermed. Countries: *Summers and Heston



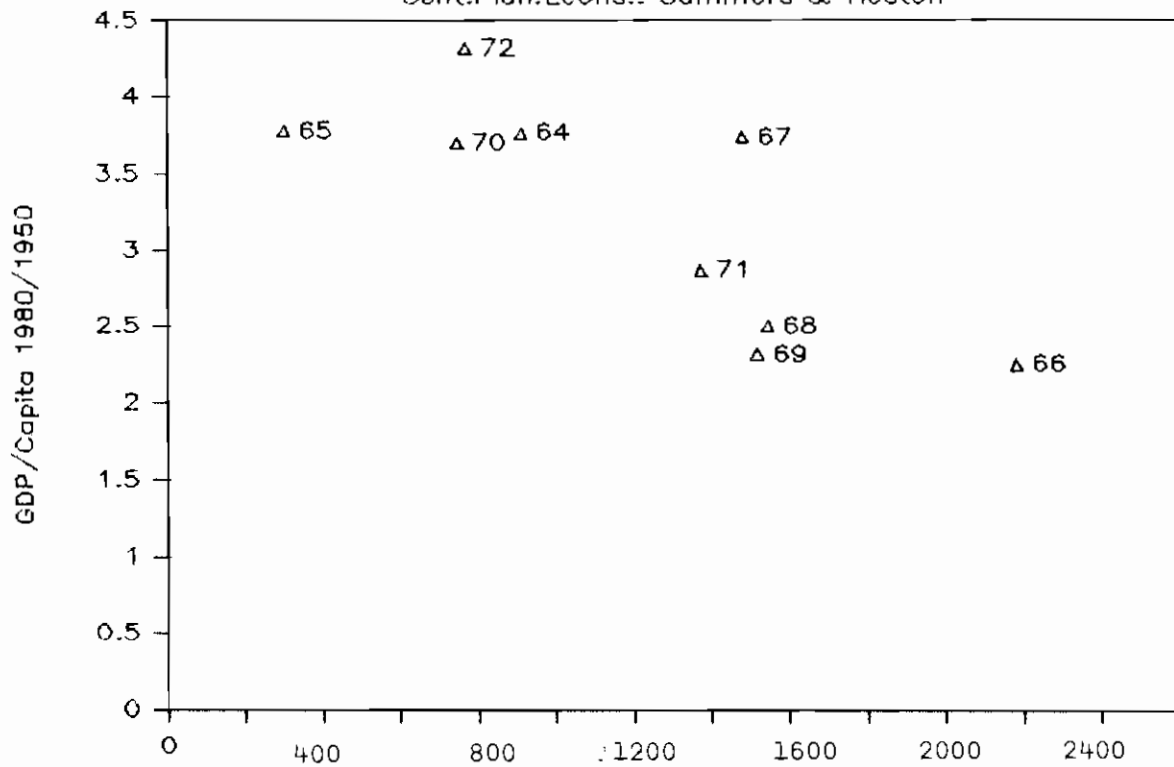
*The countries and their identification numbers are:

- 17 Argentina, 18 Brazil, 19 Chile, 20 Colombia, 21 Cyprus, 22 Greece,
- 23 Iceland, 24 Ireland, 25 Israel, 26 Luxemburg, 27 Mexico, 28 New Zealand,
- 29 Portugal, 30 South Africa, 31 Spain, 32 Taiwan, 33 Trinidad, 34 Uruguay,
- 35 Venezuela.

Figure 4b

GDP/Cap,Ratio,1980/1950 v 1950 Level

Cent.Plan.Econs.* Summers & Heston



1950 GDP/Capita (in 1975 "international dollars")

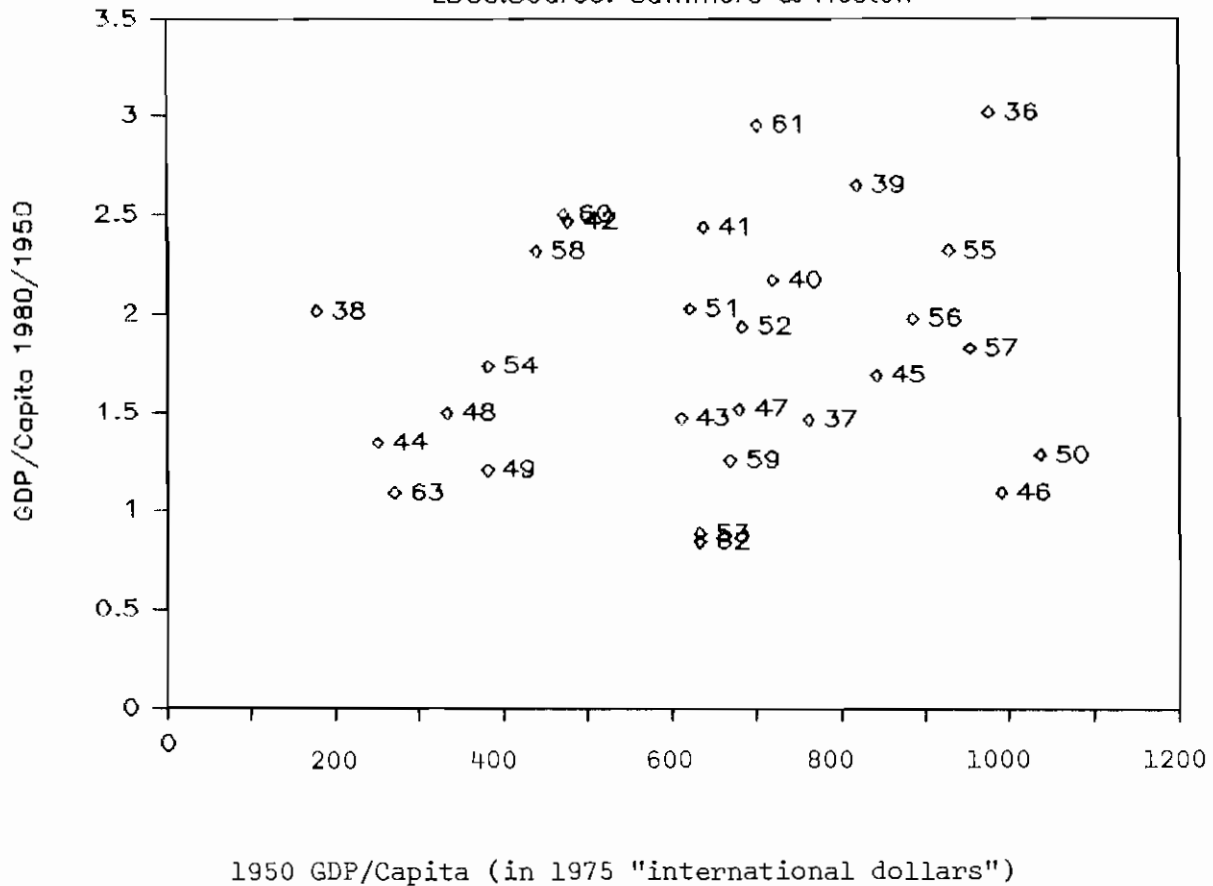
*The countries and their identification numbers are:

64 Bulgaria, 65 China, 66 Czechoslovakia, 67 East Germany, 68 Hungary,
69 Poland, 70 Romania, 71 USSR, 72 Yugoslavia.

Figure 4c

GDP/Cap,Ratio,1980/1950 v 1950 Level

LDCs.*Source: Summers & Heston



*The countries and their identification numbers are:

- 36 Barbados, 37 Bolivia, 38 Burma, 39 Costa Rica, 40 Dominican Republic,
- 41 Ecuador, 42 Egypt, 43 El Salvador, 44 Ethiopia, 45 Guatemala, 46 Guyana,
- 47 Honduras, 48 India, 49 Kenya, 50 Mauritius, 51 Morocco, 52 Nicaragua,
- 53 Nigeria, 54 Pakistan, 55 Panama, 56 Paraguay, 57 Peru, 58 Philippines,
- 59 Sri Lanka, 60 Thailand, 61 Turkey, 62 Uganda, 63 Zaire

Figure 4d

GDP/Cap,Ratio,1980/1950 v 1950 Level

All Countries: Summers & Heston

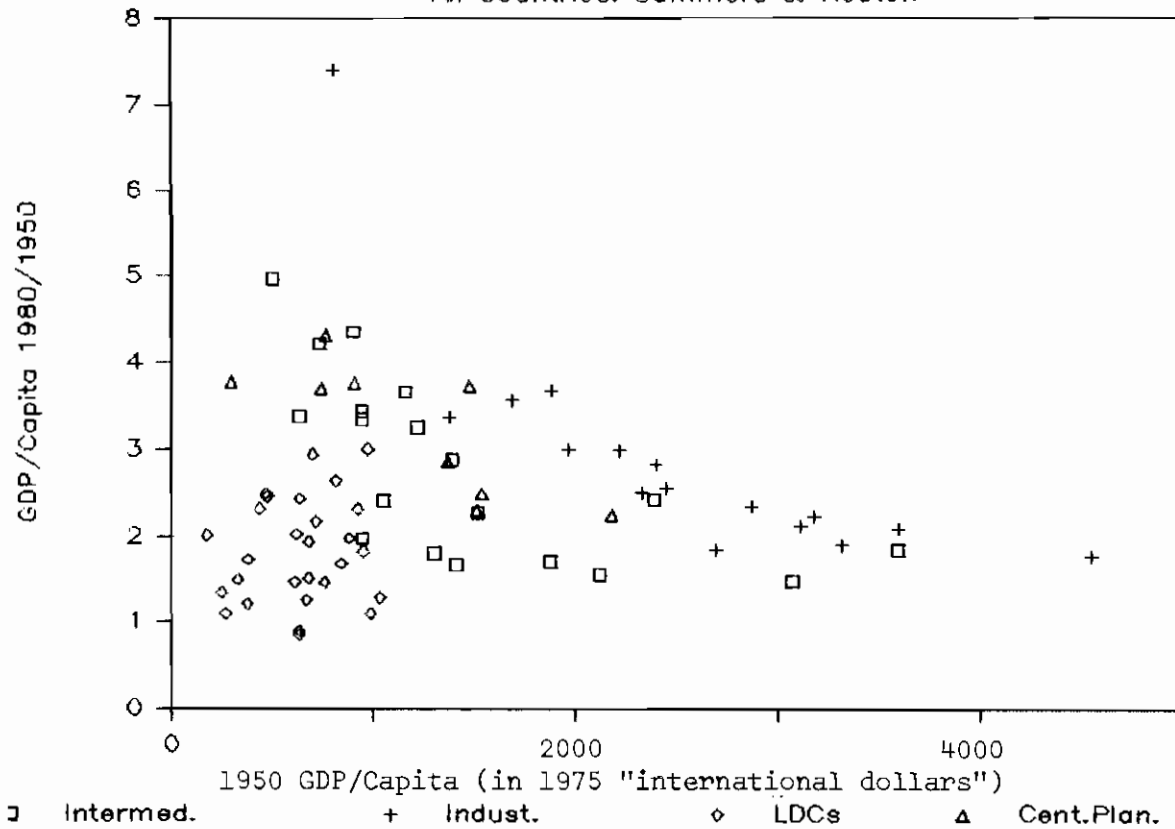


Figure 4e

GDP/Cap,Ratio,1980/1950 v 1950 Level

All Countries: Summers & Heston

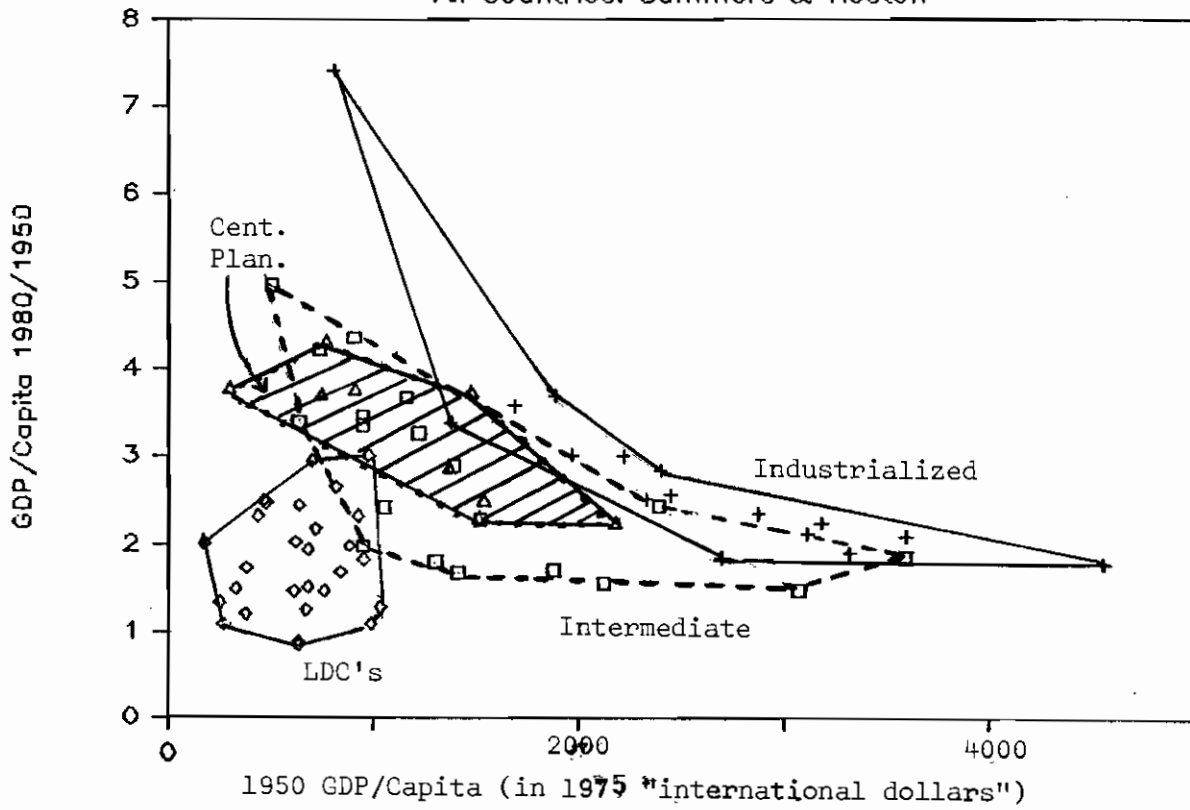


Figure 4f

U.S. Labor Force, Sector Shares

'1800-1980 Source: Beniger: p. 364

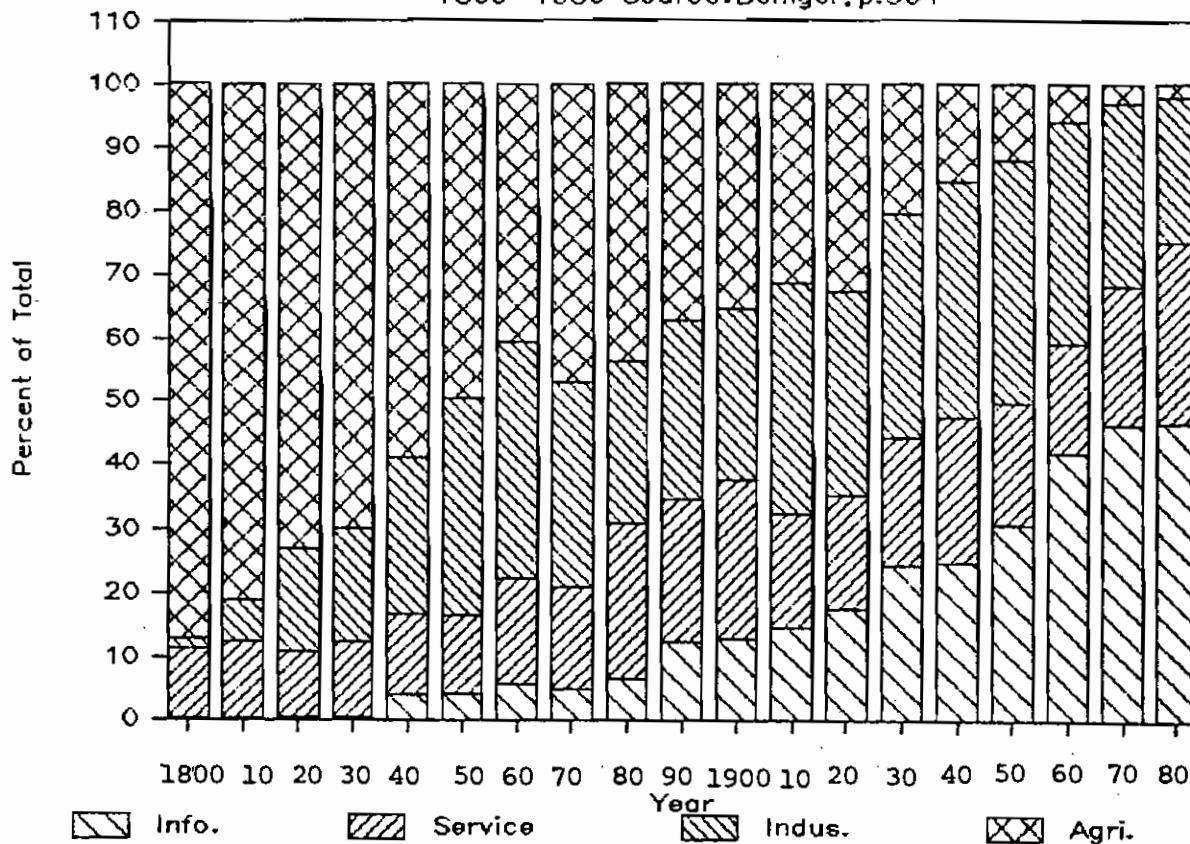


Figure 5