

PRODUCTIVITY UNDER TWO  
SYSTEMS: THE USSR VERSUS  
THE WEST \*

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## *Introduction*

Economics today abounds in weighty issues, but few can be more so than the proverbial one concerning the comparative economic merit of rival social systems. Of particular interest, however, are the two great systems that now so nearly dominate the world. The relative economic merit of entire social systems such as socialism and capitalism is a large and complex issue. We must be optimistic to think that we shall ever be able to settle it at all definitively.

We have, however, gained some insight into the question from scholarly studies made through the years. At least, if we are at all detached, we know better than we did before how to evaluate

the more extravagant of partisan pronouncements on it. Needless to say there has been no lack of such pronouncements on either side. Perhaps further investigation can narrow the range of speculation still more.

I report summarily on the results of some research to that end. Economic merit has many facets. My concern will be with but one of them, but a by no means unimportant one.

In technical economic writings, productive efficiency is construed variously. I focus on that standard on the understanding that reference is being made to the degree to which a country produces the volume of output of which it is theoretically capable. What a country is theoretically capable of in that respect depends on the quantity and quality of the productive factors and the knowledge of technologies for combining them that are available to it. Productive efficiency is a somewhat intricate concept, but it may suffice here to underline what is in any event rather familiar: A country may indeed fail to realize its theoretic productive capacity because of the nature of its economic working arrangements; because, that is, of defective managerial and labor incentives, and because of deficiencies of one kind or another in coordination of enterprises and industries, whether the coordination is achieved through markets or planning, or both. Productive efficiency is properly viewed, therefore, as a

standard for appraising economic working arrangements. I shall so view it here.

How may we gauge productive efficiency? Usually, when the concern has been to do so, an attempt has been made to delineate patterns of behavior induced by the economic working arrangements, and somehow to contrast such patterns with corresponding theoretic norms of productive efficiency. Divergencies observed between the behavior patterns and theoretic norms then signify inefficiency. Such inquiries have long been a familiar feature in the study of capitalism, and by now have often been undertaken in the study of socialism as well. The results have been illuminating, and it is in part through such studies that we have gained the insight we now have into the comparative economic merit of the two systems.

I propose, however, to explore another and relatively novel approach to comparative productive efficiency. In order to gauge that aspect, I shall refer primarily to comparative data on levels of productivity in different countries. Productivity and productive efficiency, while sometimes taken to be one and the same, are not really such. A country's productivity may well be relatively high or low because its economic working arrangements are efficient or inefficient. But, its productivity may be relatively high or low for other reasons as well. As we need not ponder long to

see that is so even where, as here, reference is to data on productivity more or less comprehensive of the economy generally, and also to measures not only of a usual type, on output per worker, but of the kind that only lately have come into use, that is measures of output per composite unit of labor and capital together, or "factor productivity." But, granting that all such measures may diverge from productive efficiency, they can, I think, still shed light on that matter.

Socialism and capitalism are understood here, as they usually are, primarily in terms of the locus of preponderant ownership of the means of production. Under either system, however, institutions, policies, and practices for the conduct of economic affairs may still vary. Moreover, depending on such economic working arrangements, economic performance, including productive efficiency, may vary as well.

We must understand accordingly, the particular comparisons of productivity that are to be made. For that purpose, I consider only one among all the socialist countries in the world today. The USSR, nevertheless, is certainly a particularly interesting socialist country. It is clearly preeminent among socialist countries generally. Furthermore, its famous system of centralist planning and its economic policies have been widely copied elsewhere, not only in broad outline but in detail.

Among capitalist countries, I shall refer to the United States, France, Germany (the Federal Republic, of course), the United Kingdom, and Italy. The economies of these countries, as with those of the capitalist world generally, are all decidedly mixed, and quite remote from the pure *laissez-faire*, private enterprise systems of textbooks. Economic working arrangements, nevertheless, often vary in detail from one of these countries to another. These circumstances must be borne in mind.

The data compiled on productivity relate to 1960. For present purposes, this seems to have been a fairly usual year in the USSR. Farm output there, however, was several percent below the peak level of 1958. Among the Western countries considered, 1960 was marked everywhere by an expansion of output to new high levels. Some countries, however, especially the United States and Italy, were experiencing significant unemployment. These facts, too, will have to be considered.

While the approach adopted is relatively new, I myself have already made several studies such as the one now being undertaken.<sup>1</sup> A further inquiry, however, has resulted in additional and more or less novel calculations and will also permit me to take account of some further thoughts.

To compare productivity in different coun-

tries is a formidable task, but one need not aspire to an impossible statistical certitude to feel it worth undertaking. I explain sources and methods in an Appendix, but I should note here that I have benefited especially from the well-known, recent work of Edward F. Denison on Western economic growth.<sup>2</sup> In the compilation of the comparative data to be considered, his calculations again and again served as an invaluable point of departure.

### *Productivity in the Economy Generally*

As implied, the comparative data that I have compiled on productivity levels are inexact, but productivity in the different countries studied should vary broadly as found (Table 1). Thus, among the Western countries considered, the United States clearly surpasses all others. Next, and more or less on a par with each other, though far below the United States, are our three Northwest European countries: France, Germany, and the United Kingdom. And much below even these countries is our remaining Western country, Italy.

These comparative relations are observed whether reference is to output per worker or to output per composite unit of labor and capital, that is, factor productivity. The latter yardstick,

*TABLE 1*  
*GROSS MATERIAL PRODUCT PER EMPLOYED*  
*WORKER AND PER UNIT OF FACTOR INPUTS,*  
*SELECTED COUNTRIES, 1960<sup>a</sup>*  
*(USA = 100 percent)*

	Gross Material product per Employed Worker (1)	Gross material product per unit of factor (labor and reproducible capital) input (2)
United States	100	100
France	51	63
Germany	51	65
United Kingdom	49	64
Italy	34	47
USSR	31	41

a) Gross material product represents gross domestic product exclusive of output originating in selected final services: health care, education, government administration, defense, and housing. In the comparison between the USSR and the USA, however, reference is to gross national rather than gross domestic product.

Employment is, throughout, exclusive of workers employed in the services referred to, except for housing. In the calculation of factor productivity, reproducible capital employed in all such services, including housing, is omitted.

Output and, in the calculation of factor productivity, factor inputs are valued at US dollar prices. In the comparison of Western European countries and the United States, valuation of output is at factor cost, and in that of the USSR and the United States, at market price. Employment is adjusted for hours, additional hours beyond those worked by a US nonfarm worker in 1960 being counted less than proportionately. For sources and methods, see the Appendix.

however, is decidedly the more favorable one for all the Western European countries when they are compared with the United States.

I have referred to Western countries. As for the USSR, that ranks with Italy at the bottom of our list. That too is so whichever the yardstick. The USSR, however, is essentially on a par with Italy in respect of output per worker, but appears to fall perceptibly below that country in respect of factor productivity.

In all these comparisons, a country's output is essentially its national income or output before the deduction of depreciation, but exclusive of output originating in diverse services, particularly education, health care, government administration, defense, and housing. Correspondingly, in relating output to employment of labor, on the one hand, and to such employment and the available capital stock, on the other, I refer to the amounts of both factors used in the economy generally, exclusive of those service sectors.

Our comparative data, then, relate to productivity in the economy generally, apart from the indicated service sectors. International comparisons of productivity are often made that include services such as are in question, but in conventional national income accounting output in such sectors is actually measured only by factor inputs. For this reason, as practitioners have long been aware, inclusion of such sectors tends only

to obscure, rather than illuminate, differences in economic performance. They are, therefore, properly omitted here. I refer to services apart from housing, but for one reason or another, that sector seems to be rather special everywhere. Comparative productivity in it, therefore, is best left to separate inquiry.

In view of the indicated omissions, my comparative data are appropriately referred to as relating to gross material product per worker and per composite unit of labor and capital. Those familiar with the famous Soviet concept of national income will be aware that I have in effect delineated national income here in a manner more or less comparable to that which is customary in the USSR. The Soviet concept of national income has often been criticized in the West, often with good reason, but for purposes of productivity calculations such as are in question it has its point.<sup>3</sup>

In my calculations, output and, where in order, factor inputs are, of course, in comparable prices. Specifically, valuation throughout is in terms of US dollar prices.<sup>4</sup>

Output per worker is the most usual representation of productivity. But the alternative and more novel one of output per composite unit of labor and capital is decidedly the more interesting one here. Output per worker may vary between countries simply because workers in one country are equipped with relatively more capital

than they are in another, and without productive efficiency of economic working arrangements being any greater in one case than in the other. By comparing instead output per composite unit of labor and capital, we in effect allow for such differences in capital stock per worker. Our data should be seen in that light.

#### *Sources of Productivity Differences*

For our purposes, however, factor productivity too has its limitations. To begin with, labor may differ in quality in different countries. So far as it does factor productivity too will vary without productive efficiency necessarily being any greater in one country than in another. Were it not for the difference in labor quality, the economic working arrangements of one country might really function quite as well as even very different economic working arrangements in another. Two outstanding causes of differences in labor quality, however, are differences in education and sex. If we allow for such differences in a way made familiar by Denison and indeed by use of adjustment coefficients he himself has applied in such calculations, we see that all Western countries other than the United States again gain on that

country (Table 2). They compare with each other, however, much as before. That is so whether the yardstick is labor or factor productivity. The Soviet Union also gains on the United States at this point. It is still more or less on a par with Italy in labor productivity, however, and somewhat below that country in factor productivity.

Denison's adjustment coefficients supposedly

*TABLE 2*  
*GROSS MATERIAL PRODUCT PER EMPLOYED*  
*WORKER AND PER UNIT OF FACTOR INPUTS,*  
*WITH EMPLOYMENT ADJUSTED FOR QUALITY,*  
*SELECTED COUNTRIES, 1960<sup>a</sup>*  
*(USA = 100 percent)*

	Gross material product per employed worker (1)	Gross material product per unit of factor (labor and reproducible capital) inputs (2)
United States	100	100
France	60	70
Germany	61	75
United Kingdom	54	68
Italy	44	57
USSR	42	51

a) Employment adjusted throughout for differences in education, and sex and age structure, as well as hours. See the text. For sources and methods, see the Appendix.

represent the comparative earning capacity of workers at different educational levels and of different sexes. I refer to earning capacity in terms of the US experience. Such coefficients are appropriately applied here not only to the United States but to other countries, for to repeat, my calculations generally are in US dollar prices. As Denison would be the first to admit, however, the coefficients are crude, and my results must be so also. Particularly dubious, I suspect, is the allowance for differences in sex structure. This entails discounting female relatively to male workers by 41 percent. That conforms to the average difference in earning between female and male workers in the United States, but even a male chauvinist must concede that the differential probably often reflects limitations in employment opportunities open to women rather than the inherent qualitative inferiority of their labor. To the extent that it does, my calculations tend to be unduly favorable to the USSR. In the Soviet Union, women are employed to a far greater degree than in any other country considered. They now constitute one-half of the Soviet labor force. In the West the corresponding figure is one-fourth to one-third. An inordinately high discount for female labor would overstate calculated productivity for the USSR relative to that for other countries.

Factor productivity may also vary because

workers do not work as hard in one country as in another. To what extent is that so here? According to the authority on productivity to whom I have already referred: <sup>5</sup>

It seems to me probable that differences in effort are partially responsible for a higher level of output in the United States than in Europe. . . . But the quantitative importance of differences in intensity of work I find impossible to judge, much less to measure by any direct approach.

Reference is only to Western countries, but the degree to which effort might differ between the USSR and the West is, needless to say, also obscure. According to a familiar socialist claim, under public ownership of the means of production, the worker might be expected to exert himself with notable diligence. The Soviet worker no doubt has sometimes done so, but among workers, as among the population generally, ideological zeal seems for long to have been on the wane. Perhaps effort is, if anything, usually greater in the USA than in the USSR, though that is conjectural.

In whatever way effort differs among countries, productivity should differ correspondingly.

Effort, however, may differ because of differences in incentive arrangements, the arrangements in one country being more beneficent than those in another. If so, the difference in effort might properly be construed as manifesting a difference in productive efficiency as well, so there would be no incongruity after all between such efficiency and productivity. However, effort may vary simply because of differences in worker preferences for labor and leisure, and without incentive arrangements being any more or less beneficent in one country than another. In that case, productive efficiency would be the same despite the observed difference in productivity. It would be understood that the economic working arrangements prevailing in different countries simply satisfied different preferences between work and earnings. They might do that just as they might satisfy different preferences among consumers' goods. If differences in effort are difficult to gauge, however, comparative causes of such differences are no less so. Our comparative data on productivity must be viewed accordingly.<sup>6</sup>

In calculating factor productivity, I have referred in the case of labor inputs only to workers actually employed. Such a calculation has its point, but in judging comparative productive efficiency we must consider the fact already noted: At the time studied, among Western countries, the USA and Italy were experiencing significant

amounts of unemployment. Relative to the gaps in productivity that have been observed, however, the differences in unemployment rates were nevertheless very limited (Table 3). As for the

*TABLE 3*  
*UNEMPLOYMENT RATES, ADJUSTED TO US*  
*DEFINITIONS, SELECTED COUNTRIES,*  
*1960<sup>a</sup>*

	Unemployment Labor Force (percent)
United States	5.6
France	1.9
Germany	1.0
United Kingdom	2.4
Italy	4.3

a) President's Committee to Appraise Employment and Unemployment Statistics, *Measuring Employment and Unemployment* (Washington, D.C. 1962), p. 220.

USSR, it is often claimed that in that country unemployment has been abolished. In fact, unemployment of the cyclical sort familiar in the West is no doubt little known. In the USSR as in the West, however, there is, of course, structural and frictional unemployment, though how much is difficult to judge.<sup>7</sup>

For capital, inputs have been measured by the entire stock, whether utilized or not. Capital may be utilized with varying intensity, however, and at least beyond a point, more intensive use is

by no means costless. Hence, should productivity be high merely because of more intensive use, that need not betoken anything like a correspondingly high productive efficiency. It should be observed, therefore, that productivity in the USSR is low despite the fact that capital there is used notably intensively. At least that is so in industry. In the USSR at the time studied, 35 percent of industrial workers were employed in other than the first shift. In the USA the corresponding figure was 23 percent; in Northwest Europe about 10 percent, and in Italy 16 percent.<sup>8</sup>

In the case of capital, I have referred only to that of a reproducible sort. Hence, productive efficiency apart, productivity may also vary because of differences in the quality and location of natural resources. Needless to say, there are such differences not only among the Western countries studied but as between the USSR and such countries. There are nevertheless reasons to think that they could not in any case account for any large part of the observed differences in productivity, but this is an intricate matter on which we still have much to learn.<sup>9</sup>

Productivity may also differ, without any corresponding variation in productive efficiency, due to differential opportunities to exploit economies of scale. Such opportunities turn on market size, which is not, of course, the same thing as size of the country, for transportation costs and access

to foreign markets also matter. Moreover, in industry economies of scale are associated to a great extent with the size of production units. Where they are, they probably can be largely realized with plants of only relatively modest size.<sup>10</sup> Such economies, nevertheless, are not always realized, but a failure to realize them, while lowering productivity, is properly seen as reducing productive efficiency as well.<sup>11</sup> In any event, the USSR should not be at any disadvantage at this point. Compared to the Western European countries studied, it may well be favored.

In sum, productive efficiency is indeed not the same thing as productivity, and it is not easy to gauge one thing from the other. The presumption is, though, that productive efficiency varies widely even among Western countries. But the Soviet performance still does not seem especially distinguished in that light. Most likely, it is matched, if not surpassed, in the West even where productive efficiency is at its lowest.

### *Productivity and the Stage of Development*

But, granting that, are we not concerned with the comparative productive efficiency not merely of the USSR and the Western countries studied,

but of socialism and capitalism, or at least of the variants of those social systems found in those countries? From that standpoint, must we not consider that even similar economic working arrangements may perform differently depending on historical and cultural factors? Indeed, is that not already indicated by the differences in factor productivity observed among Western countries? What in particular of the possibility that such differences essentially reflect differences in the stage of economic development in those countries? If so, may not the relatively low factor productivity in the USSR also be due simply to the less-advanced stage of development of that country? So far as productive efficiency is low in the USSR, therefore, may not the cause be the less-advanced stage of development rather than any intrinsic inferiority in socialist centralist planning, as found there?

The questions are in order. Regrettably we have only five observations on factor productivity under capitalism and only one on factor productivity under socialism. These hardly suffice for us to make any very firm generalizations on the relation of factor productivity and the stage of economic development. But among the Western countries studied factor productivity does vary positively with one of two plausible indicators of the stage of development, capital stock per worker (Table 4; Charts 1 and 2).<sup>12</sup> Very possibly it also

TABLE 4  
INDICATORS OF THE STAGE OF ECONOMIC DEVELOPMENT  
AND FACTOR PRODUCTIVITY, SELECTED COUNTRIES, 1960 a

	Share of non-agricultural branches in total employment (percent) (1)	Capital stock per worker with labor		Factor productivity, with labor	
		Unadjusted for quality (USA = 100) (2)	Adjusted for quality (USA = 100) (3)	Unadjusted for quality (USA = 100) (4)	Adjusted for quality (USA = 100) (5)
United States	92.0	100	100	100	100
France	78.6	45	52	63	70
Germany	86.2	36	43	65	75
United Kingdom	95.8	35	39	64	68
Italy	68.0	25	33	47	57
USSR	61.5	34	45	41	51

a) For capital stock per worker, reference is made to reproducible fixed capital and employment in the economy generally, exclusive of selected final services as already described. Employment is adjusted for differences in hours in both variants given. For data on factor productivity, see Tables 1 and 2. For other data, see the Appendix Tables A-1 and A-3.

CHART 1.  
Share of Nonfarm Branches in Employment  
and Factor Productivity, Selected Countries, 1960

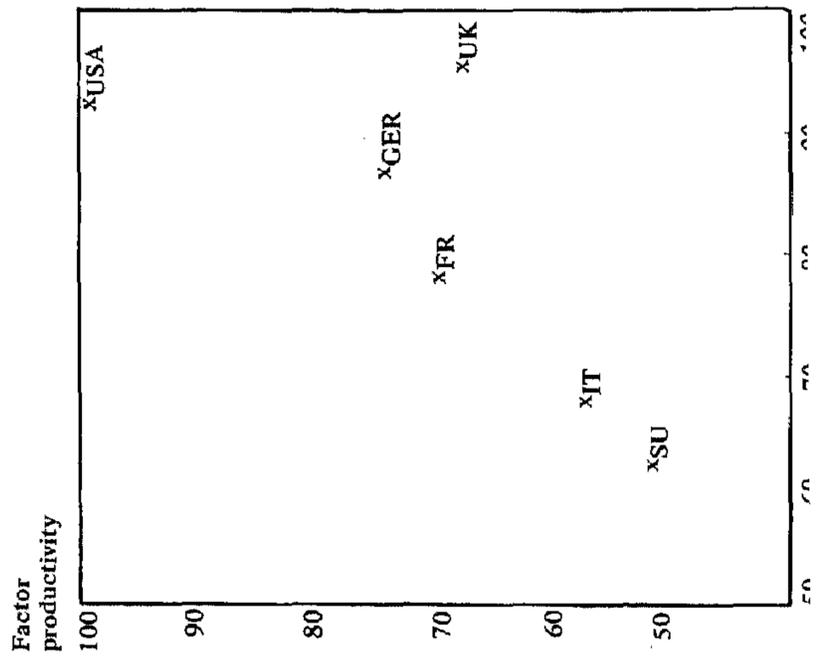
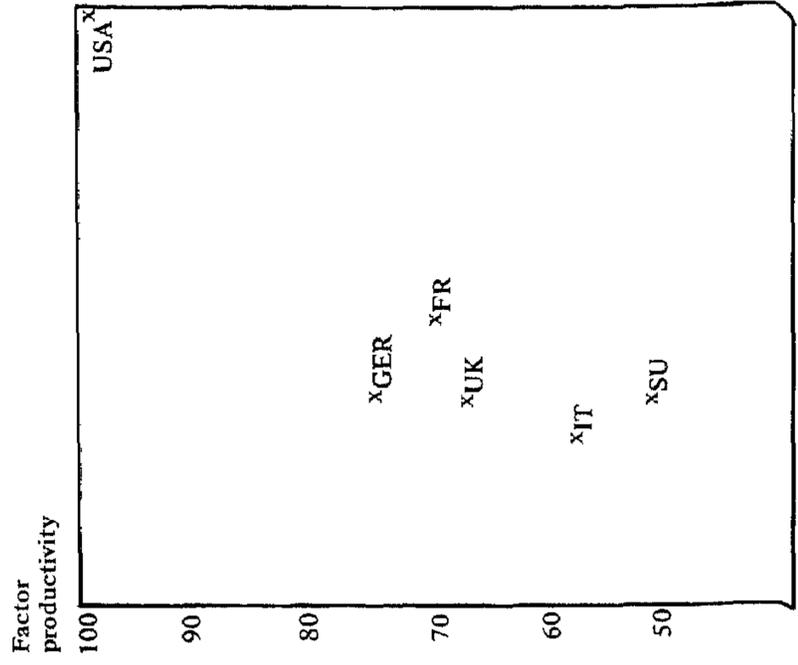


CHART 2.  
Capital Stock per Worker and Factor  
Productivity, Selected Countries, 1960



does so with the other, the share of nonfarm branches in total employment. There are, however, marked incongruities in the latter case. Thus, in terms of the share of nonfarm employment, Britain is at a very advanced stage, in fact at an even more advanced stage than the USA. In factor productivity, however, Britain ranks below the USA, and is only more or less on a par with Germany and France. With labor adjusted for quality, it even appears perceptibly below Germany. However, in terms of the same yardstick of development, factor productivity in the United States seems incongruously high.

What of the USSR? So far as there is a systematic relation in Western countries of factor productivity to the development stage when the share of nonfarm employment is the yardstick, the USSR apparently fits well into that pattern. With capital stock per worker as the yardstick, however, the USSR seems not to conform to the Western pattern. The capital stock per worker of the Soviet Union is practically comparable to that of two of our three Northwest European countries, Germany and the United Kingdom, and distinctly above that of Italy. Yet as already seen, factor productivity in the USSR is well below that in all of our Northwest European countries. Soviet factor productivity appears to fall to some extent below even that of Italy.

Of our two yardsticks of the stage of eco-

conomic development, that represented by the share of nonfarm branches in total employment is the more familiar. For our purposes, however, it is subject to an important deficiency: The yardstick itself is apt to be affected by productive efficiency, particularly in respect of the choice of investment projects in industry. I shall have more to say in a moment about this matter, well known to students of economic development. The alternative yardstick of capital stock per worker is free from any such deficiency, but it too has its limitations, for the data compiled on it are especially inexact.<sup>13</sup>

To come, then, to the larger issue of interest, factor productivity in the USSR may well be relatively low to some extent because of the still not very advanced stage of economic development in that country, rather than because of any intrinsic deficiencies in socialist centralist planning. It is not clear, though, that the low Soviet factor productivity is fully explicable in such terms. The comparative productive efficiency of socialist centralist planning as found in the USSR must be seen accordingly. The performance is clearly better than it appeared initially, though it still cannot be considered especially distinguished by Western standards.

Even these tentative observations put a heavy burden on the limited and imprecise data at hand.<sup>14</sup> It may be useful, even so, to pursue somewhat further the intriguing question posed con-

cerning the relation of factor productivity and the stage of economic development. Are there indeed reasons to think that one aspect should be related to the other?

There no doubt are, but the relation might also be expected often to differ, as our data suggest it does, under such disparate economic working arrangements as are being considered. Thus, a cardinal reason why factor productivity might vary with the development stage turns on the relation of population to resources in agriculture. For historical reasons that relation may be unfavorable, so that an inordinately large labor force works in agriculture at an inordinately low productivity. By the same token, productivity in the economy generally is also depressed. And that may be so whatever the economic working arrangements, but how great the "excess" labor in agriculture is at any time must depend on how rapidly it had been absorbed into industry previously as development proceeded. That must depend among other things on the choice of technologies for new investment projects there. Should these have been unduly "capital intensive," for example, the rate of absorption of farm labor into industry would necessarily have been slowed. For well-known reasons, revolving partly about the improper accounting for capital under an obsolete labor theory of value, industrial investment projects probably have been un-

duly capital intensive in the USSR.<sup>15</sup> One wonders whether the observed incongruity there between our two yardsticks of development, that is, the low share of nonfarm employment relative to the capital stock per worker, may not be due essentially to that fact.

As a country becomes more advanced economically its economy also tends by almost any reckoning to become more complex. Interconnections multiply among an ever increasing number of production units. The number and variety of products also tends to grow disproportionately. Very possibly here too factor productivity is affected, though differentially under different economic working arrangements. At least, what the effect might be, if there should be any to speak of, under a Western market system is not very clear. Under centralist planning, such as prevails under Soviet socialism, however, it is commonly assumed, and I think with good reason, that the effect is apt to be adverse. As the economy becomes more complex, the burden of decision-making on higher planning agencies becomes evermore onerous. That can hardly be favorable to productivity.

As we saw, productive capacity depends on available technological knowledge. That must be true also of factor productivity. Technological knowledge may originate in any country, but it usually does so more often in more advanced than

in less advanced countries. New technological discoveries, however, are not easily monopolized. At least among countries that are at all modern, new knowledge discovered in one seems to become available very soon to others. But, to the extent that there is any lag, that might be a further reason for productivity to be lower in less advanced countries. Here too, however, the effect might depend on the economic working arrangements, but whether that has been so and in what ways among the countries studied is admittedly not very clear. In view of well-known facts about the efforts of the USSR to acquire new foreign technologies, there is little reason to think that that country might be especially tardy in that respect. If it is, though, no doubt the reason is to be found at least partly in the well-known Western restrictions on economic relations with the USSR, rather than in any deficiencies in centralist planning there.<sup>16</sup>

The Western countries studied are all capitalist, and economic working arrangements everywhere are broadly similar. But they are not at all the same. Divergencies in such arrangements must also be a source of differences in factor productivity and sometimes, though hardly always, such differences too should be associated with the stage of development. Thus, among the causes of the relatively high US productivity, it is often suggested, are our superior managerial practices

and relatively competitive markets. Of these two factors, it would be surprising if the first were not associated in one way or another with stage of development. The second, though, is not very easy to construe similarly. Among more advanced countries, it has often been held that competition tends to decline as development proceeds.

Where economic working arrangements vary more or less independently of the development stage, however, they may still help explain incongruities in the relation of productivity to that aspect. Thus factor productivity in Britain is perhaps not as high as might have been expected for a country at its stage of development. If that is so, we may wonder whether the much discussed restrictive trade union practices of that country may not be among the more important causes.<sup>17</sup>

Among socialist countries, economic working arrangements also vary, but where the countries are relatively modern, the divergencies seem only rarely both consequential and clearly related to the stage of development. Perhaps such a relation would be more pronounced were it not for the constraints on institutional innovation imposed everywhere by Soviet hegemony, but that is conjectural, and how factor productivity might be affected at this point is especially so.<sup>18</sup>

The forces affecting factor productivity that have been described should all affect productive efficiency as well. If factor productivity varies

with the stage of development, therefore, so too must productive efficiency, though here too the variation should be different under Western capitalism and socialist centralist planning. Productive efficiency in the Soviet Union must be seen accordingly. I have focused on contemporaneous differences in factor productivity in different countries. Factor productivity no doubt has also varied historically with the stage of development in any one country, but that is another matter, and it is the contemporaneous variation among different countries that is now of particular concern.

Quality of labor is again an issue here. So far as the calculation of labor inputs does not allow sufficiently for differences in quality, factor productivity is necessarily affected. The effect could easily be to cause it to vary with the stage of development. For example, workers learn not only from formal schooling but also by doing. Learning by doing, however, seems beyond the reach of the measurement of labor skill. So far as it is, there is a further reason for factor productivity to be higher in more advanced countries. In this case, however, productive efficiency could not be considered as varying correspondingly. Measured performance would vary because of a qualitative difference in supplies of factors, particularly labor, rather than because of any difference in effectiveness in their use.<sup>19</sup>

While reference has been to the relation of factor productivity to the development stage, our larger concern has been with the explanation of the apparently low Soviet productive efficiency, particularly the degree to which that is characteristic of the socialist system of centralist planning that prevails there. From the same standpoint, must we not consider also that deficiencies in socialist centralist planning in the USSR might be culturally determined, and in complex ways not necessarily related even to the stage of development? If socialist centralist planning does not function too well in the USSR, what, in other words, of the possibility that that system is simply not particularly appropriate for "moody" Russians, but may still be so for other peoples, say "disciplined" Germans? That is sometimes suggested and, despite the clichés, perhaps is not entirely far fetched. As calculations made here for the USSR are extended to other socialist countries, it may be hoped that we shall have a better basis than we now have to judge this intriguing question.

*Industrial Productivity*

I have been considering productivity in the economy generally, apart from diverse service branches. How does productivity in the Soviet Union compare with that in the West in nonfarm branches alone?

The question is in order, the more so when we consider that productivity in the economy generally is affected by productive efficiency not only within agriculture but in respect of the allocation of resources between that and other sectors. As we saw, that allocation is apt to be historically conditioned, and hence only partly determined by prevailing economic working arrangements. By comparing productivity in nonfarm branches, we are able to observe performance apart from such historical conditioning. While performance within the important agricultural sector is also excluded, our inquiry is usefully extended to embrace a comparison of nonfarm productivity in the countries studied.

Selected service branches again being omitted, the nonfarm branches in question include manufacturing, mining, power, construction, transport and communications, and trade. I

shall refer to all these sectors together as "industry," though industry is thus construed in a relatively broad sense. As before, I have calculated output per worker and per composite unit of labor and capital. Reference is to the gross output originating in the branches in question.

With the comparison so delineated, the United States apparently is still preeminent among Western countries (Table 5). Other Western countries, however, are affected variously. Britain performs no better and perhaps somewhat worse relative to the United States than it did before. Germany, France, and Italy, however, all gain on the United States, the gain being greater for France than for Germany, and still greater for Italy than for France.

These are not very surprising results. Productivity in industry, it might be supposed, would tend to be higher than that in agriculture and perhaps the more so the greater the importance of agriculture in the economy. That must be so where, for historical reasons, employment in agriculture is inordinately large. With industrial productivity supplanting productivity in the economy generally as the yardstick, a country's performance relative to that of the United States should improve more or less commensurately with the comparative share of the excluded agricultural sector in its economy and in that of the United

*TABLE 5*  
*GROSS INDUSTRIAL PRODUCT PER EMPLOYED*  
*WORKER AND PER UNIT OF FACTOR INPUTS,*  
*SELECTED COUNTRIES, 1960<sup>a</sup>*  
*(USA = 100 percent)*

	Gross industrial product per worker (1)	Gross industrial product per unit of factor (labor and reproducible capital) inputs (2)
United States	100	100
France	60	71
Germany	54	69
United Kingdom	48	61
Italy	46	60
USSR	50	58

a) Gross industrial product represents essentially the gross output originating in manufacturing, mining, power, construction, transport and communications, and trade. In the calculation of output per worker and per composite unit of factor inputs, reference is to employment and capital stock used in the same sectors. Valuation of output and inputs is as in Table 1. Employment is also adjusted for hours in the same way as in Table 1. For sources and methods see Appendix.

States. That is indeed the case, as may be seen at once by juxtaposing our results with the comparative data already set forth on the share of non-farm sectors in total employment (Table 4).

These results obtain whether reference is to output per worker or to output per composite unit

of labor and capital. As before, though, the latter yardstick is the more significant one for our purposes.

What of the USSR? Here too performance improves relative to that of the United States. As might be expected in view of the still very large share of agriculture in the Soviet economy, the gain is especially marked. In terms of industrial productivity, the USSR is now practically on a par with Italy and also with the United Kingdom. The United Kingdom, for the reasons just indicated, no longer enjoys any margin to speak of over Italy. The Soviet performance, however, is still somewhat less impressive in terms of factor than in terms of labor productivity.

As previously, productive efficiency may diverge from factor productivity because of differences in the educational and sex structure of the population, but if we allow for such differences rather crudely as we did before, we see that Western countries other than the United States gain on that country much as before (Table 6). So too does the USSR, but that country now appears somewhat to surpass Italy when output per worker is the yardstick. In terms of factor productivity, however, the USSR still only matches Italy. Here again the United Kingdom is only more or less on a par with Italy, so productivity in the USSR is comparable to that in the United Kingdom as well as Italy.

*TABLE 6*  
*GROSS INDUSTRIAL PRODUCT PER EMPLOYED*  
*WORKER AND PER UNIT OF FACTOR INPUTS,*  
*WITH EMPLOYMENT ADJUSTED FOR QUALITY,*  
*SELECTED COUNTRIES, 1960<sup>a</sup>*  
*(USA = 100 percent)*

	Gross industrial product per employed worker	Gross Industrial product per unit of factor (labor and reproducible capital) inputs
	(1)	(2)
	<hr style="width: 50%; margin: 0 auto;"/>	<hr style="width: 50%; margin: 0 auto;"/>
United States	100	100
France	68	78
Germany	65	79
United Kingdom	53	66
Italy	56	70
USSR	61	68

a) Employment adjusted throughout for differences in education, and sex and age structure, as well as hours. See text. For sources and methods, see Appendix.

Productive efficiency may also diverge from factor productivity in industry due to causes other than differences in labor quality, but these are much the same as those making productive efficiency diverge from factor productivity in the economy generally. What I have said regarding the latter causes essentially applies here as well.

I conclude, therefore, that productive efficiency in industry probably varies among Western countries, though not as much as in the economy generally. As for the USSR, in respect to productive efficiency, that country compares more favorably with the West in industry than in the economy generally. Most likely, it still only matches the least efficient of the Western countries studied, but that now means not only Italy but the United Kingdom. Also, to repeat, the margin between the worst and the best Western performance has now narrowed.

What again of the stage of economic development? May not differences in that now as before be a source of observed variations in factor productivity among Western countries? If so, may they not account as well for the still relatively low factor productivity and hence productive efficiency in Soviet industry? By focusing on industry alone, we have excluded one important way in which the development stage might affect factor productivity, that is through an historically conditioned misallocation of resources between agriculture and industry. As we saw, however, factor productivity might vary with the development stage for other reasons, and these should still be operative.

Stage of development seems most properly gauged at this point, though, from the capital stock per worker in industry. Among Western

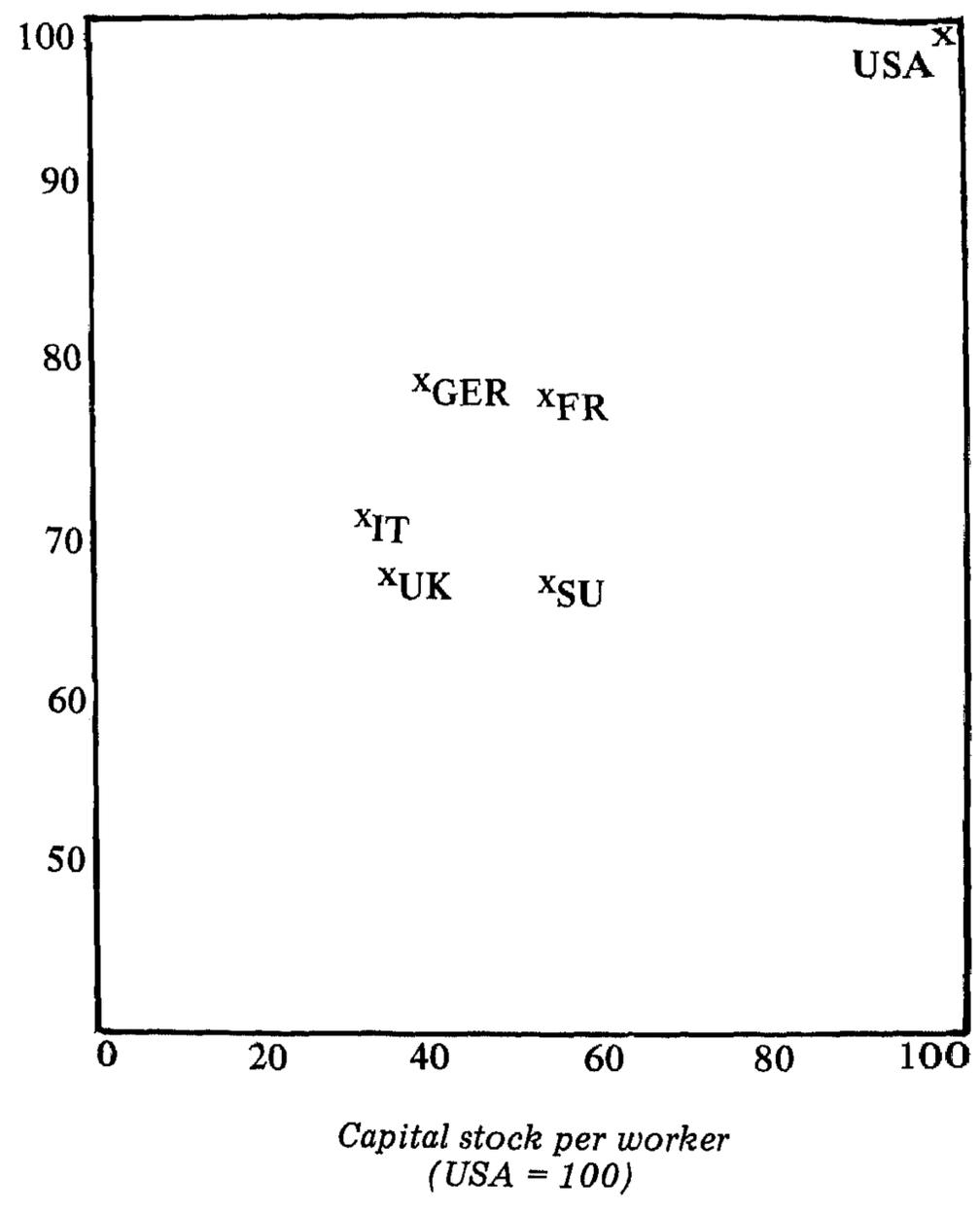
countries factor productivity very possibly does vary broadly with the development stage, as so viewed (Table 7; Chart 3),<sup>20</sup> but, as before, the Soviet Union does not seem to fit in well with the Western pattern. Perhaps the low productivity there relative to that in the United States is partly explicable in terms of the less advanced develop-

*TABLE 7*  
*CAPITAL STOCK PER WORKER AND*  
*FACTOR PRODUCTIVITY IN INDUSTRY,*  
*SELECTED COUNTRIES, 1960<sup>a</sup>*  
*(USA = 100 percent)*

	<u>Capital Stock per worker with labor</u>		<u>Factor productivity with labor</u>	
	Unadjusted for quality (1)	Adjusted for quality (2)	Unadjusted for quality (3)	Adjusted for quality (4)
United States	100	100	100	100
France	49	55	71	78
Germany	37	45	69	79
United Kingdom	33	37	61	66
Italy	32	39	60	70
USSR	50	63	58	68

a) For capital stock per worker, reference is to reproducible fixed capital and, in both variants, to employment adjusted for differences in hours. On factor productivity, see Tables 5 and 6. For data on reproducible fixed capital stock per worker, see Appendix, Table A-2.

CHART 3.  
Capital Stock per Worker and  
Factor Productivity in industry,  
Selected Countries, 1960



ment of the Soviet Union, but by the same token that country now seems to compare less favorably with Italy and the United Kingdom than it did before. As previously, there is no assurance in any event that factor productivity varies with the development stage similarly under socialist central planning and capitalist mixed systems. What has been said of comparative factor productivity should hold as well for comparative productive efficiency.

### *Conclusions*

I have sought in this essay to contribute to the appraisal of the comparative economic merit of socialism and capitalism. Attention has been focused on relative productive efficiency, as indicated by comparative labor and factor productivity, and on socialism, as represented by centralist planning in the Soviet Union, and capitalism, as represented by the variously mixed economies of the United States, France, Germany, the United Kingdom, and Italy.

This is a rather novel approach to comparative economic merit, and the inquiry perhaps has been justified if it merely demonstrates that the approach is also promising, and so should stimu-

late further research such as has been attempted. Additional research is in order to improve on the quality of the complex data required, and also to provide observations on comparative performance of countries other than those studied. Such additional observations are needed especially in judging how representative the countries studied regarding economic performance might be of countries with similar economic working arrangements.

Meantime, though, we may have succeeded in providing further evidence of how far socialism is economically from the system critics once held it would be, and also from the system that proponents have often envisaged. As found in the USSR, socialism is neither colossally wasteful, nor extraordinarily efficient, but well within those extremes, so familiar in polemics on socialist economic merit. Even so, however, productive efficiency in the USSR may well be low by Western standards. That may be so in industry as well as in the economy generally, including agriculture. As might be expected, though, industrial efficiency is greater than that of the economy generally, including agriculture.

Productive efficiency represents the degree to which total output corresponds to capacity. Closely related, though not the same thing, is the degree to which output structure conforms to prevailing preferences. Our comparative data

on productivity may to some extent reflect performance in that respect as well as productive efficiency. But it should be observed that the Soviet performance regarding output structure by all accounts leaves much to be desired. That appears so from the standpoint of either "consumers' preferences" or any likely "planners' preferences." Extension of the appraisal fully to embrace performance regarding output structure, therefore, could not be very favorable to the USSR.<sup>21</sup>

The level of productivity of a country at any time may be viewed as representing the product of its level at any earlier date and its growth over the period thus delineated. Since available technological knowledge is normally increasing over time, the growth of productivity, even of the factor variety, does not indicate any corresponding increase in productive efficiency, as understood here, which relates simply to the effectiveness in use of whatever technological knowledge may be available. Among different countries that are economically interrelated, however, technological knowledge increases for all more or less to the same extent. Hence comparative trends in productivity may be more or less indicative of concomitant comparative trends in productive efficiency. It is of interest, therefore, that an extended comparison that has been made of productivity trends over time in not only the USSR but other countries of socialist centralist planning and also

many capitalist mixed economies seems no more favorable to socialist centralist planning than the comparison made here.<sup>22</sup>

As the same study shows, given socialist centralist planning it has often been possible to compensate for any lag in the growth in productivity through the famous political control that is exercised over the rate of investment. Through a resultant rapid increase in the capital stock, a rapid increase in total output still has been achieved. Growth of output on that basis, however, has necessarily been costly to consumers, and, as each day's news reminds us, socialist governments have had to concern themselves increasingly lately with such costs. But comparative performance regarding growth, important as it is, is properly the subject of another inquiry. I must also leave for such inquiry extension of the appraisal in still other directions of interest. Needless to say, there are such, for comparative economic merit is indeed a many-faceted thing. It should help put that intricate matter in perspective, however, if even limited light has been shed here on comparative productive efficiency.

*Technical Note*<sup>23</sup>

I show in Table 8 selected data concerning various regression relations alluded to in the text. All the data pertain to relations of the form

$$(1) \quad Y = aX + bS + k$$

where  $Y$  represents factor productivity,  $X$  is an indicator of the stage of economic development, and  $S$  is a dummy variable standing for the presence or absence of socialism. All regression relations were calculated from six observations on the relations of the variables in question, either in the economy generally (Table 4) or in industry (Table 7).

Rows I A-C and II A-C all relate to the economy generally. In IA-C, reference is to regressions where  $Y$  represents factor productivity, with labor unadjusted for quality. The variable  $X$  represents, in I-A, the share of nonagricultural branches in total employment, in I-B, the capital stock per worker, and in I-C, the capital stock per worker, with labor adjusted for quality. In rows II A-C, all relations considered are as in I A-C, except

TABLE 8  
Selected Data on Various Regressions

Text 2 <sup>a</sup> Table		a	b	k
I	A	1.146 ( 1.498) <sup>b</sup>	.8706 ( .03424)	-28.63 ( .4415)
	B	.6330 ( 6.875)	-17.81 (2.894)	37.29 ( 7.352)
	C	.6937 ( 5.996)	-20.97 (3.039)	30.76 ( 4.537)
II	A	.8780 ( 1.337)	- 3.140 ( .1440)	.1429 ( .0026)
	B	.5123 ( 5.732)	-15.73 (2.633)	49.31 (10.02)
	C	.5645 ( 5.488)	-18.26 (2.976)	43.86 ( 7.277)
III	A	.5614 (11.29)	-14.09 (4.515)	44.02 (15.71)
	B	.6210 (14.18)	-19.04 (7.561)	37.92 (14.45)
IV	A	.4369 ( 5.401)	-10.51 (2.071)	56.67 (12.43)
	B	.4893 ( 6.668)	-14.42 (3.417)	51.59 (11.74)

a)  $p^2$  = coefficient of correlation

b) Parenthetic figures are  $t$  values. Each has the sign of the constant to which it refers.

that  $Y$  represents factor productivity with labor adjusted for quality.

Rows III A-B and IV A-B relate to industry. In III A-B,  $Y$  is factor productivity with labor unadjusted for quality. In III A,  $X$  is the capital stock per worker. In III-B, it is the capital stock per worker with labor adjusted for quality. In IV A-B, all is as in III A-B except that  $Y$  represents factor productivity with labor adjusted for quality.

#### Notes

\* Research for this study was done partly with the aid of a grant from the National Science Foundation (Contract G-1525).

1. *Economics of Soviet Planning* (New Haven, Conn., 1964), pp. 340 ff; *Planning and Productivity under Soviet Socialism* (hereafter PPSS) (New York, 1968); "East-West Comparisons and Comparative Economic Systems: A Reply," *Soviet Studies* (October 1971); "Comparative Productivity and Efficiency in the Soviet Union and the United States" (hereafter *Productivity*), in Alexander Eckstein, ed., *Comparison of Economic Systems* (Berkeley, Calif., 1971). These studies all deal, at least in part, with the appraisal of comparative productive efficiency from comparative data on productivity. Sometimes, however, a further concern is to appraise from comparative data on change in productivity over time relative "technological progress," including gains in

productive efficiency. I have also explored that problem in "National Income," in Abram Bergson and Simon Kuznets, eds., *Economic Trends in the Soviet Union* (Cambridge, Mass., 1963), and in "Development under Two Systems: Comparative Productivity Growth Since 1950," *World Politics* (July, 1971). Finally, mention perhaps should also be made of another related inquiry: "The Comparative National Income of the USSR and USA," in National Bureau of Economic Research, Conference on Research in Income and Wealth, *International Comparisons of Prices and Output* (New York, 1972).

2. *Why Growth Rates Differ* (Washington, D.C., 1967).

3. Housing apart, the services omitted here do not comprise all of the components of national income for which output is measured by factor inputs, but they generally represent the bulk of such sectors. Note that, from the present standpoint, the case for omission of such services is the greater since typically in national income accounting output of these services is measured by inputs of only one factor, labor. Inputs of reproducible capital and land typically are not represented at all.

As is proper, I exclude from gross material product only output originating in the service sectors in question. Output originating elsewhere but employed in the provision of services is still included. In the case of defense, for example, gross material product excludes the services of military personnel but includes munitions.

Output originating in housing is omitted along with output originating in the other services in question, but with the available data it was not feasible to exclude from the number of employed workers those engaged in providing housing services. The capital stock represented

by housing, however, is of course omitted from that considered.

On the scope of national income according to the Soviet concept, see Abraham Becker, "National Income Accounting in the USSR," in V. G. Treml and J. P. Hardt, eds., *Soviet Economic Statistics* (Durham, N. C., 1972).

4. What if in each comparison of a foreign country with the United States, valuation were instead in terms of the prices of the foreign country? Regrettably it was not possible to make such calculations here, but from broadly similar computations made elsewhere, it seems safe to assume that, with substitution of foreign national for US dollar prices, the spread in productivity levels among Western countries would tend to widen. The USSR should be related to these countries, however, essentially as here. This is most clearly indicated for productivity in the economy generally, which is here in question, but most likely the same relations obtain for productivity in industry alone. I refer below to the latter. See *PPSS*, pp. 19ff; *Productivity*, pp. 178ff.

5. Denison, 1967, pp. 113-114.

6. To return to incentive arrangements, as the primers teach, these could conceivably induce too much effort as well as too little. On comparative incentive arrangements and effort generally, see *ibid.*, pp. 112ff., and *PPSS*, pp. 34ff.

7. See, however, the interesting information collated in Central Intelligence Agency, "Unemployment in the Soviet Union, Fact or Fiction?" ER 66-5 (March, 1966).

8. Tsentral'noe Statisticheskoe Upravlenie (hereafter, TSU), *Narodnoe khoziaistvo SSSR v 1960 godu* (Moscow, 1961), p. 646; Denison, 1967, p. 163.

9. On the possible importance of disparities in resource endowment as a cause of productivity differences

among the countries studied, see Denison, 1967, Ch. 14; *Productivity*, p. 192.

10. According to J. S. Bain, *International Differences in Industrial Structure* (New Haven, 1966), p. 65, among twenty US manufacturing industries studied, "the proportion of total industry output supplied by plants of reasonably efficient scale lay uniformly between 70 and 90 percent."

11. *Ibid.*, pp. 55ff., 144ff.

12. In Chart 1 reference is to factor productivity with labor adjusted for quality. In Chart 2, however, productivity as so determined is related to capital stock per worker with labor unadjusted for quality.

13. Among Western countries, the figure on capital stock per worker for the United Kingdom is surprisingly low. Perhaps it is too low, but it should be noted that I refer to the economy exclusive of selective services. In at least one service sector, housing, the British capital stock per worker turns out to be relatively high. See Denison, 1967, p. 129. As for the USSR, with all that is known about the high rate of capital investment maintained there through the years, one is still struck that the country compares as favorably with the West as our data show. There seems to be no reason to think the Soviet capital stock per worker is over-, rather than understated, but, to repeat, the data on capital stock per worker generally are crude.

As an indicator of the stage of economic development, capital stock per worker might be misleading here even apart from limitations in the data from which that relation is compiled. As is well known to the technically initiated, calculation of factor productivity requires aggregation of inputs of labor and capital with weights corresponding ideally to the shares of output properly imputable to the two factors. In practice, however, such

ideal shares can at best be approximated. So far as the weights applied do diverge from them, as can readily be seen, the relation between factor productivity and capital stock per worker must to some extent be affected. In which direction the relation would be affected, though, would depend on the nature of the divergence. Thus, with too large a weight for capital, factor productivity should vary inversely rather than positively with capital stock per worker.

14. For the technically inclined, though, I should explain that in formulating the foregoing findings I have sought to take into account here various regression relations between factor productivity and indicators of the stage of economic development that are explained in the Technical Note. Later I will present some comparative data compiled for industry alone and will refer again in that context to the question of the relation of factor productivity to the stage of economic development. There too I take into account regression relations described in the Technical Note.

15. See Abram Bergson, *The Economics of Soviet Planning* (New Haven, Conn.), 1964, Ch. 11.

16. According to Denison, 1967, p. 292, "In the field I have termed 'technological knowledge,' a gap presumably exists, but I have difficulty in supposing that it is of any great importance." I wonder whether that is entirely realistic as to the rapidity of dissemination of new knowledge. For a case study that seems to corroborate Denison, however, see John E. Tilton, *International Diffusion of Technology: The Case of Semi-Conductors* (Washington, D.C. 1971).

Denison and Tilton refer, however, to Western countries. In the case of the USSR, as indicated, acquisition of new technological knowledge from abroad might take longer. It should also be observed, though,

that in technologies actually in use the USSR may often lag behind the West for quite other reasons, particularly because the USSR may not be very prolific regarding new discoveries even for a country at its stage of development, and because of deficiencies in procedures for applying new knowledge already at hand. See *PPSS*, Ch. 3.

17. On the possible import of divergencies in economic working arrangements for differences in factor productivity among Western countries, see Denison, 1967, pp. 292ff.

18. The most important divergence by far is that represented by the shift from centralist planning to relatively decentralized systems, emphasizing markets, in Yugoslavia, beginning in the early fifties, and in Hungary in January, 1968. But from the standpoint of the stage of development, these two countries bracket a number of others where centralist planning is still practiced. In Czechoslovakia, one of the most advanced of all socialist countries today, a similar transformation was initiated in the mid-sixties, but apparently efforts to that end were much dampened by the events of August, 1968.

Among countries where centralist planning is still practiced, the presumption must be that, if only in degree of sophistication, procedures vary with the stage of development, but this intriguing question still remains to be explored.

19. I referred earlier to superiority of managerial practices as a possible reason for the high level of US productivity. Quality of managerial practices, however, is not easy to delineate from quality of managerial personnel. So far as managerial personnel is superior in the USA, the resultant gain in productivity would represent another instance of the kind of statistical deficiency in the measurement of the labor skill in question.

20. In the chart, factor productivity with labor adjusted for quality is related to capital stock per worker with labor unadjusted for quality.

21. As I explained, in compiling comparative data on productivity for Western countries, I use index numbers of output that are in terms of US factor cost. In order to relate Soviet to US productivity, however, I value output at US market prices. As the reader who is at all familiar with the technicalities will see, only the latter comparison should be especially affected by relative performance regarding output structure, but even so it can hardly reflect fully the proverbially inordinate amount of substandard and low quality goods produced in the USSR. See *Productivity*, p. 195, and Bergson, "The Comparative National Income of the Soviet Union and United States," pp. 153 ff.

22. Bergson, in *World Politics* (July, 1971). See also *PPSS*, Ch. 3.

23. I am indebted to Jonathan Eaton for assistance in carrying out the calculations summarized in this note.

APPENDIX:  
SOURCES AND METHODS  
ON COMPARATIVE PRODUCTIVITY

This appendix explains the sources and methods used in compiling the comparative data on output per worker and per composite unit of factor (labor plus reproducible capital) inputs in Tables 1, 2, 5, and 6 in the text. As will become clear, the calculations made are often crude. While they may, I think, still serve for the present purposes, care should be exercised in using them in other ways.

In Tables 1, 2, 5, and 6, reference is, on the one hand, to “gross material product” and to the factor inputs corresponding to that output and, on the other, to the gross product originating in “industry” and to the factor inputs corresponding to that output. As was indicated, “gross material product” is the gross output of the economy, excluding that originating in health care, education,

public administration, defense, and housing. The gross product originating in "industry" is the gross material product, less output originating in agriculture. In each case, output is generally related to corresponding inputs, but employment throughout includes that in housing.

The comparative data on output per worker and per composite unit of factor inputs for the two spheres in question were compiled from the intercountry index numbers of employment, reproducible capital, and output in Tables A-1 and A-2. I first refer to these index numbers, and then to the weights employed in aggregating the index numbers for different factor inputs into corresponding measures of total factor inputs. The latter measures, of course, were needed for the calculation of output per composite unit of factor inputs.

#### *Employment, unadjusted*

The index numbers of employment, adjusted for hours, and those for employment, adjusted for hours, education, sex, and age, in Tables A-1 and A-2, are derived from the data in Table A-3 on employment prior to any adjustment. In the table agriculture includes and industry excludes

forestry and fisheries, but I show parenthetically for the USA and USSR figures for agriculture exclusive, and for industry, inclusive of forestry and fisheries.

For Western countries, for *agriculture*, inclusive of forestry and fisheries, see Organization of Economic Cooperation and Development (hereafter OECD), *Labor Force Statistics, 1958-1969*, Paris, 1971. For the United States, employment in forestry and fisheries is taken to be .29 millions, as in US Department of Commerce, *The National Income and Product Accounts of the United States, 1926-1965* (hereafter, *US National Income, 1966*), Washington, D.C., 1966, pp. 112-113. Employment in *industry* is calculated as a residual.

Regarding *selected final services*, other than defense, for the United States employment in health care is the sum of employment in "medical and other health services, other than hospitals" and in "hospitals," in US Bureau of the Census, *Census of the Population, 1960*, Series PC(2)-7F, *Subject Reports: Industrial Characteristics*, Washington, D. C., 1967, p. 6. For education, I cite the sum of employment in "Public education" and "Educational services," in *US National Income, 1966*, pp. 112-113. For public administration, see OECD, *Statistics of the Occupational and Educational Structure of the Labor Force in 53 Countries*, Paris, 1969, p. 109. The Census figure cited

TABLE A-1  
INDEX NUMBERS OF FACTOR INPUTS AND OUTPUT,  
TOTAL ECONOMY (EXCLUSIVE OF SELECTED SERVICES),  
SELECTED COUNTRIES, 1960  
(USA = 100)

	Employment, adjusted for hours (1)	Employment, adjusted for hours, education, sex, and age (2)	Reproducible fixed capital (3)	Inventories (4)	Gross Material product (5)
United States	100.0	100.0	100.0	100.0	100.0
France	30.1	25.9	13.4	18.1	15.4
Germany	43.2	35.7	15.4	23.1	21.9
United Kingdom	40.2	36.5	14.1	24.6	19.8
Italy	33.8	26.2	8.6	13.7	11.4
USSR	162.5	120.1	54.6	77.9	50.5

TABLE A-2  
INDEX NUMBERS OF FACTOR INPUTS AND OUTPUT,  
INDUSTRY, SELECTED COUNTRIES, 1960  
(USA = 100)

	Employment, adjusted for hours (1)	Employment, adjusted for hours, education, sex, and age (2)	Reproducible fixed capital (3)	Inventories (4)	Gross product originating (5)
United States	100.0	100.0	100.0	100.0	100.0
France	24.7	21.9	12.1	16.5	14.8
Germany	40.6	33.8	15.1	24.0	22.1
United Kingdom	42.7	38.5	14.3	27.1	20.3
Italy	24.3	19.8	7.7	13.0	11.1
USSR	98.0	79.6	49.8	77.8	48.7

**TABLE A-3**  
*Employment by Sector, Selected Countries, 1960*  
(millions)

	Agriculture	Industry	Selected final services					All	All
			Health Care	Educa- tion	Public Admin- istration	De- fense	All		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
United States	5.46 (5.17) <sup>a</sup>	51.75 (52.04) <sup>a</sup>	2.59	3.32	2.66	2.51	11.08	68.29	
France	4.19	12.04		2.48		.84	3.32	19.55	
Germany <sup>b</sup>	3.62	19.80	.59	.49	1.45	.29	2.82	26.24	
United Kingdom	1.03	20.78		1.24	1.21	.52	2.97	24.78	
Italy	6.52	11.87	.10	.65	.86	.37	1.98	20.37	
USSR	(39.3) <sup>a</sup>	(49.0) <sup>a</sup>	3.5	5.0	2.0	3.3	13.8	102.1	

a) Figures shown parenthetically relate to agriculture exclusive, and industry inclusive, of forestry and fisheries.

b) Including West Berlin.

there relates to April 1, 1960, and is here increased by .7 percent in order to obtain a figure centered on July 1, 1960.

For all selected final services, including defense, for France, I take as a point of departure data for 1950 calculated from various US-French occupation and branch per capita employment relatives for that year in Milton Gilbert and Irving B. Kravis, *An International Comparison of National Products and the Purchasing Power of Currencies*, Paris, n.d., pp. 39, 177, 180; and Milton Gilbert and Associates, *Comparative National Products and Price Levels*, Paris, n.d., p. 50. Corresponding absolute employment data for sectors of interest are obtained by reference to related occupational and branch employment data for the United States in 1950 in US Bureau of Census, *Census of Population 1950*, Series P-E, No. 1C, *Special Report, Occupation by Industries*, Washington, D. C., 1954, pp. 12, 68; *US National Income, 1966*, pp. 112-113; and OECD, *Statistics of Occupational and Educational Structure of the Labor Force in 53 Countries*, p. 104; OECD, *Manpower Statistics, 1950-1962*, Paris, 1963, p. 125. Reference is also made to the comparative population of France and the United States in 1950, as given in the OECD study above.

For all selected final services, including defense, employment in France is taken to increase by 45 percent from 1950 to 1960, chiefly in the

light of data on the concomitant change in gross product originating in "public administration" (including public health care and education) and defense, and on the comparative magnitude of that and the gross product originating in private health care and education in OECD, *Statistics of National Accounts, 1950-1961*, Paris, n.d., p. 91. Finally, employment in final services other than defense is calculated by reference to the OECD figure on employment in defense in 1960 to which I refer below.

For employment in selected final services other than defense in Germany, see OECD, *Statistics of the Occupational and Educational Structure of the Labor Force in 53 Countries*, p. 38. Figures given for 1961 are extrapolated to 1960 in the light of annual data on civilian employment in OECD, *Labor Force Statistics, 1958-1969*, p. 97. Also, the cited figure for employment in education in 1961, .6 million, is reduced to .5 million in order to exclude employment in scientific research institutes.

For the United Kingdom, employment in health care, education, and public administration is calculated for 1950 by use of the same sources and methods as were used in calculating employment in all final services in France in that year. For health care and education, employment is taken to increase from 1950 to 1960 by 17.8 per-

cent, in the light of data on the gross product originating in public health care and education, in current prices, and implied price trends for miscellaneous services, in OECD, *Statistics of National Accounts, 1950-1961*, p. 197. Employment in public administration, in 1950, together with defense in that year, as given in OECD, *Manpower Statistics, 1950-1962*, p. 115, is taken to decline by 1960 by 5.2 percent, in the light of data on real gross product originating in public administration and defense. See OECD, *Statistics of National Accounts, 1950-1961*, p. 197. From the resulting figure for employment in public administration and defense in 1960, I deduct employment in defense in 1960, as explained below.

In Italy, employment in selected final services other than defense in 1950 is estimated, sometimes not very reliably, by use of essentially the same sources and methods as were used to calculate such employment in 1950 for France. I extrapolate health care and education to 1960 by reference to data on trends in employment of teachers in OECD, *The Mediterranean Regional Project, Italy*, Paris 1965, p. 44. Public administration employment is extrapolated similarly by reference to data on employment in the "civil service," *ibid.*, p. 29.

For employment in *defense* in all Western

countries, see OECD, *Labor Force Statistics, 1958-1969*. Employment in *all sectors* is from the same source.

Employment by sector in the USSR is from *Productivity*, p. 203, except that employment in education, given there as 5.7 million, is reduced here to 5.0 million in order to make it more nearly comparable in scope to employment in education in Western countries. Particularly, the concern is to limit the coverage of employment in scientific research institutions, and in branches such as entertainment. The figure of 5.0 million is nevertheless derived on the supposition that employment in education in the USSR and USA is proportional to the number of teachers and scientific workers in the two countries, as determined chiefly from data in TSU, *Narodnoe khoziaistvo SSSR v 1960 godu*, Moscow, 1961, p. 34, and the US Bureau of the Census, *Census of Population, 1960, Series PC(2)-7C, Subject Reports: Occupation by Industry*, Washington, D. C., 1963, pp. 7-8.

#### *Employment, adjusted for hours*

Elements in the adjustment of employment for hours are shown in Table A-4. To refer first to Western European indices relative to the USA,

for columns (1) and (2), see Table A-3. Note that "all sectors" here comprises "agriculture" and "industry" in the latter table. For purposes of deriving columns (3) and (4), I take comparative hours for agricultural and industrial workers in the countries considered in 1960 to correspond to those for agricultural and nonagricultural workers in those countries in an autumn week in 1960 in Denison, 1967, p. 55. Resulting indices with US industrial hours as 100 percent are then corrected to allow for differences in vacation time and in loss of time due to weather in the observed week. See Denison, 1967, pp. 363ff. The indices are also adjusted on the supposition that hours in excess of those worked by US industrial workers in 1960 are properly discounted, the discount to vary with the excess according to a scale in Denison, 1967, pp. 58ff. Column (4) follows at once. So too does column (3), after the adjusted indices for agriculture and industry are averaged with appropriate employment weights (Table A-3), and a shift is made in the base, so that the US average for the two spheres is 100 percent.

In columns (5) and (6), the resulting indices are further adjusted to allow for the fact that, for purposes of productivity calculations, such coefficients are properly applied only in industries where output is not measured by inputs. I take into account data in Denison, 1967, p. 188, on the share of labor inputs in civilian activities

*TABLE A-4*  
*Adjustment of Employment for Hours, All Sectors (Exclusive of Selected Final Services) and Industry, Selected Western Countries, 1960*  
*(USA = 100)*

	Employment, unadjusted		Hours worked, adjusted		Hours worked, further adjusted		Employment adjusted	
	All sectors	Industry	All sectors	Industry	All sectors	Industry	All sectors [(1)x(5)]	Industry [(2)x(6)]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
United States	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
France	28.4	23.3	106.4	106.5	105.9	105.8	30.1	24.7
Germany	40.9	38.3	106.0	106.5	105.6	106.0	43.2	40.6
United Kingdom	38.1	40.2	105.9	106.8	105.4	106.2	40.2	42.7
Italy	32.1	22.9	106.3	108.0	105.3	106.0	33.8	24.3
USSR	154.3	94.2	195.3	104.0	105.3	104.0	162.5	98.0

for which output is measured by employment. Such labor inputs occur to a great extent in selected final services, which are in any event omitted from both the output and inputs of concern here. Allowance need be made now only for labor inputs such as are in question additional to those in selected final services, as indicated in Table A-3.

Turning to the indices for the USSR in Table A-4, for columns (1) and (2) see Table A-3. To explain columns (3) and (4) reference is made to Table A-5. To begin with columns (1) and (2), in the United States workers in agriculture and in nonfarm branches, taken here to represent industry, averaged 45.5 and 40.0 hours weekly during 1960. Reference is to averages calculated from monthly data in US Department of Labor, *Monthly Report on the Labor Force*, January-December, 1960. The corresponding annual totals of 2366 and 2080 hours are reduced by 3.7 and 6.5 percent in order to allow for eight holidays and also, somewhat arbitrarily, for vacations. See Denison, 1967, p. 363, and data on vacation time in the US Department of Labor report just cited.

For the USSR, agricultural workers are taken to work eight hours a day for an average 280 day year. See US Bureau of the Census, *International Population Reports*, Series P-91, No. 15, *Estimates and Projections of the Labor Force and Civilian Employment in the USSR, 1950-1975*, Washing-

*TABLE A-5*  
*Elements in Calculation of Coefficients for Hours, All Sectors*  
*(Exclusive of Selected Final Services) and Industry, USA and USSR, 1960*

	Annual hours		Annual hours (US industry = 100)		Annual hours, adjusted (US industry = 100)	
	Agri- culture (1)	Industry (2)	Agri- culture (3)	Industry (4)	Agri- culture (5)	Industry (6)
United States	2278	1945	117.1	100.0	109.1	100.0
USSR	2240	2057	115.2	105.8	108.7	104.0

ton, D. C., June, 1967, p. 19; Nancy Nimitz, *Farm Employment in the Soviet Union, 1928-1963*, RAND RM-4623PR, Santa Monica, November, 1965, pp. 10, 11, 123. At the end of 1960, workers in nonfarm branches, which I take to represent industry, were employed an average of 39.4 hours weekly. See TSU, *Narodnoe Khoziaistvo SSSR v 1960 godu*, p. 645. This reflects reductions of working time during 1960. For 1960 as a whole, hours were on the average an estimated 6.3 percent higher than at the end of 1960, or 41.9 weekly. I rely here chiefly on data in Central Intelligence Agency, *An Evaluation of the Program for Reducing the Work Week in the USSR*, ER 61-13, March, 1971. The implied annual total, 2179 hours, also reflects holidays and shorter hours before free days and holidays, but not, I believe, vacations, averaging in 1960 17.4 working days, or at 7 hours a day, 122 hours: TSU, *Narodnoe khoziaistvo v 1968 godu*, Moscow, 1969, p. 207. Net of vacations, therefore, industrial workers averaged 2057 hours in 1960.

The indices in columns (3) and (4) follow and so too do those in columns (5) and (6) after hours in excess of those of US industrial workers are discounted here in the same way as in the calculation of Western European coefficients.

To return to the Soviet coefficients in Table A-4, that for industry in column (4) corresponds to that for industry in Table A-5, column (6).

The coefficient for all sectors in Table A-4, column (3), is calculated by averaging, with appropriate employment weights (Table A-3), the coefficients for agriculture and industry in Table A-5, columns (5) and (6). In Table A-4, in the case of Soviet coefficients, no further adjustment is made to allow for labor inputs in activities where output is measured by employment. Such activities beyond those in excluded services are believed to be relatively limited in the case of the USSR.

In adjusting employment for hours worked, I make no allowance for loss of time due to sickness. Such an allowance is made for Western countries in Denison, 1967, p. 364, but it evidently had to be rather conjectural, and it seemed best to omit it here for all countries alike. Because of generous arrangements for pregnancy leave, time lost due to sickness is appreciable in the USSR; in industry, it averaged 16.6 days in 1960. See TSU, *Narodnoe Khoziaistvo v SSSR v 1968 godu*, p. 207. In terms of a seven-hour work day, that comes to 116 hours or 5.6 percent of the nonfarm work year. In the circumstances, omission of any allowance for time lost due to sickness probably is somewhat disadvantageous to the USSR. That seems more clearly so, however, when that country is compared with the United States than when it is compared with Western Europe. It is also

more clearly so in the comparison of productivity in industry than in that in all sectors.

While Soviet hours should thus sometimes be relatively overstated, it should be noted that there is also something of a bias to the contrary so far as the USSR, as distinct from other countries considered, reference here is to normal hours exclusive of overtime.

*Employment, adjusted for hours,  
education, age and sex*

Elements in this calculation are shown in Table A-6. For column (1), see Table A-4. Column (4) is simply the product of columns (2) and (3), except that for Western European indices an allowance is made as before for labor inputs in activities for which output is measured by employment, or rather for such activities beyond those represented by selected final services. Column (5) is obtained as indicated in the table. It remains to explain Table A-6, columns (2) and (3).

To refer first to column (2), the indices there follow from Table A-7, columns (3) and (4). Turning to that table, and to begin with to the

TABLE A-6  
 ADJUSTMENT OF EMPLOYMENT FOR EDUCATION, SEX AND AGE,  
 ALL SECTORS (EXCLUSIVE OF SELECTED FINAL SERVICES),  
 AND INDUSTRY, SELECTED COUNTRIES, 1960  
 (USA = 100)

	Employment adjusted for hours (1)	Educational quality (2)	Quality as affected by sex and age (3)	Quality as affected by education, sex and age, adjusted (4)	Employment adjusted for hours, education, sex and age [(1)x(4)] (5)
United States	100.0	100.0	100.0	100.0	100.0
France	30.1	86.8	97.8	86.1	25.9
Germany	43.2	85.8	94.8	82.6	35.7
United Kingdom	40.2	91.7	98.2	90.9	36.5
Italy	33.8	74.9	97.6	77.4	26.2
USSR	162.5	81.0	91.2	73.9	120.1
			All Sectors		

TABLE A-6 (CONT.)

	Employment adjusted for hours (1)	Educational quality (2)	Quality as affected by sex and age (3)	Quality as affected by education, sex and age, adjusted (4)	Employment adjusted for hours, education, sex and age [(1)x(4)] (5)
United States	100.0	100.0	100.0	100.0	100.0
France	24.7	89.3	97.8	88.7	21.9
Germany	40.6	86.3	94.8	83.3	33.8
United Kingdom	42.7	90.8	98.2	90.2	38.5
Italy	24.3	77.1	97.6	81.5	19.8
USSR	98.0	86.7	93.6	81.2	79.6

Industry

*TABLE A-7*  
*INDICES OF EDUCATIONAL QUALITY*  
*OF EMPLOYMENT, BY SECTOR,*  
*SELECTED COUNTRIES, 1960*

*(US eighth grade quality = 100)*

	All sectors including selected final services (1)	Agriculture (2)	Industry (3)	All sectors excluding selected final services (4)
United States	118.9	103.0	120.3	118.7
France	103.6	90.3	107.4	103.0
Germany	102.0	90.8	103.8	101.8
United Kingdom	108.8	100.1	109.2	108.8
Italy	89.2	81.9	92.7	88.9
USSR	97.3	85.5	104.3	96.2

indices there for Western countries, for column (1) for the United States see Denison, 1967, p. 91. For other Western countries, corresponding figures are obtained essentially by applying to the US figure indices, with the United States as 100, of educational quality based on school years completed in Denison, 1967, p. 91. The latter indices were obtained by Denison, however, on the assumption that the armed forces are educationally equivalent everywhere and also after an adjustment for the length of the school year. I reverse the latter adjustment and also abandon Denison's

assumption regarding the armed forces, though the indices thus obtained are treated as relating to civilian workers. The necessary revisions of Denison's indices are made on the basis of data in Denison, 1967, pp. 87, 91-92.

The indices in columns (2) and (3) represent the results of an attempt to disaggregate between farm and nonfarm workers the indices in column (1). The indices thus obtained for nonfarm workers are taken here to apply also to industrial workers alone. The disaggregation takes into account coefficients of educational quality as related to years of schooling in Denison, 1967, p. 374 (his Table F-2, column [4]), and diverse distributions of the labor force by years of schooling.

For the United States I refer particularly to such distributions for male and female farm workers in 1960 in US Bureau of the Census, *US Census of Population, 1960*, Series PC(2)-7F, *Industrial Characteristics*, pp. 98, 100. I first aggregate these distributions, counting one female farm worker as .63 of a male farm worker (see below), and then calculate from the combined distribution and the Denison coefficients of educational quality as related to years of schooling an index of average educational quality for farm workers in 1960. A corresponding index for nonfarm workers is calculated as a residual.

For France, Germany, and the United King-

dom, I refer to data relating to various dates on the distribution of male and female workers in all sectors by years of schooling in Denison, 1967, pp. 385, 390, 396. I first aggregate the separate distributions for the two sexes, using as weights shares of the two sexes in the wage bill at US wage rates. See Denison, 1967, p. 87. I then disaggregate the resultant distribution between farm and nonfarm workers on the rather arbitrary assumption, but I think one not seriously amiss here, that farm workers had completed no more than seven (in England, eight) years of schooling, and that they were distributed by years of schooling up to that level in the same way as workers in all sectors. Indices of average educational quality for farm and nonfarm workers obtained on this basis for various dates are shifted to 1960 by reference to the relation between the implied index for workers in all sectors and the corresponding index in column (1).

For Italy, I refer to a distribution of male workers alone in all sectors by years of schooling in Denison, p. 80, but the rest of the indices for that country in columns (2) and (3) are obtained in the same way as those for other Western European countries.

To complete the discussion of indices for Western countries in Table A-7 those in column (4) are obtained by averaging with appropriate

employment weights (Table A-3) the indices in columns (2) and (3).

Turning to the USSR, indices of educational quality for all workers and for nonfarm workers are derived as explained in *Productivity*, pp. 205-206. The index for nonfarm workers thus obtained is taken here too to apply to industrial workers, while a corresponding index for farm workers is calculated as a residual. In doing so, I apply to the different coefficients in question appropriate employment weights (Table A-3), though a female worker is counted as equal to only .68 of a male worker. On this discount and on the breakdown thus needed of employment in different sectors by sex, see below. Finally, by use of similar employment weights, I average the indices thus derived for agricultural and industrial workers in order to obtain the single index in column (4) for the two spheres together.

In Table A-6, for column (3) for Western European countries, I take indices in Denison, 1967, p. 75, for civilian workers generally to apply also to such workers, excluding those in selected final services, and to industrial workers alone. For the USSR, the corresponding indices are calculated from indices of US hourly earnings by sex and age in Denison, 1967, p. 72, and data on the distribution of employment by sector, sex, and age in the USA and USSR in Table A-3;

Denison, 1967, p. 72; US Bureau of Labor Statistics, *Employment and Unemployment Statistics, 1947-1961*, Washington, D. C., October, 1962, p. 10; and TSU, *Itogi vsesoiuznoi perepici naseleeniia 1959 goda SSSR*, Moscow, 1967, pp. 117ff. I also refer to data on employment by sector and sex in *Productivity*, p. 203, though in somewhat revised form to conform to Table A-3.

*Reproducible fixed capital; inventories*

For Western countries, the indices for reproducible fixed capital stocks for all sectors, excluding selected services, in Table A-1 are obtained as averages of indices of "enterprise" nonresidential reproducible fixed capital stocks, gross and net of depreciation, in Denison, 1967, p. 172. Corresponding indices for industry alone in Table A-2 are calculated by reference to the share of agriculture in the reproducible fixed, nonresidential "business" capital of the United States in 1960, taken to be 9.0 percent. See the data on constant cost 2 capital stocks based on straight line depreciation in R. C. Wasson, J. C. Musgrave, and Claudia Harkins, "Alternate Estimates of Fixed Business Capital in the United States, 1925-1968," *Survey of Current Business*, April, 1970, p. 30.

Relative to the reproducible fixed capital stock in agriculture in the United States, I assume that the stock in each of the other Western countries considered corresponds to the farm output of that country compared to that in the United States. Comparative farm output in different Western countries is obtained as explained below. The indicated assumption is arbitrary, but the resulting indices of agricultural capital conform fairly well to alternative indices derived from the indices for all sectors, excluding selected final services, and data on the share of agriculture in gross fixed investment between 1950 and 1960, in OECD, *Statistics of National Accounts, 1950-1961*. This is shown in the accompanying table.

*REPRODUCIBLE FIXED CAPITAL  
IN AGRICULTURE (USA = 100),  
CALCULATED BY REFERENCE TO*

	<u>Output</u>	<u>Gross Investment, 1950-60</u>
United States	100.0	100.0
France	27.1	17.3
Germany	18.6	16.7
United Kingdom	11.0	9.1
Italy	17.6	18.6

Note that for France, gross investment data were available only for 1956 to 1959. Also, even a sizable error at this point would hardly affect

results of interest. Thus, if the French index for agricultural fixed capital were 17.3, instead of 27.1, as assumed, the corresponding index for industry would be 13.0 instead of 12.1. Factor productivity in industry in France would be 69.8 instead of 70.8 percent of that in the United States.

For the USSR, the indices of reproducible fixed capital in Tables A-1 and A-2 also represent averages of indices of such capital, gross and net of depreciation. As for the latter indices these are calculated from data on the reproducible fixed capital stocks of the USSR and USA on July 1, 1960, in US dollar prices of 1955. For the USSR, see *Productivity*, p. 208. For the United States, corresponding data are derived from the figures on constant cost 2 capital stocks, based on straight line depreciation, in Wasson, Musgrave, and Harkins, *Survey of Current Business*, April, 1970, p. 30. Data on capital stocks in 1958 dollars in this source are translated to US dollars of 1955 by reference to deflators supplied by the Office of Business Economics, US Department of Commerce. To make the results comparable with my data on Soviet capital stocks, I add to the resulting totals US highway capital, as given in *Productivity*, p. 209.

For Western countries, the indices for inventories in all sectors, excluding selected final services, in Table A-1, are those on "enterprise" in-

ventories in Denison, 1967, p. 177. (Here and elsewhere inventories in agriculture include livestock herds.) Corresponding indices for industry alone, in Table A-2, are obtained by reference to the share of agriculture in such inventories in the United States, taken to be 15.2 percent. See *Productivity*, p. 209. As with reproducible fixed capital, I assume that, relative to farm inventories in the United States, those in other Western countries vary in proportion to farm output. For the indices for inventories in the USSR, see *Productivity*, p. 209.

### *Output*

In Tables A-1 and A-2, indices of Western European gross material product and gross product originating in industry are calculated from Table A-8. In that table, for the *gross domestic product* of the United States, see OECD, *National Accounts of OECD Countries, 1958-1967*, Paris, n.d., p. 44. Corresponding figures for the other countries are derived from the cited figure for the United States, indices of Western European relative to US net national product in US factor cost in Denison, 1967, p. 22, and comparative data on net national product and gross domestic prod-

TABLE A-8  
 GROSS DOMESTIC PRODUCT BY SECTOR, SELECTED WESTERN  
 COUNTRIES, 1960, IN US FACTOR COST OF 1960  
 (billions of dollars)

	United States (1)	France (2)	Germany (3)	United Kingdom (4)	Italy (5)
Agriculture	21.0	5.7	3.9	2.3	3.7
Industry	355.7	52.5	78.6	72.3	39.4
Selected final services					
Health care	13.6		3.4	5.1	.5
Education	14.9	-11.9	2.2		2.9
Public administration	14.6		8.0	6.6	4.7
Defense	10.6	3.5	1.2	2.2	1.6
Housing	33.4	3.9	6.1	6.6	1.9
All	87.1	19.3	20.9	20.5	11.6
All sectors	463.8	77.5	103.4	95.1	54.7

uct at factor cost in national currencies in the OECD report just cited.

In Table A-8, *agriculture* includes forestry and fisheries. For the gross domestic product of the United States originating in that sector in US market prices, see the cited OECD report. To convert to US factor cost, I allow for indirect business taxes and government payments to landlords, as given in *US National Income*, 1966, p. 29.

#### FARM OUTPUT

France	222.1
Germany	155.2
Italy	125.8

For the United Kingdom, I take the gross product originating in agriculture to be 10.9 percent of that for the United States. I refer here to comparative data for the UK and USA for the gross product originating in agriculture in 1950 in US prices of that year, in Deborah Paige and Gottfried Bombach, *A Comparison of National Output and Productivity*, Paris, 1959, p. 19, and to data for the UK and USA on the gross product originating in agriculture, forestry and fisheries in 1950 and 1960, in constant prices, in OECD, *Statistics of National Accounts, 1950-1961*.

For other Western European countries, farm

output in 1960 varied as is indicated in the accompanying table relative to that of the United Kingdom as 100 percent. Reference is to gross farm output, less farm products used in production, in average Western European prices, as supplied to me by the Food and Agricultural Organization, United Nations (hereafter, FAO), in a letter of August 30, 1971. In Table A-8, the gross domestic product originating in agriculture in France, Germany, and Italy is calculated from these indices, after their adjustment to exclude production expenses in other than farm products. The latter are estimated from data in FAO, *Expenses and Income of Agriculture in Some European Countries*, Geneva, 1958.

For all countries, the gross domestic product originating in *industry* is calculated as a residual. Turning to *selected final services*, for the United States the gross domestic product originating in health care is obtained as the product of employment there (Table A-3) and the corresponding average earnings including "supplements," as estimated from data in Central Intelligence Agency, *A Comparison of Consumption in the USSR and the US*, ER 64-1S, January, 1964, p. 83; and *US National Income, 1966*, pp. 96-97, 108-109, 114-115. For education, reference is to labor earnings in "Educational Services" and "Public Education," as determined from the data given in *US National Income, 1966*, pp. 92-93, 96-97, 114-115.

For public administration, I cite the product of employment there (Table A-3) and average labor earnings, including "supplements," for an essentially comparable sector, as calculated chiefly from data in *US National Income, 1966*, pp. 69, 92-93, 112-113, 114-115, together with Table A-3, and the calculations just made for health care and education. For defense, see *US National Income, 1966*, p. 69.

The gross domestic product originating in housing is taken to be 7.2 percent of the gross domestic product at factor cost, or the same proportion as it is of the gross domestic product at market price. See OECD, *National Accounts of OECD Countries, 1958-67*, p. 46.

Turning to selected final services for Western European countries, product originating in health care, education, and public administration is extrapolated from data on such output in 1950 in US prices of 1950. The latter data are calculated from per capita quantity relatives (USA = 100) in Gilbert and Kravis, n.d., pp. 113-119, 177, 180, comparative population data in OECD, *Manpower Statistics, 1950-1962*, and data on the product originating in the services in question in the United States in 1950, as determined by use of essentially the same sources and methods as were used to derive such data for the United States in 1960 in Table A-8. For health care in Italy, I take the per capita product originating in 1950 to be

15 percent of that in the United States. This seems rather low, though in Gilbert and Kravis, p. 177, in per capita terms all health care outlays (for personnel and materials) in Italy in 1950 are taken to be but 10 percent of those of the United States.

In extrapolating the 1950 product to 1960 and translating to US prices of 1950, I refer to trends in employment and in US prices in the sectors in question as determined from calculations already made in connection with Table A-3 and use sources and methods essentially such as were employed in those calculations. Elements in the foregoing derivation of product originating in health care, education, and public administration are set forth in Table A-9.

For defense, I cite for all Western European countries the product of the size of the armed forces (Table A-3) and the average pay and subsistence of military personnel in the United States, \$4225 per year. See *US National Income, 1966*, pp. 69, 112-113.

For housing, product originating in Western European countries is calculated from that originating in the United States (Table A-8) and corresponding Western European quantity relatives (USA = 100). The latter relatives are extrapolated from such relatives for 1950, that are derived from per capita quantity relatives for final outlays ("space rent" only) for housing in Gilbert

and Kravis, n.d., pp. 113-119, 135-136. In extrapolating to 1960, I refer to changes in the gross domestic product originating in "ownership of dwellings," in constant prices, for Western European countries, in OECD, *Statistics of National Accounts, 1950-1961*, and OECD, *National Accounts of OECD Countries, 1958-1967*; and in personal outlays on "housing" in constant prices in the United States, in *US National Income, 1966*, pp. 48-49.

In Tables A-1 and A-2, indices of Soviet gross material product and of Soviet gross product originating in industry are calculated from Table A-10. Here agriculture excludes, and industry includes, forestry and fisheries. For the United States, the gross national product and the gross product originating in agriculture in 1960, in 1955 dollars, are given in *Productivity*, p. 200. I translate these outputs in terms of 1960 dollars by reference to deflators in OECD, *Statistics of National Accounts, 1950-1961*, pp. 209-210. The gross product of industry is calculated as a residual. For selective final services other than housing, see Table A-8. For housing, see OECD, *National Accounts of OECD Countries, 1958-1967*, p. 46.

For the USSR, gross national product by sector in 1960 in US prices of 1955 is as in *Productivity*, p. 198 except that farm output is reduced to 16.4 billion dollars in order to conform to cal-

**TABLE A-9**  
*Calculation of Product Originating in Health Care, Education, and  
 Public Administration, Selected Western European Countries, 1960*

	(1) Outlays, 1950, in US Prices of 1950 (USA = 100)	(2) Outlays, 1950, in US Prices of 1950 (billion dollars)	(3) Employment Relative, 1960-1950 (percent)	(4) Outlays, 1960, in US Prices of 1950 (billion dollars) [(2)x(3)]	(5) US Price Relative 1960 ÷ 1950 (percent)	(6) Outlays, 1960, in US Prices of 1960 (billion dollars) [(4)x(5)]
<b>France</b>						
Health care	17.9	.95				
Education	21.8	1.20				
Public administration	32.8	2.23				
All		4.38	1.62	7.10	167.3	11.88
<b>Germany</b>						
Health care	29.9	1.58	1.37	2.16	159.6	3.45
Education	15.4	.85	1.48	1.26	176.4	2.22
Public administration	43.5	2.96	1.61	4.77	167.9	8.01
All		5.39				13.68

TABLE A-9 (CONT.)

	(1) Outlays, 1950, in US Prices of 1950 (USA = 100)	(2) Outlays, 1950, in US Prices of 1950 (billion dollars)	(3) Employment Relative, 1960-1950 (percent)	(4) Outlays, 1960, in US Prices of 1950 (billion dollars) [(2)x(3)]	(5) US Price Relative 1960-1950 (percent)	(6) Outlays, 1960, in US Prices of 1960 (billion dollars) [(4)x(5)]
United Kingdom						
Health care	24.0	1.27	1.18	3.03	168.4	5.10
Education	23.7	1.30				
Public administration	54.4	3.70	1.07	3.96	167.9	6.65
All		6.27				11.75
Italy						
Health care	4.6	.24	1.36	.33	159.6	.53
Education	22.2	1.22	1.36	1.66	176.4	2.93
Public administration	36.5	2.48	1.13	2.80	167.9	4.70
All		3.94				8.16

*TABLE A-10*  
*GROSS NATIONAL PRODUCT BY SECTOR,*  
*USA AND USSR, IN 1960, IN US*  
*MARKET PRICES OF 1960*  
*(Billions of dollars)*

	United States (1)	USSR (2)
Agriculture	20.5	17.4
Industry	391.5	190.8
Selected final services		
Health care	13.6	18.4
Education	14.9	22.4
Public administration	14.6	11.0
Defense	10.6	13.9
Housing	36.5	7.5
All	90.2	73.2
All sectors	502.2	281.4

culations in Abram Bergson, "Comparative National Income of the USSR and USA," in National Bureau of Economic Research, Conference on Research in Income and Wealth, *International Comparison of Prices and Output*, New York, 1972.

Also, industrial output is once again calculated as a residual, and these data, all in billions of dollars, are now used for selected final services: health care, 14.66; education, 17.03; public administration, 8.37; defense, 11.11, and housing, 6.9. For each of these sectors except housing, I

cite the product of employment in the sector in 1960 (Table A-3) and the corresponding earnings, including "supplements" in the United States in 1955, as determined from Central Intelligence Agency, *A Comparison of Consumption in the USSR and the US*, p. 83; *US National Income, 1966*, pp. 69, 96, 112, 114-115. In 1955 dollars, housing output in 1960 is taken to be 20.5 percent of that of the US. See *Productivity*, pp. 198, 200. US housing output in 1960 in 1955 dollars is calculated from such output in 1960 in 1960 dollars (Table A-10), and implied deflators for housing in *US National Income, 1966*, pp. 162-163.

Gross output originating in agriculture in 1960 in 1960 dollars is calculated from that output in 1955 dollars by reference to the deflator applied above in the corresponding translation for the United States. Gross output originating in industry in 1960 in 1960 dollars is calculated from that output in 1955 dollars on the assumption that the corresponding prices rose 10.5 percent from 1955 to 1960. This is the deflator implied by comparative data on gross industrial output of the United States in 1960 and 1955 dollars. For that output in 1960 dollars, see Table A-10. The corresponding figure for gross industrial output in 1955 dollars, 354.3 billion, represents a revision of the figure, 343.7 billion dollars, for such output in 1955 dollars in *Productivity*, p. 200. The revi-

sion takes account of changes in estimates for selective final services implied by diverse calculations in this appendix.

In dollars of 1960, selected final services, other than housing, in the USSR in 1960 are calculated by reference to comparative Soviet and US employment in 1960 in the sectors in question (Table A-3) and the gross product originating in those sectors in the United States in 1960 (Table A-10). For housing, output in 1960 in 1955 dollars is translated into such output in 1960 dollars by application of the implied deflators for housing in *US National Income, 1966*, pp. 162-163. Gross national product in 1960 in 1960 dollars is obtained as the sum of the foregoing components.

#### *Factor input weights*

In calculating factor productivity, I aggregate factor inputs with weights corresponding to their shares in US gross output in 1960, as given in Table A-11. In the United States in 1960, *labor income* for all sectors, including selected final services, is estimated to have been 324.5 billion dollars. This is the sum of compensation of employees, 294.2 billions, as given in *US National Income, 1966*, pp. 14-15, and the labor income of proprietors, 30.3 billion, as estimated from data

TABLE A-11  
 FACTOR INCOME SHARES, USA, 1960

	All sectors excluding selected final services		Industry	
	Billion Dollars (1)	Percent (2)	Billion Dollars (3)	Percent (4)
Labor	270.8	74.15	260.1	75.37
Reproducible fixed capital				
Net	45.7		41.6	
Depreciation	37.5		33.9	
Gross	83.2	22.78	75.5	21.88
Inventories	11.2	3.07	9.5	2.75
All	365.2	100.00	345.1	100.00

in *U.S. National Income, 1966*, pp. 22-23. I assume that 80 percent of all proprietors' income is labor income, including compensation of employees. See *U.S. National Income, 1966*, pp. 22-23 and Denison, 1967, p. 37. Labor income in all sectors, excluding selected final services, is obtained by deducting labor earnings in selected final services. See Table A-8. In order to obtain labor income in industry, I also deduct labor income in agriculture. This is 10.7 billion dollars, or the sum of compensation of farm employees, 2.8 billions, as given in *US National Income, 1966*, p. 93, and labor income of farm proprietors, taken to be 7.9 billion dollars or 66 percent of all proprietors' income, the same share as labor income of proprietors is found above to constitute of proprietors' income in all sectors. On proprietors' income in agriculture, see *U.S. National Income, 1966*, pp. 14-15.

All *nonlabor income* in all sectors, including selected final services, but net of depreciation, is calculated to be 90.0 billion dollars. This is the difference between national income, 414.5 billions, given in *U.S. National Income, 1966*, pp. 14-15, and labor income as determined above. Corresponding earnings of reproducible fixed capital and inventories in sectors other than selected final services are calculated by applying to all non-labor income in all sectors the percentage shares of such income imputed to nonresidential struc-

tures and equipment and inventories, in 1960 to 1962, in Denison, 1967, p. 38. Earnings from reproducible fixed capital and inventories in industry are taken to be respectively 91.1 and 84.8 percent of such earnings in the economy generally, exclusive of selected final services. I refer to the shares of industry in the reproducible fixed capital and inventories of the economy generally, exclusive of selected final services, as calculated from the US Department of Commerce data on US business fixed capital referred to above and from data on inventories in *Productivity*.

Depreciation on reproducible fixed capital in the economy generally, exclusive of selected final services, corresponds to that on business fixed capital in the Commerce Department constant cost 2 calculations based on straight line depreciation. Similarly for industry I refer to such depreciation for business fixed capital other than that in agriculture. The pertinent figures were supplied by the US Department of Commerce, Office of Business Economics.

### *Abbreviations*

FAO:	Food and Agricultural Organization
OECD:	Organization for Economic Cooperation and Development
PPSS:	Abram Bergson, <i>Planning and Productivity under Soviet Socialism</i>
<i>Productivity:</i>	Abram, Bergson, "Comparative Productivity and Efficiency in the Soviet Union and the United States"
TSU:	Tsentrālnoe Statisticheskoe Upravlenie
<i>US National Income, 1966:</i>	US Department of Commerce, <i>The National Income and Product Accounts of the United States, 1926-1965</i>

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