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LONG-TIME SHIFTS IN HUMAN AND NATURAL RESOURCES*

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Concept of "resources" lies in the realm of technology. It has been transferred from technology to economics and has there obtained a wide ramification of meanings. Since the topic of this paper is thus concerned with technical and technical progress, the paper will attempt to interpret some of the means and processes that are involved under economic aspects.

Economics may be an observational "natural science" that lays no claim to the evolution of the economic system, but seeks to discover economic laws of economic behavior, of action and reaction, of evolution. This approach assumes as a working hypothesis that a certain stability exists and that the variety of means to satisfy wants is limited. Only the factors that have taken shape and hence are known can be taken into account. In 1800 an economist could not base his observations and conclusions on the opening of the industrial age with electric energy available and useful everywhere. In 1939 an economist cannot speculate on the invention of using water as hydro-oxygen for a motor, or some similar revolutionary achievement. Moreover, economists take their problems from the historical period in which they live and solve practical tasks of their time.

Under these conditions, the limitations as to period of observation and as to economic, social or political urgency, must involve great restraint with respect to the application of technology. Hence general economics cannot escape being a skeptical one. Only technical achievements that are tested and are applied with economic effect on a broad scale can be acknowledged. Thus the economic system, as seen by the economist, operates within a relatively closed sphere of technology and knowledge. This holds true in spite of the emphasis that economic theorists in this field have laid upon economic progress and evolution.

The economic system is permanently changed and is propelled by the reinforcing force of technological progress. This force is destructive and creative at the same time. It plays havoc with economic equilibria while within the liberal capitalist economy the automatism of prices brings about adjustments which tend to absorb the shocks and to assimilate the new techniques into the system. Technological progress is generated by economic conditions but itself creates new economic conditions. It is effect and cause simultaneously. Technological progress is fostered not by skeptics but by optimists who live more in the future than in the present, who are utopians with a practical sense. All inventors are in a sense critics of the unsatisfactory state of this world and try to improve it. They are the men at the pioneer fringe of our civilization, and theirs is the victory in the long run. In the short run they are frequently, even usually, defeated. The economists are eventually correct in the short run. In the long run, they are frequently, even usually, defeated.

There are other economists, the specialists in so-called private economics or economics of enterprise. By the nature of their studies they are the natural collaborators of engineers and inventors. The whole field of agricultural, industrial and commercial management, of marketing and cost accounting, is their domain. They stand between the general economists on the one side and the inventors, engineers on the other. Their focus is different. They simply have to be

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at the front of technical progress because it decides the potential degree of efficiency, of curtailing costs, or improving quality.

I venture here to advance a few thoughts about some phases of technological progress in the longer run, and a few reflections upon the implications for the political economy and our outlook into the future. First I offer a few selected examples of technological progress; secondly I draw a few economic conclusions.

In our economic vocabulary the term "natural resources" has come into widespread use. Natural resources are said to be the foundation of the wealth of nations. Supposedly the possession or lack of "natural resources" divides us into the "haves" and "have nots." So, obviously, natural resources must be measurable and catalogued for inventory. But what are they - really?

We speak of "land resources." No more than three generations ago sandy soils were regarded as submarginal land of little use, while heavy loam and clay soils were appraised as paying soils, because the latter had more natural plant nutrients than the former although sandy soils are easily workable and clay soils are not. Justus von Liebig discovered the importance of minerals for the growth of plants. His law of the minimum and the results of his research showed how the fertility of soils can be retained and how a deficiency in plant nutrients can be made up. This discovery has had extraordinary effects. Great mounds of potash salts, a nuisance and a waste product of the salt industry, were suddenly turned into a natural resource. Basic slag, another waste product, became a valuable fertilizer, and the Atacama Desert in Chile and Peru became as valuable as a copper deposit because saltpeter turned out to be the greatest promotor of crop production. Before the War, chemists like Haber, Bosch, Frank, and Caro invented the process of mining nitrogen from the air, thereby turning the atmosphere into a vital source in a new sense. The discovery of photosynthesis had already shown that carbon dioxide of the air is the origin of the bulk of all organic matter. The discovery of legumes as plants that fix nitrogen from the air made it possible to enrich soil poor in nitrogen, while their deep roots transport potash, phosphate, and lime from the subsoil closer to the surface. Combined with the achievements of plant breeding, all the discoveries and inventions of agronomy have slowly changed the intrinsic utility of specific types of soils. Hence they have also changed land values and the opportunity for intensive application of labor and capital on various types of land.

Sandy soils with adequate moisture are now worth relatively much more, and loam soils relatively much less, than 50 years ago. Chilean saltpeter is now worth relatively much less than 20 years ago. Land reclamation, laying out the Zuider Zee, reclaiming swamps and marshes, irrigating deserts and barren lands, and entirely new techniques and more efficient equipment, have similarly revised the meaning of natural resources. What they are seems really to require a new definition. To me it makes the best sense to say that they are a desirable correlation of labor, management, and capital, but not more than just that.

The concept of land resources has changed profoundly. But human resources have always been developed first and have thus created natural resources. The results of scientific research, the application of scientific knowledge to technique, the pioneering, and the propagation of knowledge among a multitude of people as well as the accumulation of skills have multiplied the "human resources." All that can be said about them is reflected by the changes in the natural resources of which they are responsible.

Another "natural resource" is the forests. We hear much about the criminal destruction of forest resources. Yet it is worth while noticing that as long as an endless primeval forest covers good land and makes it inaccessible, the forest's growth is a nuisance quite unlike the resource that we have in mind in our advanced industrial civilization. In 1937 I met in Louisiana the owner of a

resin retort who extracted his products with an ultra-modern chemical plant
 half-rotted stumps of "fat pine" trees. With this secondary or waste rosin
 successfully competes with primary gum tapped from living trees. He told me
 in 1897 he bought the right to cut the finest untouched timberstand for a
 \$1.50 an acre and that he burnt all the majestic logs into charcoal,
 those which could not be cut because they were too thick. At that time and
 those circumstances it was the only economical and intelligent thing a man
 do. I do not care whether you call it "yield" or "loot." It was economically
 to be sure. Neither land nor forests have originally a value or can even
 be a resource. They even have a negative value as soon as any taxes or fees
 are imposed upon them. Forests obtain value slowly as man begins to invent methods
 of utilizing wood, and to create by his imagination his demand for wood, and as
 he develops his techniques for supplying himself with it or has leisure to en-
 joy the forest on vacation. From the use of wood as fuel to charcoal burning and
 its use as construction material, the sequence of utilization passes through
 several stages. Wood becomes the raw material for plywood, cardboard, and paper
 and the next step leads to the processing of cheap wood and wood waste into the
 production of compound materials like fiberboards, masonite, or pressed boards
 and containers. Wood is distilled for alcohol. It is converted into cellulose,
 nitrocellulose, gunpowder, and varnishes. Finally, the burning of charcoal
 produces but with destructive distillation of the wood and utilization of tar by-
 products as pharmaceutica, dyes, disinfectants, and a score of other valuable
 products, while the charcoal itself is ground to a fluffy powder and blown with
 air into the fireboxes of steam turbines. Dr. Bergius who invented the proces-
 sing of gasoline and lubricants from coal has also invented several processes
 which permit the conversion of wood into digestible carbohydrates and sugar, with
 a yield of bricks as a fuel by-product. Thrift and refinement in utilization of wood
 is accompanied by progress in forest management. Finally every tree is planted.
 Forests are tree crops. And they become at the same time a recreational re-

sult. The economic result consists of a genuine revaluation of all values. A nuisance
 becomes a resource and a resource a better resource and a material resource a
 natural resource. The same volume of output means finally a multiple of the orig-
 inal product mainly through better techniques of utilization. In our example of
 forest, a deposit resource has been replaced by a flow resource because a
 wild and cultivated forest has taken the place of the primeval timberstand
 mature built up in the course of centuries.

Another good example of the disturbing and revolutionary effects of technical
 development is petroleum. Before it was discovered as a fuel and lubricant, oil
 was a nuisance to the cattle breeder because it spoiled the best watering places
 and wells. When it had been discovered that oil can be pumped and expressed from
 the earth it showed its first utility for a long while as a fuel for oil lamps. Then
 gasoline was the main product. Gasoline was still a nuisance; so was natural gas.
 In the 'sixties of the last century, the state of Pennsylvania passed laws
 which sought to prohibit the pollution of rivers and creeks with dumped gasoline.
 As the combustion engine was developed to a certain performance, gasoline
 and kerosene dropped to the rank of a minor by-
 product. Then oil became the vital resource for power. As the next step natural
 gas began to be tamed and to be piped over long distances, and it became a valu-
 able fuel. Crude oil was introduced as heating oil, and later on as another low-
 cost motor fuel for the Diesel engines, invented precisely to use it so. But
 stationary combustion motors run now with natural gas, gasoline, kero-
 sene and crude oil. In competition with these mineral fuels electricity is
 generated from coal, lignite, or water power and drives stationary motors or
 produces light. But this is far from being the end of this race in the production
 and utilization of oil. Chemists have been able to develop methods for synthetic

production of gasoline from coal or lignite. For more than seven years, wood has served also as automotive fuel. It is fed into a gas generator to the ordinary truck or motor car. The French army, the German and Swiss service, bus companies in Italy, and enterprises in Japan operate their vehicles with wood as fuel. Some of these countries also use lighting gas pressed into steel flasks as the fuel for cars. If the relative price of specific fuel gets high enough, automobiles can be operated on straw or any organic substance.

Technology has made oil accessible, has created the demand for it, and already invented the methods for getting along without it. If tomorrow oil wells in the world were exhausted it would not be long before the world would be operating in similar numbers with other fuels. One of the substitutes available already is pulverized coal blown into the cylinders and exploded.

Still another example of the upheaval that science, engineers, and inventors cause in the supposed economic order may show that this is not the exception rather the normal process. In the textile industries, competition between different raw materials has for more than a century caused immense changes time and again. Flax and hemp as vegetable fibers, and hides or leather and wool as fibers of animal origin, were the original raw materials on the European continent until cotton began to invade the markets. Cotton attacked mainly first from flax. Wool and silk had little or no direct competition until rayon. With tremendous improvement in quality and drastic reduction in price, the manufacture of rayon from wood cellulose has not only outdistanced natural silk but has finally attacked the domain of cotton. Today the production of synthetic cotton or staple fiber from cheap wood shows a tremendous rate of increase, in the industrial countries like Germany, Italy, and Japan which have difficulty in paying for imported raw materials. The United States, with the largest production of all countries, also produces the substitute fiber wholesale. The fiber checks the price of cotton and jeopardizes the existence of cotton while it creates employment in the machine manufacturing, the forest, the pulp, and the staple fiber industries.

Other developments in the textile field indicate a similar trend. The increase in milk production and in the utilization of milk for butter has thrown more skim milk as a by-product into the markets. Its dry form, casein, is a raw material for many plastic materials. Because of recent inventions it is used extensively for producing a synthetic wool. Japanese patents have been applied the same principle by extracting from the silkworm the raw material for manufacturing the threads with ordinary rayon filament machines. This process is not yet commercially tested. Furthermore, cotton is nowadays converted into all sorts of products such as wall and floor covers, insulating materials, and so on. When the self-binding harvester came into use, sisal cord began to be an important string fiber and a real plantation economy developed upon this. When the combined harvester-thresher pushed the binding machine back, the price for sisal fell off. In industry and commerce hemp and jute have been replaced by wire, metal band, and glued paper tape, while African alfa grasses have been replaced by a new string fiber.

In the field of metals we recognize a similar turmoil of substitution. The struggle of aluminum against copper and of magnesium against aluminum and nickel alloy steels against all of them is well known. Plastics are the latest development in engineering. These materials are composed of partly natural rosins, partly synthetic products. Plastics are beginning to replace all sorts of metals.

But instead of wasting your time with more examples from a variety of fields I prefer to speak about one last sector of a competitive battle that seems to illustrate the subject very well. I refer to the history of illumination.

of the eighteenth century, the only means of illumination that existed other than open lamps with a wick fed with certain crude vegetable and animal oils. The primitive soft candles of suet or tallow. As the Encyclopedia Britannica briefly, they gave a "minimum of light and a maximum of smell." In 1784 the inventor of the lamp with a cylindrical tube, an adjustable wick, and a glass chimney. This invention gave for the first time a really bright light. Rapeseed oil was the principal fuel. The lack of efficient illumination was so much felt that inventors by the hundreds devoted their lifework to the subject. The efficiency of oil lamps was improved first by a process of purifying oils with phosphoric acid. This made it possible to use cottonseed oil and coconut oil as a substitute for rapeseed oil. Next came the discovery of sperm whales as a source of oil and solid waxes, and an American fleet of up to 1,000 sails roamed over the western seas, earning 500 million dollars in 70 years. Spermaceti candles became a great competitor to oil lamps, but sperm oil improved their light as nothing had a higher lighting capacity than sperm oil and spermaceti wax. Spermaceti was also used in lamps. Between 1790 and 1820 candles thus conquered the market. About 1820 coal gas became prominent as an illuminant, although at that time only primitive burners were known. But in the 'thirties and 'forties one began to apply wholesale the process by which lard, bacon, and beef tallow may be converted into hard stearic acid and into liquid oleic acid or oleine. This process of saponification or fractional congealing is said to have been invented 70 or 80 years earlier. The stearic acid leads to the hard so-called "adamantine candles" which compete against spermaceti candles, and lard oil replaces sperm oil for both force the prices down and make light more accessible to mass consumption.

One may hear how economic experts judged the situation then. I quote from Niles' Register of 1842, p. 272: "The Journal of Commerce remarks that of all changes that trade is passing through, none is more remarkable than that in the whale fishery. Before the whale fishery has supplied light for a vast portion of the world. In all the large towns and villages sperm oil has been sold freely. That has suddenly ceased. This spring there has been almost no demand from the cities for sperm oils and very little from the cities. Camphine and lard oil have applied the demand at a cheaper rate. Crude sperm oil has fallen one third in price and yet remains neglected. The hogs have fairly run the whales out of the market and are likely to hold their ground, unless some new processes of cheapening can be utilized on the other side. The woods of the west are more full of quadrupeds than any ocean is of the finny whale and the quadruped is much more easily taken. The way now is to turn the whole hog into oil."¹

One may smile about the opinion of the Journal of Commerce of 1842. Today we are inclined to smile at that analysis. Yet at that time it was probably correct. In 1846 petroleum was discovered for lighting and kerosene began to kill spermaceti candles. Spermaceti wax slowly but surely squeezed out of the market, especially because its price fell rapidly lower and ever lower while it became better known. Finally it was burnt in the incandescent regenerative kerosene lamp which already gave nearly as much brilliant candle power as modern electric lamps. The same lamp, however, was soon used for burning competitive fuels, spirit kerosene. While kerosene conquers the whole world and lights it, the much brighter lighting gas comes suddenly to the fore when the mantle of rare earths is discovered by Auer von Welsbach and supplies the incandescent gas lamp. This period extends from 1860 to 1900. During the whole period from 1800 to 1900 inventors toiled to produce a better electric light. They finally succeed in 1870 with arc lamps for street illumination. But the incandescent gas lamps set them back until between

I owe the knowledge of this source to the courtesy of Dr. C. L. Alsberg.

1895 and 1920 the incandescent electric bulb is achieved and finally eradicates the competing sources of light.

Today we have light as a permanent utility which does not offer any problems. Yet it took endless detours, endless new investment, scrapping and reinvestment to get at the prevailing solution. And nobody knows whether today the final shape of our sovereignty over day and night. One of the joint results of the last solution of illumination is that vegetable oils and animal fats are today no longer needed for lighting fuel, and that they therefore become available for food, soap, and paint in abundance. Kerosene electric light have made possible the rise of the margarine industry, the candle industry, and the paint industry. But alas - this was not the final change; the meantime the production of vegetable fats has advanced. Now the latest is that peanut oil and soy-bean oil can be used as Diesel engine fuel. Vegetable fats attack mineral oil. To make the picture more confusing, American chemists are proceeding in synthetic production of fatty acids from coal and synthetic glycerine from mineral oil. Thus edible fats made from coal may soon become available.

This sketchy survey of some indeed bewildering phases of the evolution of human and natural resources was a typical long run observation. It would lead to assume that either during any one of the historical phases or in the present economic environment everything is moving so hectically. Thus condensing the happenings of a century into a few minutes, the motion picture gives the illusion of violent and almost seismic changes. In fact the general effect has to reduce the effective rate of technological progress in proportion to the normal pulse of business. In some cases the visible effect within a given year is next to zero, in others considerably more. But as soon as he concerns with a sequence of several years or with policies that cause or involve changes, he ought to be fully aware of what is in the making. In attempting forecasting the probable future deviations due to technological progress, the most specific analysis of the history of individual fields of economic activity seems to offer most useful analogies.

Glancing over the time-condensed examples that were cited, we recognize all supposedly stable equilibria between production and wants as established and maintained by flexible prices are shifting and are basically unstable. The equilibrium on top of the existing and changing standards of applied technology. Technological progress is continually attacking the equilibrium, because the possibility of setting it temporarily and gaining thereby is the great motor for progress.

Technological progress is responsible for a continuous process of destruction and depreciating capital, while at the same time it creates new capital. It renders machines tools, houses, bridges, highways, and every sort of capital economically obsolete even though they are technically still useful, and causes their rapid and premature depreciation. This circle of creation and destruction is a vital principle for the satisfactory operation of our economic system. The power of competition keeps the process of scrapping alive. Monopoly in various forms is capable of preventing the competitive price economy from keeping technological progress and its capital-destroying and capital-creating process alive. If the competitive system is abolished, then technological progress can be kept alive by planning lest we suffer a state of stagnation and all its accompanying conditions. Technological progress in the enlargement and development of human and physical resources constitutes the enzymes and bacteria that keep the body of an economic system alive. It permits producing and consuming new things. It brings about change. Change is the essence of a living economy. Mechanization creates wealth. But it also creates rigidities and increases the danger of increasing violence of depressions. If mechanization is introduced

at a time of gestation when the flow of investment is faltering it may produce the temporary phenomenon of technological unemployment. It is exclusively a result of congestion. However, this is only a fraction of the total. Since technical progress discards machines and rigidities, it is logical progress also that makes it possible to absorb the people who have been free on the labor market into other useful occupations. Inventors do not sit in attempts to save us from the vicious condition of the machines' but instead of our running them.

speculating where they shall start their ventures, inventors, engineers, research scholars take a good deal of their stimulus and "hunch" from the atmosphere. Here technicians can obtain most valuable co-operation from scientists. But finally only those accomplishments become a reality in agriculture, industry, and commerce that mature economically into applicability.

The long run, natural resources of yesterday and today mean relatively little. It is the human resources, man's ability to invent, to adjust his needs, to utilize the new resources, to utilize them more intelligently, that are the greatest assets of the human race. To develop them to their optimum requires the education of the skeptical general economist as well as that of the speculative special business economist. Here lies the great task for education. It is not only should the productive spirit and the knowledge that man himself can create in his world by his toil and sweat be developed at their very best, but the education in economics should supply a sufficiently solid background to the technicians, researchers, engineers, and inventors, to put their tools to work at those places where the greatest margin for economic results offers itself. It seems as if the deal of economic teaching has become over-sophisticated and by mis-education the emphasis has emancipated itself from the fundamental comprehension of what creates wealth, income, and employment; and of what prevents it. Such a situation seems to spread a subtle pessimism and with it they nourish the mental stagnation for a stagnant and constipated economy.

After all, the wealth of nations depends on the volume and quality of production. It is familiar with the progress at that frontier of those who toil with their hands. It is something worthy of a good economist. How otherwise is it to be explained that in countries like Germany, Russia, and Italy, countries with a distinguished history of political economy, economics have been thrown into a scrap heap and engineering has been put into its place? It seems to be an ever present danger in other countries as well that the transfer of economics into a less static theory that does not suit the necessities of the life of the present costs the loss of public endorsement. It is no accident that frequently utopian and cockeyed economic plans are drafted by engineers, architects, and artists who are often the most brilliant technicians in their field. This national phenomenon seems to indicate that many of the most inventive brains despise economics because it is too static, too skeptical, and too unprogressive. Many economists in turn disregard experimental technique and theory entirely because it seems to them some sort of a lofty hobby that has no connection with the economic process. The same economists, however, are just as cockeyed as those by engineers because they lack sufficient familiarity with technical problems. One of my good friends is a well-known economic theorist. When I proved to him with very specific technical criticism that most of his judgment and theory about collective agriculture in Soviet Russia five years ago were impractical and in contradiction to his assumptions, he stated that he never bothered himself with such "minor technicalities."

Therefore we should not be swayed in our judgment by overstressing the effects of technical evolution, we should be familiar with the character and strength

of its rejuvenating power, observe the rate of progress, and try to see the trend of p
our analysis, our interpretation, and our forecasts for its fermenti the scope of
To do so leads me to vigorous protest against certain tendencies in competent autho
economic thought. article, in the

During the last decade a new interpretation of the prolonged depre es started to
widespread unemployment has been conceived by some economists of disa number of oth
reputation. In its essence it suggests that our present economic syst a, and Malay
reached more or less its ultimate saturation point for three reasons: quate statis
growth of the population of the world is declining and approaching a words, we k
stagnant population. Secondly, no inventions like the railroad and st d toward dec
to be expected. Thirdly, the discovery and development of new territ here industr
resources like the development of the American continent are not like who decide w
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This latest emanation of historical materialism and determinism is able to have
not expressed in so comprehensive a picture and is not very bluntly s able to have
it is frequently interwoven into the fabric of all sorts of diagnoses changed the
roots of the evil of unemployment. The validity of this pessimistic ing survival
ministic economic philosophy surely warrants our sharpest attention. set of other
thesis of saturation of our economic system is an economic parallel t ture of moti
famous thesis on the "Decline of the West." Both assume that due to obtain that th
of the aging of a civilization, its vigor and vitality are diminishing section? Even
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the saturation of the capitalistic system do so for the realm of the another attit
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and predestination is nothing new. It has any number of precedents. In t. It is - to
German economist, Julius Wolf, wrote a book on political economy as a turn. It
in which he claimed that further investment in the traffic system of t increase in
not pay because costs had declined to an irreducible minimum. from investme
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One of the best recent examples of the pessimistic interpretation of boil instead
ent historical situation is to be found in Professor Alvin Hansen's p ily to consum
address delivered at the Fifty-first Annual Meeting of the American Econ against any pr
Association at Detroit in December 1938. In this remarkably well-balanc not seen in a
skeptical survey, Mr. Hansen points out that with reference to the grow the desire to
population Western Europe has "already virtually reached a standstill." ad poor whit
mits, however, that population is still growing in Eastern Europe, note ereover, I s
Russia, and in the Orient. He points out also by quoting from the book of the iner
of Land Settlement that the frontier outlets for new investment are rep s as people
closed. Then he rounds up his further conclusions by the following stat logical reaso
"The growth of modern industry has not come in terms of millions of sm ily of physic
ments of change giving rise to a smooth and even development. Character inseparable
it has come by gigantic leaps and bounds." "It is the cessation of, and intel
which is disastrous." "It is in connection with the growth, matu ation.
decline of great industries that the principle of acceleration operated s to be a
peculiar force. And when giant new industries have spent their force, or the uncor
a long time before something else of equal magnitude emerges. In fact n a totem pol
emerged in the decade in which we are now living." a previous

To me this economic pessimism that is so much in vogue now is hardly
a philosophy ex post which offers a reflection upon our particular situ
these days. It is one interpretation of a certain selection of facts wh
pen to be shared more or less by all Marxian economists. But facts and
identical facts are open to very different interpretations. I doubt ver
whether statistical data support this philosophy very well. As to the fo

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pp. 47-72.

the trend of population, it appears to exaggerate the opportunity for the scope of future happenings by statistics of the past. As one of competent authorities on population, Robert R. Kuczynski, has shown in his article, in the majority of countries in Western Europe the net reproduction started to decline not earlier than around the turn of this century, and Malaya are significantly not included in these calculations where adequate statistics are not available.

In other words, we know nothing more than that during a period of one generation toward declining matrimonia fertility has been observed in the territories where industrial development has been most marked. But after all it is not like who decide what they consider worth while living for. In this basic philosophy it is no unimportant item whether people of a given epoch regard it as desirable to have many children, few children, or no children. It is true that people have changed their minds under the impact of the progress of medicine and the increasing survival of more children, of increasing economic insecurity, and a host of other changes in the social setup. What the predominant factors in the change of motives are is obscure. But who would be daring enough to predict that the people will definitely not change their mind in the future? Even very slight changes in the leanings might reverse the trend. Is it impossible that after an era of rapid concentration of industries and urbanization and after the experiment of one generation to live with a high birth rate but few or no children, people should tend in their majority to a different attitude? Metropolitan areas have ceased to increase in concentration and are already dispersing. Moreover, the city is changing in character. The city of today is not what the city was 30 years ago when it meant a lot of things. It is - to be sure - not at all impossible that the population trend will change a turn. It is equally untrue that only the crude growth of population will increase in the capacity of the economic system to absorb and to yield a return from investment. The economic capacity to produce goods is a function of science, technology, education, technique, and last but not least a function of the will to produce instead of idling along. It is the capacity to produce that decides the ability to consume. Indolence and lack of ambition are indeed a psychic barrier against any progress and prosperity and the only one that counts. I have not seen in any country a race or group of people yet that was absolutely without the desire to improve their consumption, either in Mexico, or among the poor whites of the South. At least there are varying degrees of ambition. Moreover, I suspect that poor physical conditions is responsible for a part of the inertia.

As people are not so degenerate as to be content in poverty, I do not see any logical reason for a cessation of economic progress. We must not think only of physical goods but also of the intangibles like all the services which are inseparable from the essence of becoming really civilized. Services to the mind, and intellect are so innumerable that no reason is to be seen for their cessation.

It seems to be a result of the fatalism involved in thinking in terms of trends or the unconscious raising of a graphic symbol like the "trend" to the status of a totem pole. Trends are merely lines on paper which may deviate at any time from a previously regular direction.

R. Kuczynski, "The International Decline of Fertility," in Political Geography, A Symposium of Population Studies, edited by Lancelot Hogben (London, 1950), pp. 47-72.

I cannot see more documentary proof either in behalf of the other of Professor Hansen's economic pessimism. He says at one point in his "What we need is not a slowing down in the progress of science and technology but rather an acceleration of that rate." Yet he reduces this recognition of creative power behind technological progress to a negligible role because he assumes that only such progress as that of the railroads and the moving frontiers can cause sufficient change and thereby opportunity of investment that really borne out by the facts? I wonder whether this is not an illusion similar to that of Karl Marx about the general, necessary, and inescapable into concentration of production and distribution. We know now that this became reality neither for agriculture nor for a good deal of industrial production nor for the distributive field. If we try to summarize the tremendous widespread change that has been going on through more than five or six decades and all the immense depreciations of capital and regeneration of it outside of the building of railroads and outside of the American frontiers seems fairly safe to say that though the development of the railroads was a monumental single item that could easily be measured and grasped, hundreds of other changes have contributed as a whole more to the rising standard of living and employment than railroad construction in itself. Why should we believe in the construction of the worldwide electric empire with all its ramifications, the advent of the mobile combustion engine, the new widespread and diversified chemical industry with nitrogen, rayon, dyes, and pharmaceuticals, the radio in the concrete industry, highway construction, and transcontinental and trans-airmail which all are absorbing capital in large amounts? Why should we believe in the tremendous requirements of investment that are necessary for ordinary maintenance and replacement of a modern transportation system? Why should we forget the eternally basic investment industry: housing, as a potential large-scale investment opportunity for capital? Looking upon the housing conditions for the farmers in large parts of this continent, I see for a century sufficient opportunity for immense improvement. Are we not forced perhaps to consider our houses obsolete although they may offer satisfactory utility according to the standards of yesterday? Have not the heating engineers, through progress in gas, electrical furnaces and ranges, through better insulation and new designs, changed our concept of usefulness of houses? Have not the architects and contractors, the lumber and building material industries done their best to render our houses obsolete at a faster rate than ever? Are they not the ones who are to put idle man-power to work? - Whether we can afford to wreck them depends on the total amount of labor that is put into production.

In these very days of ours a most startling and overwhelming process is taking place, a process which changes almost every aspect of so-called economic life. This process consists of nothing less than the decline of ultra-urbanism and the shaping of new forms of human and industrial settlement. The pyramid of the super-cities is flattening out. The great decentralizing forces in power are transportation, and communication are some of the material foundations of the new evolution, while psychic forces originate from hygiene, aesthetics, and social motives and set new social standards. Electricity, motor cars, telephones, and radios are great decentralizing influences that bring the conveniences of the city to the country. In strictly economic terms the validity of my observations on the return from ultra-urbanism can be measured in dollars and cents of suburban real estate values. My point against the thesis of Professor Hansen is that this reversal of the trend toward concentration of industries and investment is not yet in full swing in all industrial countries and that it opens up entirely new fields for investment on an immense scale.

³See the article "Inventions and Discoveries, Technological Advance and the Depression" in The Index, quarterly by the New York Trust Company, Vol. 1, summer 1939.

other Hansen is most skeptical about the end of colonial settlement. It in his Luxemburg who added to Marxian prophecies the indeed brilliant thought decay of private capitalism could be postponed by the expansion under recognition. Professor Hansen seems to conclude that the era of imperialism is and that hence colonial development does not open many opportunities investments. However, if the world were finally distributed between stic powers, why should the prospects for investment be exhausted ex- these years of our immediate present and future? The South and the Europe are in an early colonial state. Asia Minor, all of Russia, South America, not to speak of the Orient, can easily stand a century of tion with all the possible aid from the industrialized parts of the world.

an years ago in a dispute on exactly this subject an economist and a high- ceer tried to disprove my argument that housing and traffic alone would ce to absorb tremendous amounts of investment capital. They pointed out was not true any more because railroads will not expand much further ate highways last forever. Today we know the automobile engineers who ed the railroads have already made most of the existing highways obso- Better super-highways will absorb even more capital than the existing is the question how much we can produce and thereby afford to scrap and

ould say whether in 1939 we are not on the eve of a large-scale applica- collection of many ripening inventions that call for an amount of investment that puts all the people to work!

ology may be permitted to be inserted. The earnest argumentation of the danger of food scarcity in the world still reverberates in my ears. For ce up to 1928 the supposedly imminent effects of the Malthusian law of ce was the scare of a majority of economists. Since then we have been the talk about food surpluses. It is neither an inherent defect of our ve price economy nor a process of aging that has created the temporary that some economists consider as a permanent condition. If we try to the causes exclusively in the economic sphere or in the technical ap- of the economic system, we are like engineers who try to discover within the stoppage of all machines while the lightning has struck the elec- plant a hundred miles away. In the complex array of causes one of the nent reasons for the unsatisfactory employment of all our productive ce, human and physical ones, lies in the political disintegration of the ce are living amidst the gigantic conflict of power economics versus wel- omics. If and when the present game of power politics and aggression ce at a point where it does not pay any more, and if a rearrangement estab- state of peace, it is quite imaginable to me that an era of worldwide ce as never experienced before may begin. If the fetters can be taken ce international trade and international capital movement, if a certain psychol- political stability induces capital to go to steady work, which means ce, all the arguments advanced in behalf of sophisticated pessimism ce insignificance.

try to interpret the present prolonged business recession with all its ce and economic discomfort correctly, it seems most logical to me that the ce used for the political preparation to bring about that condition which ce mit the nations in the world to produce for civilian consumption. If the ce of war occurs, no economic rationalism can apply any more. But if it can ce, and a stalemate of power be reached, it should be possible to arrive ce in which the economic game can be played again, with more vigor than ce. If so, the progress will be limited by the rate of developing our human ce resources but not by some mystical limitation of consumption.

As long as the total volume of production is too small to employ to work, it is only natural that economic research is pushed into a more equal and socially just distribution. It seems to me that the margin for raising the standard of living of the masses lies in taking brakes from production.

What prevents us from attaining the technically available level is not essentially the maldistribution of wealth and income but the poor use of our present resources. All economists of any creed agree today that the flow of long term investment that controls the volume of production controls the income of the people. It appears to me as the result of misleading economics that a great nation permits a large proportion of its forces to lie idle simply because the fallacy of calculating a labor force in a high hourly wage rate instead of an annual wage income stops investment. Wage rates and taxes together can destroy the presupposition of a profitable investment and thereby a satisfactory income.

None of the reforms and adjustments aiming at a better distribution of income and wealth can achieve anything toward the general welfare as long as the issue of a well-balanced utilization of all our productive resources is not solved.

If the science of political economics becomes too sophisticated by putting the necessary emphasis on the axiom that it is the physical output intelligently adjusted to the needs which creates wealth, it will eventually be pushed aside by people who do not understand a word of our skeptical theories, but who have the willpower and the brutality to make the machine go, probably for non-economic purposes.

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