Philippine Review of Economics and Business
Volume XVII, Nos. 3 & 4, September & December 1980

FURTHER NOTES ON THE LIMITATIONS OF GROWTH THEORIES

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Professor Kuznets' interesting notes on the reasons for the failure of Classical and Marxian growth theories to forecast the course of modern economic growth in the 20th century are suggestive of additional comments. Using his view that underlying the secular growth of nations are the interactions of changes in technologies and institutions, one can note other limitations to the growth theories of not only the Classical and Marxian but also those of neo-classical and dualistic theories.

1. Classical Theory

The Classical theory originated during the early part of the Industrial Revolution based at first on water power and then on steam-driven mechanized technologies and was completed long before the more efficient, powerful and dynamic electric/gas driven mechanized technologies began to spread, and wages of unskilled workers rose. The Classical economists (and even Marx) never lived to see how the new mechanized technologies powered by gas and electricity undercut the assumptions they posited in their growth theories.

The rapid growth of the industrialized economies of the U.S. and Western Europe in the 19th century was based on the mechanized technologies driven by steam power. But because steam power was not only crude and cumbersome requiring not only huge boilers but also an extensive network of belts, shafts, pulleys and ropes for transmission, it was inefficient, inconvenient, inflexible, and relatively expensive. The superiority of electric/gas power made possible the designing of machines, more functional with greater power, speed, accuracy, and flexibility, leading to standardization, serialization,

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automation, and mass production, and presently to robotization.[1] Under steam-driven mechanization, it was not possible to mechanize the smaller workshops employing a limited number of workers (because of the heavy expense of steam generation and transmission) on the one hand, and to develop large integrated, automatized heavy industries (because of the lack of control of speed and accuracy on the other). Because of inflexibility, nor was it possible to mechanize agriculture, the home, and offices (Corey 1933, pp. 21-25).

The Classical economists lived in a period when population was increasing rapidly, and the Western nations were just entering the early phases of the demographic transition, and the race against the food supply. It seemed plausible that population growth would outrun food supply with consequent diminishing returns and stationary state as far as industrializing countries were concerned. It could not be expected from them to foresee that half a century or so later population growth would slow down substantially with the completion of the demographic transition a (phenomenon brought about largely by the superior mechanized technologies) and that the growth of the food supply would accelerate with the rapid spread of electric/gas driven mechanization (and advances afterwards in biology) in agriculture. Thus, instead of the Western world becoming stagnant, there was a quickening in the pace of economic growth, with output per capita and total factor productivity both in agriculture and industry accelerating in the early decades of the 20th century compared to the later decades of the 19th century.

The more efficient and superior machine technology driven by gas and electricity was able to mechanize most handwork operations in agriculture and industry, rendering superfluous unskilled, manual workers. Agriculture was tractorized and motorized with internal combustion engines and mechanized with electrically-driven implements, reducing substantially the need for unskilled workers, and raising output per worker and per unit of capital. In industry, work requiring hauling and carrying became increasingly motorized and electric conveyors substituted for muscles but most important, handwork operations were performed by small, portable, and speedy electric-driven machines. Thus, in the U.S., while skilled and semi-skilled workers were increasing, unskilled workers in farming began

[1] Given the product and its quality, the sources of productivity of machines may be said to be their speed, size and efficiency with which fuel is consumed. Machines may be thought of as equipment driven by mechanical power, neither human, animal or water.

to fall absolutely in the 1910s and 1920s. Laborers in manufacturing and other industries also began to fall relatively in the 1910s and then absolutely during the prosperous 1920s, the depressed 1930s, or the militarized 1940s.

The significance of these developments is that in the age of electric/gas-driven machines, the demand for unskilled workers began to fall while the demand for skilled, technical, and professional workers rose. This meant that parents of farming and working class families had to send their children not only to primary schools but also to secondary and other schools where more than literacy and numeracy were taught. Some knowledge about science and mathematics and mechanical, vocational skills became necessary for most jobs in the 20th century. The sending of children to post-primary schools raised the cost of rearing children very substantially, for now children can no longer be put to work after finishing primary school (around 12 years of age). The foregone earnings of about 5 or 6 years of work plus the added expenses of high school attendance had significant impact on views regarding the desired number of children. The sharpest declines in the birth rates in the history of modern economic growth occurred in and around the 1920s for nearly all of the industrialized countries.[2]

The revolution in mechanization of handwork in and around the 1920s in the industrialized countries of the West destroyed the basic assumptions of the Classical model of growth. One of such assumptions was that population growth would outpace that of food supply which through diminishing returns was supposed to stop the growth of the industrialized countries. Instead, food surpluses began to mount.

Institutionally, the Classicists in England did not foresee that the power of the machines would establish a large middle class which began to acquire political power sufficient to bring down tariffs on food from less developed regions, which was transported by steam ships and railways. Nor did they see that these mechanized transports could take back cheaply to the new world masses of people of the old world, some of them to produce the very food that was carried back to the old world in the same ships.

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[2] In the United States, United Kingdom, Sweden, France, and Germany, the most rapid increases in enrollment for post-primary education occurred during the 1920s; in Italy, Belgium and Netherland, they came in the 1930s.

2. Marxian Theory

Karl Marx, writing half a century or so later, could see the dynamic nature of steam-driven machine technology, and by his time, diminishing returns was no longer a problem. Moreover, agriculture in England was rapidly superseded by industry, as England moved into the industrialized society. But this industrialized society was one based on technology driven by steam power. Marx could not be expected to foresee the supplanting of steam-powered technology by electric/gas powered technology, which spread rapidly from the early decades of the 20th century. In his world, factories became increasingly bigger as they began to house more and larger machines and more workers, most of them unskilled. With population continuing to rise rapidly, it was not implausible for Marx to predict, not a stationary state, but the downfall of capitalism. Society, according to him, would be divided into a dwindling class of very rich capitalists in whose hands was centralized the ownership of the expanding factories, and a rapidly growing proletariat of unskilled workers whose real wages were dropping or rising very slowly, as population increased.

As noted earlier, the coming of electric/gas driven mechanization reversed these trends. Real wages of unskilled workers in industry and agriculture began to accelerate during the 20th century as population growth in the industrialized countries of Europe began to slow down in the later decades of the 19th century and as migration to the New World accelerated. With the rise in real wages, the substitution of machines for handwork began to weaken the demand for unskilled workers. This resulted in the decrease in absolute size of the laboring class during the 1920s while those of the skilled, technical and professional classes began to rise. This raised the cost of rearing children and lowered even further the growth of population, and thereby the growth of the labor force.

Both the proletariat and the misery of the lower classes began to diminish as the decades of the 20th century wore on. Instead, the middle classes of skilled workers, technicians, professionals, and service workers began to increase as gas/electrically-driven mechanization spread throughout the economy, wiping out completely steam-powered mechanization. Moreover, although the concentration of production in fewer establishments continued in the heavy industries, especially in process manufacturing (i. e., iron and steel, chemicals, non-ferrous metals, paper and pulp), electric/gas

driven mechanization favored small establishments as well. This was so because the cost of generating and transmitting electric power was much cheaper and accessible to small workshops, and the machines were cheaper and smaller than steam-driven (or even diesel) machines. This, in turn, made possible the rapid increase in sub-contracting of parts and components in assembly manufacturing, particularly in the engineering industries which by the end of the 1970s had grown to be nearly as large as the rest of manufacturing (in terms of value added or employment). The statistics for the U.S. and Japan show that concentration of production in manufacturing as a whole was no longer rising and if anything the trend was slightly downward. The richer capitalist class was not necessarily growing smaller as Marx expected.

These tendencies imply that the overall distribution of incomes should be improving instead of worsening. During the 1920s, family income inequalities began to decline in most of the industrialized countries, as incomes in the lower brackets began to rise faster than those in the upper income brackets (Kuznets 1966, p. 212). Like the Classical economists, Marx also assumed increased population (and therefore labor force) growth and the persistence of the basic technology (i. e., steam-driven mechanization), both of which turned out to be wrong as population growth slowed down in the 20th century and technological change accelerated. At bottom, the Marxian theory of growth probably assumed implicitly faster growth of population over technological progress.

Marx's views about institutional changes likewise appear to be influenced by the revolutions taking place during his time. His strong emphasis on the primary importance of changes in basic technology with institutional changes as more or less a function of technological changes may have been plausible up to his time. But with the rise in importance of the middle class in the 20th century and the spread of democratic decision-making processes, technological changes became a function of institutional changes and vice-versa. Institutional changes such as the migration to the New World in the 19th century from England gave major impetus to the rapid mechanization of British industry and the laws restricting immigration to the U.S. in the 20th century (partly the result of the growing strength of craft unions under Samuel Gompes) were the most important factor in the rise of electric-driven mechanized technology which catapulted the U.S. ahead of England as an indus-

trial power. The relation between the two could be best described in Kuznets' phrase, as an interplay.[3]

3. Neo-Classical Theory

Technological change is conceived too abstractly and in general terms to be very useful for the analysis of secular growth in the neo-classical theory. But two or three different types of machines (say, one steam-driven, another diesel-driven, the third electric-driven as in trains) operated by the same worker may produce vastly different amounts of output (or productivities). Specific characteristics of machine technologies expectedly have different impact on wages, profits, factor productivities substitution, and so on. Without specification, the neo-classical theory is a normative theory (as Kuznets notes), limited to statements as to how economies should grow and not how economies have grown or will grow.

Of more importance is its neglect of major institutional aspects of growth. Accordingly, the supply of labor is exogenously given, and its quality (to be discussed in the next section) taken to be a homogeneous mass. As noted earlier, it is impossible to understand how nations develop unless one analyzes the growth of labor. This includes changing views about the number of children desired, immigration policies, and so on. A theory which does not explain the growth of the most crucial variable in economic growth cannot have much explanatory power.

Under these circumstances, the neo-classical theories dwell mainly on secondary factors (or intervening variables as the sociologists would say) such as wages, profits, substitution, and so on.

4. Dualistic Theories

Unlike the neo-classical theories, the strength of dualistic theories is in the premise that in dualistic economies, labor supply is unlimited. This may be the reason for their popularity in explain-

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[3] In another paper, "Reinterpreting Japan's Postwar Growth," I have argued that the rise of Japan to become an advanced industrialized country started with vast changes in institutions in the 1950s. Similarly, the rapid growth of Taiwan in the postwar decades would not have been possible without the extensive institutional changes as described in my paper, "Economic, Demographic, and Distribution Transition in Postwar Growth," (mimeo, 1981).

ing the rapid growth of developing economies and the slow growth of highly developed economies. With unlimited labor supply, growth of output is rapid because wages remain constant or increase very slowly as long as large pools of unemployed workers remain. For less developed countries, the supply of technologies is also unlimited and can be imported, as long as profits continue to increase with workers using more and more capital. In development economies, without any source of cheap labor and at the technological frontier, growth is likely to be slow.

First, one technical issue may be raised. Basic in both the Lewis and Ranis-Fei versions is the constancy of wage rates: the supply curve of labor is horizontal as long as there is a surplus of unskilled workers. This contradicts the postwar experiences in most Asian countries. Real wage rates began to rise in Japan during the late 1940s, in Taiwan in the late 1950s and in South Korea in the early 1960s — all periods of substantial unemployment. This was also the experience in many industries in Southeast Asia. The reason is that the supply curve of labor facing the industrial sector may never be horizontal (or perfectly elastic) as assumed in both versions because a substantial part of the mix of the industrial labor force employed is managerial, supervisory, professional, technical, clerical, sales, and skilled — unlike in the 19th century and this was so even for labor-intensive industries. Lewis (1954) seemed to be aware of this problem but he dismissed it by referring to Alfred Marshall's (1954) view that skilled manpower can be trained in a matter of a few months. This may be so in developed countries where there is a large pool of educated persons and a variety of institutions to train the educated persons. But this is not so in developing countries going through the formative period of industrialization, where trainers, institutions, and educated persons to train are scarce. (This is one reason for the widespread adoption in postwar Japan of life-time-commitment hiring practices to enable the firm to inject large amounts of in-service training without risking the loss of workers so trained.)

Also, real wages of hired workers in agriculture in Taiwan and South Korea began to rise from the first half of the 1960s with the improvement in their productivity. This was so because typically in the monsoon *padi* agriculture of Asia, there is little or no surplus labor during the busy seasons of planting and harvesting. Hence, to attract these workers to urban industrial employment, wages of unskilled workers must be raised. And this was also done to attract unpaid family helpers on the farm (Oshima 1963, 1958).

These theories, like the previous ones, pay insufficient attention to institutional and technological forces. They tend to equate wage rates for wage costs, neglecting the quality of manpower (defined as skills and culture of work) (Oshima 1980). Wages are low in developing economies but their costs to the employers may be high due to low quality, i. e., insufficient skills and poor habits of work and management caused by historical and institutional reasons. And with poor quality of workers (especially management), the low quality of the product may not make the industry competitive abroad, and sales must depend on domestic demand. But in this model, income distribution is worsening as wages remain more or less constant while only profits and rents are rising. Thus, the internal demand for the output of industry is limited and growth may not be sustained because of the shortage of effective demand.

Furthermore, if wages are constant as output expands, as the theory holds, there will be little incentive for the entrepreneur to improve the technology used by the firm, especially if competition is weak as may be the case in developing countries. All the firm needs to do is to expand by adding the same type of machines so that output per worker employed may rise slowly (mainly due to scale economies). Thus, even though aggregated output rises rapidly, output per capita, per worker, and total factor productivity may rise slowly, as what happened during the 19th century in the U.S., and in prewar Japan and Taiwan. It was not until the 20th century when unrestricted immigration was stopped in the U.S., and in postwar Japan when labor unions were legalized, that wages of unskilled workers rose rapidly. Also, the subsequent substitution of machines for men and better machines for existing ones began to spread quickly with output per capita, per worker, and factor productivity rising sharply, thus sustaining the initial rise in wages.[4] It is not constant wages but rising wages of unskilled workers which gave the initial impetus to the substitution of machines for men, thereby raising factor productivity in the U. S. in the 1920s, Japan in the 1950s and Taiwan and South Korea in the 1960s and 1970s. If growth is defined in terms of per capita product, then it means the abolition of dualism (or its suspension), which is one of the conditions of rapid growth. As long as wages are too low to encourage mechanization, per capita growth is likely to be slow. This is why every effort to reach full employment is important for dualistic economies to attain sustained growth with equity. Thus, countries with much more extensive dualism, i. e., a larger pool of surplus labor than in

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[4] For details, see my U.S. paper, *op. cit.*, and my "Reinstating Japan's Postwar Growth," forthcoming in *Economic Development And Cultural Change*.

East Asia, as in India and the Philippines, have grown slowly in the past decades. India, especially, with a vast internal market and industrial experience as long as Japan, has had the most extreme form of dualism with a whole range of capital-intensive, high technology industries (such as integrated iron and steel, petrochemicals, heavy engineering, integrated paper and pulp, aluminum, and so on) since the late 1950s. But its industrial growth rate in the last two decades was only one-third of those of Taiwan and South Korea and one-half of those of Indonesia, Malaysia, Thailand and Singapore and even lower than that of the Philippines. Under the influence of the Soviet-type heavy industrialization strategy, Nehru in the latter 1950s decided to plunge massively into heavy industries, leaving by the side agricultural and light industry development. Despite the large internal markets, India has found it very difficult to keep these heavy industries operating close to full capacity to be able to earn profits sufficient to pay for replacement investments. The postwar decades have shown that technological changes are extremely rapid in the heavy industries and the rate of obsolescence of machines high (because these are the industries in which the leading industrial powers are spending enormous sums of R and D to keep ahead of each other). Thus, most of the heavy industries of India are obsolete and inefficient.[5] They sell to the moderately capital-intensive and labor-intensive industries downstream their costly and outdated equipment and processed products making them also inefficient and unable to compete internationally, i. e., the "cost cascading" effect.[6] Similar problems may have induced Communist China recently to emphasize on light industries. South Korea was perhaps in similar troubles with its shift to heavy industries during the 1970s. So, more than wage dualism is involved and technological and institutional forces need to be taken into account.

The charges made here are not exactly fair to the earlier theories of long-term growth. Technologies and institutions are not

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[5] This is despite large expenditures by the government for replacements and renewals which in the present plan period may be larger than for new plants, as far as steel and other metals, heavy engineering, petrochemicals, paper and pulp are concerned *(Draft Five Year Plan, 1978-1983,* 1978, pp.188-205).

[6] For a discussion of "cost cascading" in the Indian textile industries, see Pack. It is partly the system of protection which has promoted inefficiencies but once a whole range of heavy industries is established, what alternative is there but to protect it, if tens of billions of dollars of investment are not to go down the drain? Without the resources (both personnel and funds) to keep up with the R and D of developed countries, what chances are there for Indian heavy industries to close the cost gap?

measurable, and are difficult to categorize and conceptualize in ways appropriate for theorizing. Major changes in technologies (mechanical and otherwise) are difficult to foretell, so that, as Kuznets notes, bringing them into the models is likely to cause havoc. It is difficult to predict what impact robotization will have on industry, electronics in the services, and bio-engineering in agriculture and pharmaceutical industries. No one in the beginning of the 20th century could have foreseen that manufacturing, heavily dominated by the process industries (food, textile, wood, paper, chemical, metallic and nonmetallic) in the 19th century, would come to be dominated by the engineering (or machinery) industries in the closing decades of the 20th century. This may mean that the rapidity of technological and institutional changes may no longer permit theorizing for the long run.

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