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## **NATIONAL ECONOMIC PROBLEMS**

A lecture delivered  
at the Naval War College  
on 24 September 1954 by  
*Professor Wassily Leontief*

Admiral McCormick, Captain Moore, Members of the Naval War College:

### I.

I hardly need to say how rewarding it is to have an opportunity to present to this type of audience problems, which, obviously, are of most fateful importance to this country. I will try to center your attention on basic problems and will strip their discussion from consideration of secondary issues.

In the year 1939, this country produced approximately 184 billion dollars' worth of goods and services. Out of these 184 billion dollars, 132 were consumed in our households. Twenty-two billions, just about 12% of the total gross output of goods and services, went into investment — partly to maintain and partly to expand our various productive facilities. When we speak of 'investment' in the United States we often include housing, which, of course, does not represent direct productive facilities; it must rather be counted as contributing directly to our high standard of living. Of the total production of 184 billion dollars only \$2,700 million were allocated for what might be called "defense." This was indeed a peacetime economy.

What an all-out-war means to a country we can see by looking at the similar figures for the year 1944, the time when economically speaking, we reached the height of our military efforts. First of all, our production was not 184 billion dollars' worth, but 323 billion dollars' worth. We increased our total output; we began to work harder. Instead of 2.7 billion dollars, we devoted to military needs 142 billion dollars' worth of commodities

and services; in other words, nearly half of the total output went directly for military uses.

It might surprise you to learn that at the same time we increased our consumption from 130 billion dollars' worth to 160 billion dollars' worth. Of course, this was partly a reflection of the fact that more people got jobs. A greater effort, even in human beings, requires greater input. Putting it in very simple language, if one works much harder one is also inclined to eat more. During the war we nearly stopped, however, adding to our investments; we used the existing facilities much more intensively and without expanding them much nearly doubled the output. This demonstrates how elastic an economic system is; it shows how by squeezing the peacetime facilities one can produce more in wartime.

We reduced during the war our annual investments to only 5 billion dollars; actually a negligible amount considering the 323 billion dollars of total income.

What are we doing now? Now, the U. S. total national income is in the order of 350 billion dollars, a little more than during the war — but not much more. We are resting a little. We are not working so hard, which is natural in peacetime. Our defense expenditures are much lower than they were during the war, but much higher than they were in the pre-war period. In 1952, this country spent, for example, just a little less than 60 billion dollars on defense, which is quite a goodly proportion, one-seventh, of its gross national income. We increased our consumption making it nearly twice as large as it was before the war. We also increased our investment, which is indeed a very hopeful sign. In this country since the war the rate of investment, the rate of expansion and improvement of productive facilities, is indeed a pretty satisfactory one. We devoted to new investment 60 billion dollars, approximately the same amount as that allocated to the military establishment and more than twice as much as we used to invest before the war. All these comparisons of the

pre-war, the war and the post-war figure are expressed in so-called fixed dollars corrected for changes in purchasing power.

This thumbnail sketch of the over-all balance of the U. S. economy, as it shifted from peace to war and halfway back, indicates how important for the economic health of a country is its ability to produce goods and services; also, how important it is from a point of view of its military capabilities. A significant fraction of our total income is devoted to purposes of defense, even in the present peacetime, and an overwhelmingly large proportion — during wartime.

The fact that we expanded our consumption, even during the war, is too very significant. The method used by this country to satisfy the military demands — whenever an emergency arose — was that of increasing the total output, rather than simply shifting goods and services from consumption to military uses. There is a considerable contrast in this respect between our policy and, say, the Russian policy, during the last war. The Russians were able to throw an unexpectedly large amount of economic substance into the battle — not by increasing output, but by reducing consumption to the very bare minimum. This is the great difference, from the point of view of economic mobilization and military allocation, between a free and a dictatorial country. The “tightening the belt” policy is typical for a totalitarian regime. A dictatorial government can afford letting three-quarters of the population starve if they do not directly contribute to the immediate war effort.

## II.

To produce the final goods and services, our economy, as any other, uses what might be called the “primary inputs,” such as various natural resources, labor and capital; “capital” really means buildings, machinery and inventories of semi-fabricated or finished commodities which assist in maintaining the smooth

flow of production. I do not want to ply you with statistics, but let us examine the basic facts.

First, the labor force. It does not include the entire population, since the very young and the very old are not expected to work. The U. S. labor force comprised in 1939 56 million people (less than half of the total population); it increased to 66 million by 1944, and now, ten years later, the labor force is around 67 million — not much larger than during the war. Why so slow an increase? Because during the war we put to work a large number of people who under normal circumstances do not participate in the production process.

In considering capital it is better not to think in terms of so many dollars' worth of stocks or of bonds, but rather to visualize it as so many buildings, so much machinery, so much auxiliary equipment, and so on. The productive sectors of the American economy currently use something like 800 billion dollars' worth of such capital goods. You remember that we turn out a national income of about 350 billion dollars which means that for each dollar of current annual output our economy uses approximately two dollars' worth of equipment, machinery and other stock — things which have to be accumulated from the non-consumed part of the flow of earlier production.

How are these stocks actually distributed between the different branches of production? This is an important question because the existence or absence of specific productive stocks might constitute the difference between our ability or inability to expand certain militarily important lines of output. Only approximately 5% of our total capital investment is tied up in agricultural production and only about 25%, or one-quarter, is used in industry and transportation. The accumulation of finished goods in stores, mainly retail and wholesale stores (but also comprising all other reserves) constitutes approximately 10% of the total stocks. The various strategic stockpiling programs, designed to



build up reserves which can be immediately put to use in the case of emergency, should increase that figure, to, let us say, something like 12%-15%.

Finally, the natural resources. As compared to other countries, the United States is quite well situated in this respect. We have a very good supply of coal. As a matter of fact, we do not have to worry about power resources in the long run. Russia, on the other hand, might have certain weaknesses in this direction. In some of the special metals, many of which are important for manufacture of modern weapons (and I am not speaking of uranium only), we are already beginning in normal peacetime to depend on foreign imports. But, again, I would dare to say that with the development of substitutes, with the readiness to absorb higher costs for the purpose of replacing imported raw materials with domestic ones, we should be able to get along pretty well.

It would, of course, be naive to think that the economic process consists in simply picking up the "primary resources" and combining them in appropriate proportion in the production of various finished commodities. No other system is as complicated as the economic system in the sense of the intricate interdependence between many different kinds of activities. One could nearly say such system consists of nothing else but bottlenecks and that a well-running economy balances these bottlenecks in such a way as to yield the greatest possible final output. The balance between the hundreds of its different branches constitutes the essence of a smoothly operating economy, be it in war or in peace.

You know how the logistic balance between many interdependent operations affects the solution of a strategic problem. It is not enough to have some place sufficient total amounts of this and that. It is essential to have them at the right time, in the right place and in proper combinations. In the same way, it is not enough to have a large national product; that product must consist of proper amounts of specific items, properly geared into each other. No industry can operate without the support of

other industries; the physical destruction of any one of them can, as you well know, effectively paralyze many others. This fundamental fact of functional interdependence constitutes the basis of the economic logistics of modern warfare, both in its offensive and its defensive phase.

To give you a concrete idea of this industrial interdependence, I suggest that you examine the so-called Input-Output Table of the American Economy.

On the reverse side of an ordinary road map there is often printed a little table from which one can read the distance between any two localities. The names of different cities are listed along the stub and — in the same order — also along the top of table. To find the distance between Boston and New York, one simply locates and reads the mileage figure entered in the intersection of the Boston row and the New York column. The structure of the input-output table is quite similar. The industries of which our economy is composed are listed on the stub and, in the same order, also along the top of it. Each figure shows how much of the product of one particular industry — listed on the left hand side of the table — is used by the consuming industry named at the top. Thus you can find out how much steel goes to the textile industry, or how many textiles go to the steel industry. One glance at the input-output table shows how interdependent the different parts of the American economy actually are — or, as a matter of fact, of any economy.

Let me give you a specific example; that of Automobile Production (in the consolidated table which you see it is included in the Transportation Equipment Industry). One would think that the making of cars and trucks involves only people and plants in and around Detroit, where the automobile plants are located. Examine, however, our capability to produce trucks, from the point of view of interindustrial interdependence, and you will find this: to produce one million dollars' worth of trucks it takes approximately two billion dollars' worth of capital — by capital,



I mean machinery, buildings, stores of goods, etc. — and approximately 200 man-years of labor. But (and this is most important from the point of view of logistic thinking), of these 200 man-years of labor, only 87 are really man-years worked in the Detroit automobile plants. Where do the remaining 113 man-years come from? Eighteen come from the workers in the iron and steel industry, supplying the steel of which the finished cars are made. Eight are the man-years of the railroad's employees; these are required in transportation of the things which indirectly contribute to production of components and materials which ultimately end up in finished cars. Four man-years are contributed by the non-ferrous metals industries and so on. Directly and indirectly every single branch of employment existing in the American economy contributes to the manufacture of automobiles.

The same is true of the physical facilities. As I said before, it takes two million dollars' worth of capital to produce one million dollars' worth of automobiles per year, but less than half of that capital — only 824 million dollars — are invested in the automobile industry itself. More than 200 million dollars' worth of it is represented by the blast furnaces and rolling mills of the steel industry; 167 thousand dollars' worth of railroad equipment is kept busy hauling goods which have to be moved to enable the final production of one million dollars' worth of automobiles.

The importance of such indirect relationships must already be familiar to you from the point of view of strategic bombing problems; the knowledge of its input-output structure is, however, also helpful to proper understanding of the working of any peace or wartime economy, in general.

### III.

Our economy is always on the move. In planning for a mobilization five years from now we must remember that the capabilities of the U. S. economy at that time will be very different from what they are at the present time, and ten years from

now they will be different again. Ultimately, we must, of course, compare our progress with the progress of the potential adversary.

In the long run the American economy has been doing pretty well. From the end of the nineteenth century, and up to the present, we have succeeded in doubling our national income every twenty years. If the real U. S. national income of 1890 is conventionally equated to 100 units, in 1910 — or twenty years later — it was equivalent to 200 units; in 1930 (again a twenty year interval) it rose to 400 units and in 1950 it reached the level of over 800 units. You see that our total outputs of goods and services increased in a geometrical progression.

The U. S. standard of living was able to increase because our total income increased faster than our total population; or, should one rather say that our population increased slower than did its total income.

In speaking of the per capita income, on the one hand, and of the total national income, on the other, let us not overlook the fundamental difference between the assessment of economy from the point of view of the level of peacetime welfare it is able to provide and the assessment of the same economy in the light of its military capabilities. It is the expenditure per person which really measures the economic welfare of a country. In considering the military capabilities, however, it is the 'total punch', not the 'per capita punch', which counts. A poor country, yet which is very large and which, because of that, can scrape together a lot — even if it is little per capita — may have a military capability equal or even greater, than another country with a very high standard of living but with a smaller total national income. This is why I emphasize in my talk today the total rather than the per capita figures — the latter are important, but not as immediately important in military considerations as they are from the point of view of a peacetime economy.

Our population was increasing very fast from the end of the last century up to approximately the First World War. That phenomenal population growth was to a large extent due to immigration, which played a very great role — in comparison with internal growth — up to 1910-1920. After the First World War there was a considerable slackening of immigration causing — in combination with a steadily slackening of the birth rate — a slowdown in the over-all population growth. However, since the last war, contrary to confident predictions of many experts, we had an upward jump in the birth rate, as you possibly know from observing your immediate environment.

Population is the basis of the labor force; but, as I have already observed before, the two are, of course, not identical since only people in certain age groups work. At the present, this country is relatively well situated in this respect. Because a smaller proportion of our population falls in the lower age groups a larger proportion is in the labor force — much larger than in Russia. Russia, because of its high birth rate, has a relatively large number of children and of young people who do not pull their own weight, in the economic sense.

There is also another factor to consider. In this country (and this is a sign of its high standards of living), we are taking it very much easier. Our work week was 70 hours at the end of the last century; now, it is approximately only 35-40 hours. But, of course, in a sense the many hours of leisure constitute a reserve on which the American economy can fall back in the case of emergency. This was what enabled us to increase our total national products so fast during the last war. We just lengthened the labor week, introduced more overtime multiple shifts, and the same population generated a much larger labor input, which in its turn resulted in higher output.

How about our stock of capital? Its growth depends on the rate of saving; i.e., upon the allocation of a certain part of

the national product to accumulation rather than current consumption. The U. S. rate of saving is, in the long run, diminishing. At the turn of the century, over 20% of the total gross output was devoted to maintaining and increasing the capital stock; between 1910-1920, our rate of saving fell to approximately 12%; now it came down to 8%-10%. This could appear to be somewhat alarming, but there is a silver lining to that cloud!

The American economy utilizes its capital much more effectively now than it used to in the old days. There is a notion amongst many people, including professional economists, that in order to have a large output it is necessary to pile up a very large amount of equipment, inventories and other kinds of productive capital. It is true that up to 1910-1920 the economic progress of the country could have been well measured by the accumulation of such stocks; "more productive capacity" was nearly synonymous with "more capital." But the development of modern technology took recently a turn in the opposite direction. As a matter of fact, for a couple of decades now we have not only used less and less labor per unit of output — which everybody knows — thus making our labor more productive, but capital has also become more productive. We are using also less and less capital per unit of output. At the turn of the century something like \$2.50-\$3.00 worth of equipment and machinery was needed to produce one dollars' worth of net output (which could be allocated to consumption, investment, or, if necessary, to military uses). Around 1950, only \$1.60 worth of equipment and machinery was doing the same job. If you ask how this increased productivity of capital was achieved, the answer is "organization, human and technical."

With the introduction of conveyors — first by Ford and then throughout the entire industry — the utilization of machinery, as well as labor, became much more efficient. With modern scientific scheduling, i.e., with better organization, a ton-mile of freight will be moved with less equipment than would have been required for the same job twenty years ago.

However, one should not forget that the same technological changes which enable us to economize on our capital and develop output beyond the previously imposed limit of available savings are being taken advantage of also by the Russians. It is often being said that in the future they will not be able to develop their economic capabilities as fast as in the last thirty years because their rate of saving and of investment is bound to fall. But the Russians can use the new technologies, too; the new technologies which enable them, as they enabled us, to increase the output beyond what previously appeared to be the limit imposed by the available stock of capital.

As time went on, there was not only an increase in the total mass of commodities and services produced, but also a marked change in the structure of the American economy, a change in the proportions between various industries and various types of occupations. This change is, again, of great importance, from the point of view of military capabilities. Some industries contribute more — or, at least, might contribute more, if you want to reconvert them — to military output than do others. Some train men and prepare them for the type of requirements presented by various branches of military service better than other.

At the end of the last century a very high proportion of our population (nearly half of it) was working on the land. Most of the rest was engaged in manufacturing and mining and a relatively small fraction devoted themselves to transportation and all kinds of service industries. As time went on our farm population not only became smaller percentagewise, but after 1910 — despite the fact that the total population increased — even the absolute number of people in agriculture began to diminish.

Up to about the end of the First World War, the number as well as the percentage of those engaged in manufacturing was going up. But that trend is now also reversed. The proportion of the total force in manufacturing has not increased for a number of years; indeed, it may now be even a little smaller,

depending on how you define 'manufacturing', than it was thirty years ago. On the other hand, the number of men and women engaged in distribution, in selling, in advertising, in putting gasoline into the tanks of cars at the service stations, has been increasing steadily.

This is a typical change in the structure of the labor force of a progressing economy. It reflects the change in the increase in our standard of living. In a free economy the consumers expenditures determine what commodities are produced and the consumer's income determines how he spends his money. A relatively poor family devotes a very large part of its income to purchase of food, i.e., of agricultural commodities. At the turn of the century we were, by present standards, a moderately prosperous country and spent a large proportion of our income on food. Consequently, we allocated large parts of our labor and capital to production of food. As the per capita income increased, we could not eat much more food. After the basic requirements have been satisfied, one cannot absorb many more calories; however, one begins to eat more meat. This change was promptly reflected in the structure of our agriculture — less grain — and relatively more meat production.

But most of the additional income was spent on industrial goods — clothing and all kinds of durables. We have even gone beyond that and started to spend more money on education, on travel, on medical services. You can see that one nearly can anticipate the shift in the purchases of the average consumer as his standard of living increases. On the basis of these shifts one can explain the changes in the distribution of labor, capital and natural resources between the various productive sectors of the economy.

Of course, to meet the growing demand those industries which increase their productivity faster than others will require relatively fewer additional inputs.

The productivity of different industries has not been advancing evenly. Manufacturing still keeps the lead. Recently, agri-

culture began to catch up. The smallest progress in this respect has been achieved in those intangible types of production which conventionally are referred to as the "service industries." They absorb an ever increasing proportion of our labor and of our stock of capital.

These observations lead back to consideration of interindustrial relationships. You remember that cars are produced not only, or even mainly, by people employed in the Detroit automobile plants. The men on the railroad, the worker in the steel plant, even the cotton farmer is indirectly also engaged in automobile production. One of the revolutionary changes which took place in the U.S. economy was the transfer (purposely, I use the word 'transfer' in a symbolic way) of agricultural workers into the cities. (Soviet Russia consciously went even further in the same direction.) What I mean is this: Much of "agricultural labor" is actually being engaged in tractor building. The mechanization of the Soviet agriculture was obviously promoted with an eye on military capabilities. Instead of letting the peasants produce grain with old-fashioned horse teams, the Soviet government transferred them to the tractor factories. The total amount of labor, directly or indirectly devoted to production of food, might not have diminished; as a matter of fact, it most likely has increased. Still the fellow who is now producing grain by making tractors has acquired a skill which proved to be quite useful when he had to build a tank or run one in the battlefield.

In speaking of the basic technological changes affecting the structure of the American economy, one must particularly mention automatization — a development which in the coming ten to twenty years, I think, will play the same role in increasing the efficiency of our industries which was played by the conveyer in the industrial revolution of the last three decades.

#### IV.

The figures which I have quoted and the structural shift which I have described reflect the basic trends of our economic

growth. Above these deeper currents, on the surface of the economic process one observes what the economist calls the "ups and downs", of prosperities and depressions. Having decided to devote this lecture to consideration of the fundamental structural aspect of the American economy, I cannot discuss with you in any great detail the rather technical question of "the business cycles". However, let me try to give you some indication of what the problem of "economic stability" involves.

According to the present view the business cycle is essentially the same type of disturbance which you might have sometimes observed in the operation of the automatic heating system in your home. The thermostat signals the furnace when the temperature drops below a certain level; the furnace starts to work, raises the temperature and the thermostat shuts it off again. What happens, however, when the thermostat responds only to changes in temperature with great delay and the heating plant takes its time in responding to the command which it gets from the thermostat? Instead of maintaining a nearly even temperature, the sluggish mechanism has you sweating one hour, freezing the next and so on in endless succession.

Something of that nature apparently happens sometimes to the automatic mechanism of our economic system. The response of investment to changes in demand works somewhat like the reaction of the furnace to a change in temperature. If the reaction mechanism is not sensitive enough, if the lag is too long, the economy is bound to go through alternate periods of "over" and "underinvestment", i.e., through cycles of prosperity and depression.

A certain amount of guarded intervention has done much to even out the path of our long-run economic progress. After the bitter experience of the great depression of the thirty's, our government — liberal and conservative alike — has been prepared — through taxes, monetary policy, public works and other similar



measures — to turn the heat up or down when the economic mechanism appeared to be too slow in its automatic response.

Foreign trade will be discussed in another of this series of lectures. To complete the thumbnail sketch of the U. S. economy, let me only observe that this country is relatively less dependent on foreign trade than any other of the large countries — except, possibly, Soviet Russia. In this respect, our position is very different from that of all our allies in Europe. I know this observation may raise many questions; let them be taken up during the discussion period.

I was also asked to consider the problems of economic policies — that is of public actions designed to affect the course which our economic system takes. We are, thank God, not a planned economy! The government can influence that course only by limited, and mostly indirect, means. The so-called “burning issues” of economic policies are concerned not so much with the general direction of economic development as with the question of how “to divide the pie.” The farmer wants a bigger piece; the taxpayers’ groups are apprehensive lest their cut is reduced; the workers feel that their share is too small. It is not primarily all a question of production as a problem of distribution. In a sense, however, the answers given to it indirectly affect also our total economic capabilities. It is the essence of a private enterprise system that if greater rewards are offered in a certain line of activity more people and more capital will go into it. One of the justifications of the price support in farming is that it will maintain higher capabilities in agricultural production.

You certainly remember the recent controversy over the tariff on the watches, the argument of its defenders being that we should protect the profits of the domestic watch-making, thus maintaining a high productive capacity of the industry which might be of great strategic importance. I am afraid, however, that in most — but not necessarily all — such instances, the national point of view plays a greater role in the arguments pre-

sented in the political forums than it does in actual political decisions. These still can best be understood as more or less opportunistic compromises between opposing pressures of two or more essentially self-speaking groups of economic interests.

This does not mean, of course, that measures of economic policies, specifically designed to increase this country's military capabilities, cannot and have not been effective. The strategic materials stockpiling program, for example, and the accelerated amortization (for tax reduction purposes) of certain militarily important production facilities have contributed much to the economic preparedness of this country.

Thank you.

## **BIOGRAPHIC SKETCH**

### **Professor Wassily Leontief**

Professor Leontief was born in Leningrad, Russia, on 5 August 1906. He was graduated as a "Learned Economist" from the University of Leningrad in 1925 and received a Ph.D. degree from the University of Berlin in 1928.

From 1925-28, and again in 1930, he was a Research Assistant at the *Welwirtschaftlicher Institut*, University of Kiel (Germany), and in 1929 served as Economic Advisor to the Chinese Government at Nanking. In 1931 Professor Leontief came to the United States to join the faculty of Harvard University as an Instructor of Economics. He advanced through the ranks, attaining full Professorship in 1946, the position he now holds.

He served as Research Associate for the National Bureau of Economics Project in New York in 1931 and has been Director of the Economic Research Project since 1948. In 1940, and again in 1950, he was a Guggenheim Memorial Foundation Fellow and also was a Fulbright Fellow in 1950. During World War II, Professor Leontief served as Chief of the Russian Economics Subdivision of the Office of Strategic Services from 1942-45.

He has traveled throughout Europe and in Turkey, Egypt, India, China, and Mexico. He is the author of: "Structure of American Economy."