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Current International Comparisons

The Comparative National Income of the USSR and the United States

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INTRODUCTION

HOW Soviet and U.S. real national income compare is a question of much interest in the West. The question began to be considered primarily in the appraisal of Soviet military potential, and continues to be of concern for this reason, though no longer as much so as at the height of the Cold War. In a more academic context, comparison of the outputs of the two countries has long been a means of putting the Soviet economy in perspective and so facilitating understanding of its functioning. Such a comparison may also serve as a point of departure for normative appraisal of the Soviet performance. ✓

This essay presents some further calculations on this matter. I draw heavily on, indeed have done little more than synthesize the results of, research done by others. It may have been possible, however, to improve on comparative data now available on national income in the two countries.

Theory teaches that comparisons of real national income in different countries, like such comparisons within a single country at different times, may have to proceed somewhat differently depending on which of two analytic purposes is in mind: appraisal of comparative "production potential" or appraisal of comparative "welfare." I take as a

NOTE: Simon Kuznets kindly read a preliminary draft, and I have profited from his comments on it.

As so often in the past, I am much indebted to Mary Towle for impeccable typing.

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desideratum here the appraisal of comparative production potential. To what extent such an abstract desideratum can be achieved is another matter, but the inquiry is usefully organized nevertheless with it in mind.

Because of the dating of the basic data, I calculate national income for both countries initially for 1955. Comparative magnitudes that are derived for that year, however, may be extrapolated to more recent years by use of published indexes of the change over time in physical volume.

While national income purportedly represents the sum of "final" goods and services produced by a community, it almost inevitably omits diverse activities which contribute to final output, and includes others which at least in part might properly be considered intermediate rather than final. This is a familiar theme, and need not be elaborated here, but it should be observed that in 1955 the USSR was still much behind the United States in terms of degree of industrialization, though of course not nearly as far behind as in 1928, on the eve of the five-year plans. Thus, in 1955, over two-fifths of the Soviet labor force was still employed in agriculture. For the United States, the corresponding figure was 8.4 per cent.¹

As generally understood, the degree to which national income omits final activities, or includes intermediate ones, depends on the degree of industrialization. On balance, output of a less industrialized country tends to be understated relative to that in a more industrialized one.

That should be so here, but the two countries considered also differ in their social systems. Curiously this probably has tended to limit rather than compound the understatement of output in the USSR relative to the United States. Thus, one of the most important omissions from national income is home processing. Because of the notably extensive employment of women in the USSR, however, the volume of home processing there must be less than normal for a country of a comparable degree of industrialization.² Because of the

¹ See the references cited below.

² In the USSR in 1960 women accounted for more than half of all civilian employees, and for some 47 per cent of all civilian employees outside agriculture. In the United States in the same year women accounted for 29 per cent of all civilian

wholesale socialization in the Soviet Union, many independent activities of a kind that might tend to escape reporting, and hence inclusion in national income, have also been drastically curtailed, if not wholly eliminated, there.

THE CALCULATIONS

Comparative data have been compiled on Soviet and U.S. national income by final use, and also in a highly summary way on Soviet and U.S. national income by industry of origin. The former data are the more basic here, however, and for the present I focus on them. Following the path blazed long ago by Gilbert and Kravis,³ I have tried to compile measures in terms of the prices of both countries. That is, I take as a point of departure data for each country on its national income by final use in terms of its own prices, and in each case derive corresponding figures in terms of the prices of the other country.

In Tables 1 and 2 are shown the data on national income by use with which I began, and the corresponding figures derived in terms of prices of the other country. As indicated, in measuring national income I focus particularly on gross national product.

In the tables, the final use categories are to be construed as the designations would ordinarily imply, but it should be observed that for the United States the figures on defense cover practically all of the relevant outlays. For the USSR, however, the corresponding data refer essentially to the so-named category in the government budget. The precise scope of this category is still controversial, but there are clearly significant omissions. One omission is the support of quasi-military internal security forces. In Tables 1 and 2, this is included, along with internal security generally, under government administration. Much defense-related research may fall under communal services rather than defense, while atomic weapon development and stockpiling may at least in part be omitted from defense and find its way instead into

employees. See Abram Bergson, "Comparative Productivity and Efficiency in the USSR" (hereafter, Bergson, *Productivity*), in Alexander Eckstein, ed., *Comparisons of Economic Systems*, Berkeley, Calif., 1971.

³ Milton Gilbert and Irving B. Kravis, *An International Comparison of National Products and the Purchasing Power of Currencies*, Paris, Organization for European Economic Cooperation, 1954.

TABLE I
Gross National Product by Final Use, USSR and United States, 1955

	In Prevailing Rubles			In Adjusted Rubles			In Dollars		
	USSR (bil.)	U.S. (bil.)	USSR ÷ U.S. (per cent)	USSR (bil.)	U.S. (bil.)	USSR ÷ U.S. (per cent)	USSR (bil.)	U.S. (bil.)	USSR ÷ U.S. (per cent)
Household consumption	659.2	3,267.4	20.2	473.5	2,376.8	19.9	64.4	239.28	26.9
Communal services, incl. health care and ed.	102.5	198.1	51.7	93.2	160.9	57.9	34.7	29.86	116.2
Consumption, all	761.7	3,465.5	22.0	566.7	2,537.7	22.3	99.1	269.14	36.8
Govt. admin.	29.5	42.8	68.9	27.4	36.4	75.3	8.8	8.29	106.2
Defense	105.4	212.1	49.7	99.5	205.9	48.3	29.9	38.06	78.6
Gross invest.	246.6	628.7	39.2	238.1	605.6	39.3	43.0	84.07	51.1
Nonconsumption, all	381.5	883.6	43.2	365.0	847.9	43.0	81.7	130.42	62.6
GNP	1,143.2	4,349.1	26.3	931.7	3,385.6	27.5	180.8	399.56	45.2
Excl. selected final services ^a	1,016.3	4,273.8	23.8	809.7	3,312.7	24.4	124.0	364.0	34.1

^aGNP less labor outlays for communal services and government administration, and military pay and subsistence under defense.

TABLE 2
Gross National Product per Capita by Final Use, USSR and United States, 1955^a

	In Prevailing Rubles		In Adjusted Rubles		In Dollars	
	USSR	U.S.	USSR ÷ U.S. (per cent)	USSR	U.S.	USSR ÷ U.S. (per cent)
Household consumption	3,359.8	19,766.5	17.0	2,413.3	14,378.7	16.8
Communal services, incl. health care and ed.	522.4	1,198.4	43.6	475.0	973.4	48.8
Consumption, all	3,882.2	20,964.9	18.5	2,888.3	15,352.1	18.8
Govt. admin.	150.4	258.9	58.1	139.7	220.2	63.4
Defense	537.2	1,283.1	41.9	507.1	1,245.6	40.7
Gross invest.	1,256.9	3,803.3	33.0	1,213.6	3,663.6	33.1
Nonconsumption, all	1,944.5	5,345.3	36.4	1,860.4	5,129.4	36.3
GNP	5,826.7	26,310.3	22.1	4,748.7	20,481.5	23.2

^a USSR population, 196.2 million; United States, 165.3 million. Differences between indicated totals and sums of items are due to rounding.

gross investment. Under communal services, health care and education for the United States include private as well as public outlays. The private outlays are accordingly excluded from household consumption. For the USSR, reference is only to public outlays, but these are nearly comprehensive in that country.

These are perhaps the more interesting incongruities affecting our final use categories, but there are others. The reader with special interests, therefore, may wish to refer to the principal sources on which I have drawn for data on national income by use in national prices: for the USSR, RAND studies by me and by others associated with me; and for the United States, publications of the U.S. Department of Commerce. These studies are cited in appendixes A and B. These are the first two of a set of three mimeographed appendixes that are available on request.⁴ I also explain there some revisions and rearrangements of published data that seemed in order for present purposes.

When output is calculated in ruble values I have compiled data in terms not only of prevailing but adjusted prices. The latter are essentially prevailing ruble prices after deduction of the famous turnover tax and the addition of subsidies. I have explored at length in previous studies the problem posed for the valuation of Soviet national income by the proverbial limitations of prevailing ruble prices.⁵ Suffice it to say that in approaching the problem I take as a point of departure the factor cost standard of valuation that theory teaches is appropriate, where production potential is the object of interest. The calculation in adjusted prices is to be viewed in that light. In fact, even adjusted rubles are rather remote from the factor cost standard of theory, but they still seem preferable to prevailing rubles if production potential is of concern, and are by no means lacking in merit, I think, as a practical expedient.

Where output is calculated in dollar values, I have considered only

⁴ Of my RAND studies, the chief is *The Real National Income of Soviet Russia Since 1928* (hereafter, *Real SNIP*), Cambridge, Mass., 1961. The main Commerce Department publication used is *The National Income and Product Tables of the United States, 1929-1965* (hereafter, *National Income-1966*), Washington, D.C., 1966.

⁵ See *Real SNIP*, Chap. 3; Bergson, *Productivity*.

prevailing prices. A further computation in terms of dollar factor cost would have been to the good, but the results probably would not be very different from those where valuation is in prevailing prices.⁶ Even dollar factor cost, of course, is not the same thing as the factor-cost of national income valuation theory. It no doubt does not diverge as much from the latter ideal, however, as do adjusted rubles.

For Soviet national income, I draw on earlier studies primarily for data in prevailing rubles, but corresponding data in adjusted rubles have also been compiled previously. I do little more here than revise these figures to make them conform to the data used on national income in terms of prevailing rubles. Moreover, once U.S. national income is calculated in terms of prevailing rubles, corresponding data in terms of adjusted rubles may be derived by applying to the prevailing ruble values of outlays in different use categories appropriate coefficients obtained from the calculations of Soviet national income in prevailing and adjusted rubles. I explain in appendixes A and B the calculation of national income in adjusted rubles from data in prevailing rubles for both the USSR and the United States.

As an element in national income in prevailing prices, farm income in kind is valued throughout at average realized farm prices. Thus, for each country farm income in kind is valued initially in terms of average realized farm prices in the country in question and then in terms of average realized farm prices for the other country. In the calculations in adjusted rubles, average realized farm prices are adjusted for taxes and subsidies along with prices generally.

Outlays in prevailing prices of one country are translated into outlays in prevailing prices of the other primarily by deflation, that is, by application of ruble-dollar price ratios for different groups of goods that were compiled from corresponding ratios for different commodities. In the case of outlays on commodities I rely chiefly on ruble-dollar price ratios that are either taken from or calculated from data

⁶ See Abram Bergson and Hans Meymann, Jr., *Soviet National Income and Product, 1940-1948*, New York, 1954, p. 103, n. 18; Morris Bornstein, "A Comparison of Soviet and United States National Product," in Joint Economic Committee (hereafter, JEC), *Comparisons of the United States and Soviet Economies*, Part II, 86th Cong., 1st Sess., 1959, p. 380.

in unclassified reports of the U.S. Central Intelligence Agency,⁷ and in a study by Abraham S. Becker for the RAND Corporation.⁸

In these studies, ruble-dollar parities have been compiled from ruble price quotations obtained mainly from Soviet price handbooks and observers' reports and corresponding U.S. price data compiled by the U.S. Bureau of Labor Statistics. U.S. price data were also obtained from the Sears, Roebuck catalogue and by special inquiry. For construction, reference was made to Soviet cost estimates used in revaluation of capital assets and to U.S. reported contract prices.

In translating farm income in kind, I refer to data on both physical structure and average realized farm prices. Average realized farm prices for the USSR are Nancy Nimitz's as given in a RAND study and for the United States are those reported in government publications.

In the foregoing ways I also obtain parities for translation of commodity components of outlays for final services, such as health care, education, and government administration. Corresponding expenditures for labor services are converted by reference to data from diverse sources on employment and average earnings in the two countries. Outlays for services of military personnel, including military subsistence, are translated in the same way as expenditures for labor in outlays for health care, education, government administration and the like.

As is proper, I try throughout to use price ratios with Soviet weights to deflate ruble outlays and ratios with U.S. weights to deflate dollar outlays. Details on sources and methods used in translating outlays from one currency to the other may be found in appendixes A and B.

⁷ "A Comparison of Consumption in the USSR and US," ER 64-1, January 1964, and "A Comparison of Consumption in the USSR and US (Supplement)," ER 64-1-s, January 1964 (hereafter, *Consumption*); "1955 Ruble-Dollar Price Ratios for Intermediate Products and Services in the USSR and US," June 1960 (hereafter, *Intermediate Products*); and "1955 Ruble-Dollar Ratios for Construction in the USSR and the US," ER 64-26, August 1964 (hereafter, *Construction*). I have satisfied myself that these reports are scholarly studies, and have utilized them as such. As will appear, at important points the results would not have been greatly affected if reference had been made instead to alternative sources that are sometimes available.

⁸ "Prices of Producers' Durables in the United States and the USSR in 1955" (hereafter, Becker, *Prices*), RAND RM-2432, Santa Monica, Calif., August 15, 1959.

APPRAISAL

Calculations of the sort that have been described are almost inevitably crude. Those made here are no exception to that rule. Appraisal of their reliability, however, may be facilitated if I now examine summarily the more important sources of error, and consider whether a bias is likely in one direction or the other. Of particular interest here is the translation of outlays from one currency to another. I focus especially, therefore, on the ruble-dollar price ratios for different groups of goods used in the translation. Where one currency is translated into the other by use of physical volume indexes rather than by deflation, reference is to the implied rather than explicit parities. It should be borne in mind that where the error in such parities takes the form of an overvaluation of the ruble, Soviet outlays in dollars are overstated and U.S. outlays in rubles are understated. Undervaluation of the ruble has a reverse effect.

Price Quotations

In each country the price of any commodity considered in the compilation of parities ideally should represent the average unit value at which the commodity is delivered to its final use. In fact, the price quotations considered in compiling the parities used here are often otherwise. Among other things, ruble retail prices often refer to Moscow while dollar retail prices are often taken from a Sears, Roebuck catalogue. Use of Moscow retail prices, however, probably does not lead to any very consequential error.⁹ As for the Sears, Roebuck prices, these were used for many nonfood items. In calculations of the kind described here, such a use of Sears, Roebuck prices is often made, but the validity of this procedure still remains to be tested systematically.¹⁰

⁹ Such prices are used without correction primarily in the case of foods. According to data assembled by Janet Chapman, however, Moscow prices for twelve major foods averaged 101 per cent of corresponding all-USSR average prices in 1936. Also Moscow and all-USSR average prices have moved closely together since that date. See Janet Chapman, *Real Wages in Soviet Russia Since 1928*, Cambridge, Mass., 1963.

¹⁰ In response to an inquiry regarding the representativeness of Sears prices, Dr. Arthur M. Ross, then commissioner of the U.S. Bureau of Labor Statistics, commented as follows in a letter of January 30, 1967: "Unfortunately, it is not possible to make a positive statement in this regard, nor have we made any definitive

Except for alcoholic beverages, the dollar retail prices considered omit state and local sales taxes. The resulting undervaluation of the ruble for all household consumption might be on the order of 1 or 2 per cent.¹¹

For producers' durables, the values to be deflated in both countries are inclusive of freight charges. That is customary in national income calculations, and also proper, at least where the concern is to appraise production potential.¹² Ruble-dollar price ratios are compiled, however, from f.o.b. shipper prices. Moreover, transportation and distribution charges probably account for a larger share of delivered prices in the United States than in the USSR. Hence, here too, the ruble is undervalued, and perhaps appreciably. Thus, for gross investment as a whole the adjusted ruble may be undervalued by as much as 5 per cent, where Soviet weights are applied, and 3 per cent where U.S. weights are applied. A similar undervaluation occurs in the defense ruble, where the parity for producers' durables is taken as a surrogate for that for munitions.¹³ A further error of uncertain nature is introduced

study of the subject. Sears' prices for various items are set according to various marketing strategies, availability of resources, and a variety of other competitive factors. As a result, prices for some items may be higher than average; others may be lower. Sears' catalog prices are used on a limited basis in the Consumer Price Index, particularly for the small cities (under 50,000 population) where mail-order buying is still important. On the basis of our own observations, we would conclude that Sears' prices are generally somewhat lower than are prices for nationally advertised brands having comparable descriptions, but are about the same as private brands offered by other stores.

"If the foregoing has not really answered your question, I would hasten to add that we in the Bureau of Labor Statistics, as well as researchers in the academic world and in private industry, have extensively used prices from the Sears' catalog as a general indicator of retail price levels for many commodities, particularly in making international comparisons."

¹¹ For household retail nonfood purchases, I use a Soviet-weighted parity of 17.4 rubles to the dollar and a U.S.-weighted parity of 18.4 rubles to the dollar. Adjusted for state and local sales taxes omitted from dollar prices, these parities might have fallen to, say, 16.8 and 17.7 rubles to the dollar, respectively. The omitted state and local sales taxes, I believe, are those of a general sort, as distinct from excises on tobacco and gasoline. On the possible magnitudes involved, see *National Income-1966*, pp. 54-55. With indicated reductions in ruble-dollar parities for household retail nonfood purchases, the corresponding adjusted ruble-dollar parities for household consumption would fall by 0.6 and 1.7 per cent. The parities for household nonfood purchases also figure somewhat in my calculations at other points.

¹² See Bergson, *Productivity*.

¹³ On the possible importance, for the parity for producers' durables, of the omission of transportation and distribution charges, see Becker, *Prices*, pp. 16-17.

wherever U.S. price quotations were obtained only from selected manufacturers.

As indicated, parities for construction are compiled from Soviet cost elements rather than final prices. Since such estimates are based on established input norms, which are often exceeded, the ruble must be appreciably overvalued at this point.¹⁴ Although average construction prices could not be compiled for either country, an attempt was made to pair projects that were "similarly" located in the two countries.

Comparability of Commodities

In compiling ruble and dollar price quotations for different commodities, studies on which I draw have sought to assure that relevant economic features of commodities paired in the two countries are comparable. This desideratum too, however, was often difficult to realize. Resulting errors in the calculations must vary in different cases, but we must consider that the production of defective or otherwise substandard goods, while a feature in any modern economy, is by all accounts notably pervasive in the USSR. For example, among products examined in the first half of 1962 by inspectors of the Ministry of Trade of the Russian Soviet Federated Soviet Republic, 32.7 per cent of clothing articles, 25 per cent of knitwear, and 32.6 per cent of leather shoes were rejected or reclassified to a lower quality category. Among clothing and knitwear articles inspected by the Ministry of Trade of the Ukraine during 1963, 20 to 25 per cent were condemned as defective.¹⁵ In all these cases it is consumers' goods that are in question, but production of substandard qualities is often reported for producers' goods as well.

How does this affect comparability? So far as substandard goods are in fact rejected or reclassified to a lower quality category, their production need not affect comparability at all, but it would be surprising if such goods were not often sold simply as standard goods. This might be so in any case, but is more likely in the USSR where both consum-

¹⁴ *Construction*, pp. 9-10; A. I. Kats, *Proizvoditel'nost' truda v SSSR i glavnykh kapitalisticheskikh stranakh*, Moscow, 1964, p. 56.

¹⁵ Abram Bergson, *The Economics of Soviet Planning*, New Haven, Conn., 1964, p. 295.

ers' and producers' goods have been chronically disposed of in a seller's market.¹⁶ By implication, goods in the USSR that are nominally comparable to those in the United States must often be inferior in fact. At this point, therefore, the ruble-dollar price ratios should tend to overvalue the ruble. The overvaluation, I believe, could be consequential.

I have referred primarily to commodities, but what has been said should also apply essentially to construction. Thus, here as elsewhere an attempt was made to pair quotations for comparable projects, but at least in the case of housing the end products of Soviet construction work have been notoriously deficient in quality. This could be only partly taken account of in pairing quotations. Hence, here too the ruble should be overvalued.

Comparability of Services

While the parities used for construction, including housing, probably overvalue the ruble, differences in quality are allowed for in the derivation of a parity for housing services. The allowance is arbitrary, but the direction of any resultant error is conjectural.

On the other hand, for a variety of other final services, the calculations expressly or by implication take comparative wages as an appropriate parity for deflation of outlays for labor. Hence, labor inputs are taken to be of the same quality in the two countries. This is, of course, a conventional kind of assumption in national income accounting, but needless to say it may be materially in error. The calculations in question here are a case in point, for the ruble, very possibly, is often overvalued in respect of the labor component of final services. That seems likely when we consider, for example, that the average level of education of labor employed in final services must usually be less in the USSR than in the United States. Also, relatively more women are often employed in such services in the USSR than in the United States, and one perhaps need not be an antifeminist to feel that quality is sometimes inferior on that account as well.¹⁷

¹⁶ There are many signs, though, that at least for consumers' goods this is no longer as true as it was in earlier years.

¹⁷ In 1960, according to computations of a Denison type, one Soviet worker was comparable on the average to 0.97 of a high school graduate. The corresponding figure for the U.S. worker was 1.17. See Bergson, *Productivity*. Soviet labor must

TABLE 3

Labor Outlays in Selected Final Services,
USSR and United States, 1955 ^a

	Ratio: Outlays to GNP (per cent)	
	USSR	U.S.
Output valued in:		
Prevailing rubles	11.1	1.7
Adjusted rubles	13.2	2.2
Dollars	31.4	8.9

^a The services included are health care, education, government administration, and defense (military personnel only).

At any rate, as was to be expected, the parities used to translate outlays for final labor services are far more favorable to the ruble than are those used to translate expenditures for commodities. Hence, relative to total output Soviet outlays for final labor services became quite large in dollars and U.S. outlays for such services notably small in rubles (Table 3). An overvaluation of the ruble at this point, therefore, could be important. Partly for this reason, in Table 1, I have compiled comparative data on GNP exclusive, as well as inclusive, of final labor services. Among the use categories considered, final labor services are especially important in communal services. The comparative results obtained for such outlays must be read accordingly.

It remains to refer to one other source of incomparability, that resulting from the treatment of retail trade services. In each country prices of goods purchased at retail include trade markups. When commodities are paired in the two countries, however, the character-

tend to be of relatively higher quality in final services than in other sectors, but it should often be inferior to that in the United States. See, for example, *Consumption*, p. 38.

For the services considered an additional source of bias favorable to the USSR is the use of inputs as a surrogate for output, and together with this the omission of any allowance for capital inputs. But this is a deficiency in the initial computation of national income in national prices, rather than in the deflation.

istics of the commodities alone are considered. Hence, no allowance is made for differences in the quality of trade services through which the commodities are supplied. As even the casual observer soon becomes aware, quality of trade services does differ in the two countries. Partly because of the relatively limited facilities available, partly because of the difference in trade technology, and partly because of the chronic shortages of goods in relation to demand, trade services in the USSR must be, by any standard, markedly inferior to those in the United States per unit of goods sold.¹⁸ Here, too, therefore, the ruble must be overvalued.

Representativeness

Ruble-dollar price ratios for different groups of commodities (as distinct from labor services) were compiled from more or less extensive samples of price relatives. While care was taken to try to assure that the samples were representative, that was often difficult, for the price relatives for different kinds of commodities sometimes varied widely. Resulting sampling errors could be correspondingly large. The dispersion is especially great in the case of producers' durables. The sample considered for these goods comprises over five hundred items representing more than half of U.S. purchases of producers' durables, but the parities derived could still err. For construction but twenty-five pairs of projects could be considered, but curiously the resultant price ratios do not vary very widely.

As for the direction of error, that is conjectural, but the samples tend almost inevitably to be more representative of varieties of goods produced in the USSR than of those produced in the United States. Thus, higher-quality commodities produced in the United States often had to be omitted because they had no counterpart in the USSR. Such omissions do not affect the representativeness of parities compiled with Soviet weights, but they do affect the representativeness of those compiled with U.S. weights. Very possibly here too there is a tendency toward overvaluation of the ruble. Commodities not produced in the USSR properly should be represented in the U.S. weighted parity, and ideally at ruble prices corresponding to costs of producing very limited supplies in the USSR. For goods that are of high quality in the United

¹⁸ Marshall I. Goldman, *Soviet Marketing*, New York, 1963.

States, presumably the ruble prices in question would be especially high. Hence, ruble-dollar parities would tend to shift against the ruble with the inclusion of such goods.¹⁹

Substitutions

Ruble-dollar price ratios compiled for one category of outlays almost inevitably had often to be used in deflation of another. How the results are affected is uncertain, but it should be observed that the most important example is the ratio for producers' durables. As indicated, that was also used to deflate munitions procurement.

Appraisal Concluded

In sum, the parities used are subject to error at many points. The direction of error is not always clear, and insofar as it is it is sometimes adverse and sometimes favorable to the ruble. Errors of the latter sort, however, seem decidedly the more important (Table 4). By implication, whether the calculations are in rubles or in dollars, Soviet output probably is overstated relative to that of the United States.

In appraising the calculations, I have focused on the parities applied. The comparative data on national income in national prices from which I start also have their limitations, and so too does the translation of such data into adjusted rubles, whether for the USSR or the United States. Moreover, the adjusted rubles in any event leave something to be desired analytically. This is also true of U.S. dollar prices, though not to the same degree.²⁰

All this, however, is fairly familiar, and what must be of concern now is whether such further deficiencies might offset or compound the relative overstatement of Soviet output already noted. This could be the subject of an essay in itself, and I can refer to only one aspect, but it is an outstanding one: the possibility often suggested that Soviet

¹⁹ The deficiency in parities at this point, it should be observed, is independent of that due to incomparabilities resulting from matching U.S. products with sub-standard Soviet products.

²⁰ So far as our comparative data in national prices are in error, the presumption must be that the fault lies more with the data in rubles than with those in dollars. On the reliability of ruble data such as are employed here, see *Real SNIP*. I also discuss at length in that study the nature and limitations of further data such as are compiled here in adjusted rubles.

TABLE 4

Biases in Ruble-Dollar Price Ratios Applied
or Implied in Deflation

Source of Bias	Probable Direction, Whether Undervaluation ("—"), or Overvaluation ("+") of Ruble
Defective price quotations	
Omission of state and local sales taxes from U.S. retail prices, use of f.o.b. shippers' prices for producers' durables	—
Use of Soviet cost estimates for construction	+
Mismatching of inferior quality goods	+
Noncomparability of labor services	+
Noncomparability of retail trade services	+
Underrepresentation of high-quality goods	+ ^a

^a For ratios with United States, weights only.

real national income suffers relative to that of the United States because of the undervaluation of farm labor services, and so of farm output, so far as it reflects that undervaluation.

How to value farm labor services is a matter on which students of national income do not always agree, but it is usually assumed, I think, that such services are accounted for ideally at a "real" wage corresponding to that of industrial labor of the same skill, and at a money wage corresponding to differential rural living costs. The principle perhaps is not as compelling as has been supposed,²¹ and is also

²¹ Insofar as rural living costs are below those in the city, application of the principle must in itself tend to distort real national income comparisons, and in a manner adverse to a country such as the USSR, where the agricultural labor force is relatively large. At least such distortion occurs where, as here, the ultimate concern is with production potential. The principle becomes more defensible, however, if national income data are compiled not for their own sake but for use in the calculation of productivity. Farm labor services must then be valued as an input, though at a relative money wage which also reflects the lower cost of rural living. With such valuation, the distorting effect of differential living costs on measures of comparative output is offset. See Bergson, *Productivity*.

not easy to apply. But it should be observed that in money terms the typical farm worker in 1955 earned in the USSR some 5,244 rubles per man-year, or 55 per cent of the average industrial wage; and in the United States, some \$1,762 per man-year, or 40 per cent of the average industrial wage.²² Differentials in real earnings between farm and industry in the two countries presumably are less than those in money earnings indicated by these data. Also, especially in the USSR, skill levels in the country must be markedly below those in the city.

But farm labor services may even so be undervalued. While the undervaluation may occur in both countries, it necessarily would operate to the disadvantage of the USSR. These further data suggest, however, that the distortion cannot be serious:

	GNP: USSR ÷ U.S. (per cent)	
	With Ad-justed Ruble Valuations	With U.S. Dollar Valuations
As initially computed (Table 1)	27.6	45.2
With farm value added in each country increased to 1.5 times initial level	29.5	46.0

An increase in the average prices, net of materials cost, at which farm output is valued to as much as 1.5 times the initial level apparently would increase Soviet national income relative to that of the United States, but only to a limited extent.²³

OTHER COMPUTATIONS

Relative levels of prices and output in the USSR and the United States have been the subject of a number of previous studies both by Western scholars and Soviet agencies or individuals. I propose, where possible, to compare summarily the data presented here with the re-

²² *Ibid.*

²³ The recalculation in effect increases farm factor charges generally by 50 per cent. In terms of adjusted rubles, farm factor charges consist almost exclusively of wages, so the recalculation results in a more or less corresponding increase in labor charges alone. In terms of dollar prices, farm factor charges include sizable nonlabor charges; so the implied increase in labor charges alone is appreciably greater than 50 per cent. The recalculation uses the estimates of GNP by industrial origin presented below (National Income by Industrial Origin).

TABLE 5

Average Ruble-Dollar Price Ratios, Consumers' Goods and Services, Kaplan-Wainstein and Bergson

	Bergson, 1955 ^a		Kaplan-Wainstein, 1954 ^b	
	Soviet Weighted	U.S. Weighted	Soviet Weighted	U.S. Weighted
Household purchases of commodities ^c				
Food ^c	11.2 (11.7) ^d	17.5 (17.7) ^d	12.9	14.6
Nonfood	17.4 (14.7) ^d	18.4 (18.2) ^d	11.5	20.6
Housing	1.32	1.32	2.5	2.5
Housing; services	3.2	5.1	4.4	5.4

^a Taken from or calculated from data in CIA, *Consumption* (footnote 7, above). See appendixes A and B.

^b Norman Kaplan and Eleanor S. Wainstein, "A Comparison of Soviet and American Retail Prices in 1950," *Journal of Political Economy*, December 1956, pp. 475, 486; "A Note on Ruble-Dollar Comparisons," *ibid.*, December 1957, p. 543. For housing Kaplan-Wainstein parity for 1950, 2.9, extrapolated to 1954 by reference to implicit deflator for housing in *National Income-1966* (see footnote 4, above), pp. 162-163. The official Soviet rental rate used in computing the 1950 parity still applies in 1954.

^c For the USSR, the Bergson parities refer to household purchases in state and co-operative shops only. The corresponding Kaplan-Wainstein parities refer to prices in these shops, though purchases in collective farm markets are apparently considered in determining commodity weights.

^d For figures in parentheses, alcoholic beverages have been shifted from foods to nonfoods.

sults of the more interesting alternative computations that have been made by others. While laborious, this comparison may contribute further to the appraisal of calculations in a still relatively hazardous field.

Kaplan-Wainstein

In Table 5 are shown a number of ruble-dollar price ratios for consumers' goods and services that have been compiled by Norman M. Kaplan and Eleanor S. Wainstein, together with corresponding parities

used in this study. As explained, the latter were taken from or derived from data in a CIA report, *Consumption* (see footnote 7, above).

Soviet and U.S. prices changed only slightly from 1954 to 1955, so although the Kaplan-Wainstein parities refer to 1954, this should have very little effect on their comparability with the 1955 parities that I use. For household purchases of commodities, I show the parities used here and parenthetically, the corresponding parities with alcoholic beverages classified with nonfoods rather than foods. The parenthetic data are to be compared with those of Kaplan and Wainstein, who likewise classify alcoholic beverages with nonfoods rather than foods.

Even so, the Kaplan-Wainstein parities sometimes differ markedly from those used here. The sources of such differences are difficult to summarize, but I should explain that, thorough as the Kaplan-Wainstein study is, I have felt it in order to rely instead on data in or derived from *Consumption*, chiefly because the latter is a later study resting on a larger sample of commodities (48 foods and 76 nonfoods, versus 37 foods and 57 nonfoods covered by Kaplan and Wainstein); because the weights used, as is desirable here, relate to 1955, while those used by Kaplan and Wainstein relate to 1954 for the USSR and 1950 for the United States; and because the Kaplan-Wainstein ruble-dollar ratios for 1954 were extrapolated somewhat crudely from corresponding ratios for 1950.

Although parities for housing services differ widely, in both cases reference is to the official Soviet rental rate, on the one hand, and U.S. Bureau of Labor Statistics rental data on the other. For this reason it is difficult to choose between the two computations.²⁴ The reasons for my use here of the parities from *Consumption* for services other than housing are much the same as those for using the corresponding parities for commodities.²⁵

²⁴ The parity used here, however, is based, in the case of the U.S. rental rate, on an extrapolation backward from 1959, and this may be more reliable than the Kaplan-Wainstein one, which involves a corresponding extrapolation forward from 1950. The calculations also differ insofar as that relied on here deducts and the Kaplan-Wainstein one includes kitchen space in computing the average U.S. rental per square meter. If the kitchen space were included here, our ruble-dollar rental parity would rise from 1.32 to 1.52. The calculations also differ regarding, among other things, the discount for inferior Soviet quality. With the Kaplan-Wainstein discount, our rental parity would rise further to 1.72.

²⁵ Reference for the USSR is to services other than trade union and other dues, which are deflated separately.

While the ruble-dollar price ratios applied in this study sometimes differ much from those of Kaplan and Wainstein, it is reassuring that the divergencies are not systematic. Thus, if I had deflated instead by the Kaplan-Wainstein parities, total outlays in the categories in question would be little affected:

	Household Purchases of Goods and Services ²⁶	
	USSR	United States
1. As originally calculated (billions of dollars)	51.8	3,221.4
2. Recomputed with Kaplan-Wainstein parities (billions of dollars)	50.1	3,275.1
3. Ratio, (2) ÷ (1) (per cent)	96.7	101.7

Bornstein

The average ruble-dollar price ratios implied for consumption (including communal services) in the present study, on the one hand, and in the calculation of comparative Soviet and U.S. national income by Morris Bornstein, on the other, are perhaps misleadingly close (Table 6). In any event, it should be observed that in deflating household consumption Bornstein uses the Kaplan-Wainstein parities. These, to repeat, sometimes differ widely from the parities used here. Also, Bornstein values farm income in kind at urban retail prices. While an allowance is made for distribution costs, this is quite small relative to the spread between retail and realized farm prices, at least in the USSR where retail prices include large turnover taxes. Hence, foodstuffs constitute a larger share of household consumption for Bornstein than in my computations, where farm income in kind is valued at average realized farm prices. Parities for consumption generally, especially that based on Soviet weights, are necessarily affected.²⁷

²⁶ For the USSR, household purchases of goods in state and cooperative shops only.

²⁷ For Bornstein, Soviet consumption of farm income in kind amounts to 145.0 billion rubles. The corresponding figure obtained in this study is 80.4 billion rubles. In allowing for distribution costs, Bornstein deducts but 12 per cent from Soviet state and cooperative and 9 per cent from collective farm market prices. The corresponding deduction made from U.S. retail prices is not indicated, but if it is at all comparable to those used for Soviet retail prices it would be much smaller than the gap between retail and average realized farm prices in the United States: 59 per cent in 1955. See U.S. Department of Agriculture, *Agricultural Statistics, 1956*, Washington, D.C., 1957, p. 458. On Bornstein's calculations on consumption of farm

TABLE 6

Average Explicit or Implied Ruble-Dollar Price Ratios, 1955,
Bornstein and Bergson

	Bergson		Bornstein "	
	With Soviet Weights	With U.S. Weights	With Soviet Weights	With U.S. Weights
Consumption, incl. communal services	7.7	12.9	8	15
Govt. admin.				
Wages	2.7	2.3	2	2
Nonwages	11.1	15.4	2	2
All	3.4	5.2	2	2
Defense	3.5	5.6	4	5
Gross investment				
Producers' durables	4.1	6.4	4	6
Construction	7.0	7.1	6	8
Other	6.3	13.0	5	7
All	5.7	7.5	5	7
GNP	6.3	10.9	6.1	12.1

"Bornstein, in JEC, *Comparisons* (see footnote 6, above), Part II, pp. 385-386.

For government administration, Bornstein deflates throughout by a single parity relating to comparative money wage levels in the two countries. I differ from him here chiefly insofar as I have deflated separately (as is more correct) the nonwage component of this outlay category.²⁸ As the near agreement on parities for defense suggests, Bornstein and I are more or less in accord on major components, though here too there are interesting differences. Thus, Bornstein deflates military subsistence by a parity relating to commodity prices. I treat such subsistence as a part of military earnings, and translate it

income in kind, see Morris Bornstein et al., "Soviet National Accounts for 1955" (processed), 1961, pp. 103ff.

²⁸ The divergence between Bornstein and me for wages alone occurs primarily because for the USSR, I include here militarized internal security forces that Bornstein classifies with defense.

TABLE 7

Comparative Data on GNP of USSR and United States, 1955,
Bornstein and Bergson

	USSR (billions)	U.S. (billions)	USSR ÷ U.S. (per cent)
In Prevailing Rubles			
Bornstein	1,285.8	4,802.1	26.8
Bergson	1,143.2	4,349.1	26.3
In U.S. Dollars			
Bornstein	212.4	397.5	53.4
Bergson	180.8	399.56	45.2

along with military pay by reference to a parity for wages of military labor services.²⁹

In deflating gross investment, Bornstein admittedly often proceeds rather arbitrarily. I may have been able to improve on his calculations at this point, but as it turns out, our parities for major components of gross investment differ little.

While Bornstein and I are frequently more or less in accord on average ruble-dollar price ratios for major categories, we differ widely in our comparative data on gross national product (Table 7). For the United States, the divergence results mainly from the fact that our parities do differ, especially for consumption, by far the chief outlay. For the USSR, differences in parities also matter, but the divergence in our measures of GNP occurs chiefly because, as already noted, Bornstein values farm income in kind at approximately retail prices. Valuation here at average realized farm prices is in conformity with the conventional procedure, and is also, I believe, theoretically more appropriate where production potential is appraised. The implied omission of home processing from farm income in kind, however, is a limitation.³⁰ Bornstein also includes in the Soviet GNP admittedly

²⁹ I refer to military subsistence as a component of defense. The Bornstein procedure is proper, and is followed here for military subsistence as a component of household consumption.

³⁰ On the difference between Bornstein and me regarding the ruble value of farm income in kind, see footnote 27, above. Bornstein does not supply a breakdown of

highly conjectural estimates of "concealed" defense expenditures. The explicit budgetary figure that I rely on instead is no doubt an underestimate, but some extrabudgetary defense expenditures find their way into other outlay categories, and so are still represented in GNP as calculated. Our calculations also differ to some extent at other points.

Despite all divergencies, Bornstein and I hardly differ on the relation of Soviet and U.S. output in rubles. We differ markedly, however, on the corresponding magnitude obtained from dollar valuations (Table 7).

Kats

Diverse ruble-dollar price ratios for different categories of goods are found in various Soviet sources. I shall consider here only a few Soviet-weighted ones given or implied in a calculation of Soviet "final social product" by final use in dollar prices by A. I. Kats. "Final social product" is a relatively novel concept in Soviet national income accounting, and as Kats makes clear,³¹ also a controversial one, but essentially it is nothing other than "national income" as usually understood in the USSR, but before the deduction of depreciation on "productive capital." Final social product thus corresponds broadly to "gross national product" as usually understood in the West, but diverges from the latter in a famous way so far as final social product fails to include a variety of personal and other final services.

The scope of different use categories considered is also sometimes strange to Western eyes. In juxtaposing Kats's parities with mine (Table 8), therefore, I focus on only the final social product as a whole, and two major uses which could also be delineated in essentials in my calculations.³² In addition to the comparisons in the table, two further

Soviet household consumption in dollars but presumably his estimate of Soviet farm income in kind in dollars markedly exceeds mine of \$5.8 billion.

³¹ *Op. cit.*, Chap. 1.

³² The scope of the two use categories will be sufficiently clear if I explain that for comparison with "fund of personal and social consumption," I aggregate these outlays in my calculations: (i) "Household consumption," excluding housing, and diverse other services, principally of a personal sort; (ii) "communal services," outlays for commodities only; (iii) "government administration, outlays for commodities only; and (iv) depreciation on housing and other "nonproductive" capital, including that in education, health care, and government administration. As indicated, the second use category considered is itself an aggregate of a number delineated in Kats (Table 8). For comparison with this I aggregate these use categories in my

TABLE 8

Average Explicit or Implied Ruble-Dollar Price Ratios
(Soviet Weights), Kats and Bergson

Category in Soviet Data	Kats ^a	Bergson
	1959	1955
"Fund of personal and social consumption"	9.0	12.7
"Growth of consumption capital"; "Replacement and accumulation of productive fixed capital"; "Growth of stock and other outlays"	4.7	5.6
"Final social product"	6.9	9.0

^a A. I. Kats, *Proizvoditel'nost' truda v SSSR i glavnykh kapitalisticheskikh stranakh*, Moscow, 1964, pp. 51ff. Kats's parities are multiplied by 10 to put them in terms of the pre-1961 Soviet monetary unit considered in this essay.

ones may be made. As he explains, Kats uses a parity of 6.4 rubles to the dollar for housing construction, and one of 3.7 rubles to the dollar for other construction. In my calculations, the parity for housing is 6.6 rubles to the dollar, and for construction generally 7.0 rubles to the dollar.

Kats's parities and mine evidently diverge markedly, his being consistently more favorable to the ruble than mine. My parities relate to 1955 and his to 1959. Dollar prices rose moderately from 1955 to 1959, the GNP deflator having risen by 11.8 per cent by the end of the interval. During the same period, ruble prices apparently were relatively stable.³³ By implication, a part of the difference in parities must be due to the difference in dates considered. For the rest, Kats

calculations: (i) "Gross investment," less depreciation on housing and other non-productive capital; (ii) "defense," other than military pay and subsistence. Note that as a form of consumption (as distinct from a form of income) military subsistence is already included in my household consumption. In rearranging my accounts in the foregoing ways, I draw on data in appendixes A and B and in the sources cited there.

³³ According to official data, wholesale prices of industrial goods, inclusive of the turnover tax in 1960, were the same as in 1955. Retail prices in 1959 in government and co-operative shops were 1.4 per cent above those of 1955, while those in the collective farm market were below the earlier level. Average money wages, however, rose by 10.5 per cent over the interval in question. See *National Income-1966*, pp. 158-59; Tsentral'noe statisticheskoe upravlenie (hereafter, TSU), *Narodnoe khoziaistvo SSSR v 1960 godu*, Moscow, 1961, pp. 717, 737; TSU, *Narodnoe khoziaistvo SSSR v 1965 g.*, Moscow, 1966, pp. 167, 567.

explains that his parities are compiled largely from data of the Ministry of Trade and have their limitations. For example, the sample of commodities considered is "not always sufficiently broad," and parities within commodity "groups" are often averaged arithmetically without weights, while no account is taken of the high prices prevailing in collective farm markets in the USSR. From the meager information supplied on the underlying calculations, however, it is difficult to judge their reliability. The difference in our results must be viewed in this light.

NATIONAL INCOME BY INDUSTRIAL ORIGIN

The comparative data on national income by industrial origin are set forth in Table 9. As before, I refer particularly to gross national product. The contribution of a sector to that output consists, therefore, of its "value added," as usually understood, though reference here, of course, is to additional value gross of depreciation.³⁴

Data on gross national product in different valuations are those already derived in the calculations of output by final use. This is also true of the figures on the value added of selected final services, since, except for housing, such value added consists only of wages, and data on wages paid in the services in question have already been compiled in the calculations on output by final use.³⁵ For housing, it seemed best to refer to final outlays, as also derived previously, rather than to try to disentangle value added from materials inputs in these outlays.

In Table 9, nonfarm value added was calculated as a residual.³⁶ Hence, in computing national income by industrial origin it remained only to determine the value added of agriculture. Essentially, such value added is obtained as the excess of net farm output (i.e., farm output net of production expenses in kind) over other material inputs

³⁴ As Professor Kuznets has made clear to me, at least for the United States, the sectoral data sometimes more nearly represent "gross domestic product originating" than "value added," insofar as the principal sectoral contributions are net not only of materials but of productive services obtained outside the sector.

³⁵ See appendix tables 1 and 6. In Table 9, I consider for "defense" the earnings, including subsistence, of military personnel only, wages paid civilians under "defense" in the United States being assumed to be more correctly classified as nonfarm income.

³⁶ Here and elsewhere reference is to the nonfarm sector, exclusive of selected final services.

TABLE 9
Gross National Product by Industrial Origin, USSR and United States, 1955

	In Prevailing Rubles			In Adjusted Rubles			In Dollar Prices		
	USSR (bil.)	U.S. (bil.)	USSR ÷ U.S. (per cent)	USSR (bil.)	U.S. (bil.)	USSR ÷ U.S. (per cent)	USSR (bil.)	U.S. (bil.)	USSR ÷ U.S. (per cent)
Farm	185.3	280.1	66.2	212.6	321.8	66.1	13.8	18.59	74.2
Nonfarm (excl. selected final services)	822.6	3,949.2	20.8	588.8	2,946.8	20.0	103.8	311.69	33.3
Selected final services									
Health care, ed., govt. admin., defense	126.9	75.3	168.5	122.0	72.9	167.4	56.8	35.54	159.8
Housing ^a	8.4	44.5	18.9	8.3	44.1	18.8	6.4	33.74	19.0
All	135.3	119.8	112.9	130.3	117.0	111.4	63.2	69.28	91.2
GNP	1,143.2	4,349.1	26.3	931.7	3,385.6	27.5	180.8	399.56	45.2

^a Gross outlays, before deduction of materials inputs.

to agriculture. Net farm output and material inputs to agriculture, other than production expenses in kind, are determined for each country initially in terms of its own currency, and then translated into the other's currency by application of suitably weighted ruble-dollar parities. Here and in the further translation made from prevailing to adjusted rubles, I rely on sources and methods such as were used in the compilation of comparative data on output by final use. Details are in Appendix C.

These calculations are often crude, and any error at this point necessarily affects as well the calculation of nonfarm output as a residual. The resultant error in nonfarm output would not be at all proportionate, however, for the nonfarm sector is by far the larger one in both countries (Table 9). Since the figures on selected final services that have been used are also inexact, the data compiled on national income by industrial origin must, in general, be considered to be relatively tentative, but they still have the merit that they permit further comparison of the computations of this essay with previous work by others. Thus, the data compiled on relative output of the two countries in the farm and nonfarm sectors may be juxtaposed with similar measures compiled by others. While illuminating the reliability of my calculations, the juxtaposition may also provide a useful perspective on previous findings on relative output by sector. Even among Western studies, these have sometimes diverged widely. As a result, comparative sector output has been a notably controversial theme.

Farm Output

The comparative data compiled here on value added of agriculture in the USSR and the United States appear to be the first of their sort, but computations have been made previously of the relative levels of farm output in the two countries, where output is more or less gross of material inputs. The results of three such computations are shown in Table 10, together with my measures of value added. I also show corresponding measures compiled here on "net farm output," representing total output less production expenses in kind, and "net farm output, adjusted," or net farm output after the further deduction of purchased farm inputs.

Of the three computations by others, two—one by the U.S. Depart-

TABLE 10

Comparative Farm Output, USSR and United States,
Alternative Computations

	Ratio: USSR to U.S. (per cent)	
	With Ruble Valuation	With Dollar Valuation
Bergson:		
Net output, 1955	55.2	63.1
Net output, adjusted, 1955	60.1	70.1
Value added, 1955	66.1	74.2
U.S. Dept. of Ag.: "Production," 1958 ^a		62.5 (53.5) ^b
Pryor-Staller: "Production," 1955 ^c		52.9
Zlomanov-Kotkovskii: "Gross output" (Soviet concept), 1959 ^d	69.7 (63.4) ^b	81.8 (74.4) ^b

^a U.S. Department of Agriculture, *The World Agricultural Situation, 1961*, Washington, D.C.

^b Data in parentheses obtained by extrapolation to 1955. For the USSR, see Douglas B. Diamond, "Trends in Output, Inputs and Factor Productivity in Soviet Agriculture," in JEC, *New Directions in the Soviet Economy* (hereafter, *New Directions*), Part II-B, 89th Cong., 2nd Sess., 1966, p. 346. For the United States, see *National Income-1966*, pp. 28-29.

^c Frederic L. Pryor and George J. Staller, "The Dollar Value of the Gross National Product in Eastern Europe, 1955," *Economics of Planning*, 1966, no. 1, p. 7.

^d L. P. Zlomanov and I. I. Kotkovskii, "Sopostavlenie ob'emov sel'skokhoziaistvennogo proizvodstva SSSR i SSHA," *Sorevnovanie dvukh sistem*, Moscow, 1965, p. 323.

ment of Agriculture, the other by Frederic L. Pryor and George J. Staller—are in dollar prices. Both indicate a level of Soviet output relative to that of the United States distinctly less than is shown by any of my measures in dollar prices. Note that in the case of the Agricultural Department computation Soviet output is already relatively low for 1958, the year studied, but becomes still lower if the calculated output ratio for that year is extrapolated to 1955, the year I consider. The third computation, by two Soviet writers, L. P. Zlomanov and I. I. Kotkovskii, values output in both rubles and dollars. Extrapolated to 1955 from 1959, the year they consider, their measures approximate

mine for net output adjusted, but are more favorable to the USSR than mine for net output without adjustment.

Such varying results tend to underline the margin of error in all computations alike, and perhaps mine not least, but, partly because of the limited detail at hand on the calculations made previously, interpretation of their divergences from my measures is not easy. The reader will wish to know, however, that for the Agricultural Department and for Pryor and Staller "production" apparently corresponds broadly with net output adjusted, as construed in this essay. Their calculations, however, do sometimes differ in scope from mine for that category. For example, in the case of Pryor and Staller, even production expenses in kind are deducted only for grain, potatoes, and milk.³⁷ Index numbers of farm output were compiled by Pryor and Staller by aggregation of quantities of different products, rather than by deflation, as was done here, and that apparently was also the procedure of the Agricultural Department. The dollar prices of the Agricultural Department are those in world markets (i.e., wholesale or export prices in major exporting countries) and these must often differ markedly from the dollar average realized farm prices that are considered in this essay. The "wholesale" dollar prices used by Pryor and Staller must also diverge from the latter. Because of sharp differences in production structure in the USSR and the United States,³⁸ such divergencies in price weights could be important.

Zlomanov and Kotkovskii focus on "gross production" as understood in the USSR, i.e., even production expenses in kind are not deducted. Among the different categories of output I consider, therefore, gross production is most comparable to net output, but is still "grosser" than the latter. Farm output is calculated by aggregation of quantities

³⁷ See Frederic L. Pryor and George J. Staller, "The Dollar Value of the Gross National Product in Eastern Europe, 1955," *Economics of Planning*, 1966, no. 1, pp. 6-7, 20. As for the Agricultural Department data, in a letter of August 1, 1960, the late Lazar Volin informed me that these ". . . attempt to represent roughly net agricultural production. Included are gross crop production, minus feed, seed and waste; the gross output of livestock products without allowance for animals produced and added (net) to the national herd minus milk fed to animals (for some countries), and minus an allowance for livestock products produced with imported feed in Western and Eastern Europe. No deduction was made for inputs from the non-agricultural sector, such as chemicals, machinery, fuel and other materials."

³⁸ See appendix tables 8 and 10.

of different products, though the nature of the ruble and dollar prices considered is unexplained.³⁹ Soviet official statistics on the output of different farm products are believed often to be inflated.⁴⁰ If only because of the use of such data, the Zlomanov-Kotkovskii calculation is apt to be unduly favorable to the USSR.

Industrial Output

Divergencies are also evident between my measures of nonfarm output in the USSR and the United States, and similar data compiled previously (Table 11). The latter data in all cases relate, however, to "industry." This is in the Soviet sense, and thus includes not only manufacturing, but mining and utilities. But even so "industry" still falls short of the nonfarm sector as understood here, which also includes construction, transportation, and trade. This difference in scope presumably affects the comparative results of my calculations and the previous ones, though just how is not very clear.

We may also compare explicit or implied ruble-dollar price ratios (Table 12) in all but one of the earlier computations with mine. The difference in scope may not be as important here as in the comparison of physical volume. In any event, parities are of prior interest in this inquiry, since no data even in national currencies have been compiled here on industry as such.

My calculations, however, continue to diverge from the others. For parities as for physical volume, the difference in scope must be a factor, though its import is still difficult to judge. For the rest, the limitations of my calculations may again be relevant, but the previous calculations, as their authors usually make clear, are also subject to error. Thus, all rest on one or another or both of two dubious, though understandable, assumptions: (i) the value added per unit of output of different products in either currency is the same in the two countries; and (ii) value added per unit of output is proportional to the price of the product. The calculations are also obviously often crude at other points, and

³⁹ The "comparable" ruble prices used in Soviet calculations of Soviet farm output over time, however, turn out to be of a complex sort. See Roger E. Neetz, "Inside the Agricultural Index of the USSR," in JEC, *New Directions in the Soviet Economy*, Part II-B, 89th Cong., 2nd Sess., 1966, pp. 486ff.

⁴⁰ See Douglas B. Diamond, "Trends in Output, Inputs and Factor Productivity," in *ibid.*, pp. 96ff.

TABLE 11

Comparative Nonfarm and Industrial Output, USSR and United States, Alternative Computations

	Ratio: USSR to U.S. (per cent)	
	With Ruble Valuation	With Dollar Valuation
Bergson: Value added, nonfarm, 1955	20.0	33.3
Nutter: Value added, industry, 1955 ^a	19.7	23.4
Campbell-Tarn: Value added, industry, USSR, 1955, U.S., 1963 ^b	29.5 (38.0) ^c	34.5 (44.4) ^c
Thornton: Value added, industry, 1960 ^d	36.6 (26.7) ^e	58.0 (42.3) ^e
Revenko: "Production," industry, 1960 ^f		58 (40) ^e

^a G. Warren Nutter, *Growth of Industrial Production in the Soviet Union*, Princeton University Press for NBER, 1962, pp. 237-342.

^b Alexander Tarn, "A Comparison of Dollar and Ruble Values of the Industrial Output of the United States and USSR," *Soviet Studies*, April 1968, pp. 484-86.

^c Figures in parentheses obtained by extrapolation of U.S. data to 1955. For U.S. industrial output, see *Federal Reserve Bulletin*, January 1968, p. A-56.

^d Judith Thornton, "Estimation of Value Added and Average Returns to Capital in Soviet Industry from Cross Section Data," *Journal of Political Economy*, December 1965, p. 631.

^e Figures in parentheses obtained by extrapolation to 1955. For U.S. industrial production, see note c. For that of the USSR, see R. V. Greenslade and Phyllis Wallace, "Industrial Production in the USSR," in JEC, *Dimensions of Soviet Economic Power*, 87th Cong., 2nd Sess., 1962, p. 120. For Soviet industrial production for Revenko, however, see *Narkhoz-1964*, p. 124.

^f A. F. Revenko, *Sopostavlenie pokazatelei promyshlennogo proizvodstva SSSR i SSHA*, Moscow, 1966, p. 48.

it may not be amiss to feel that the difference between my parities and the others originates partly in these circumstances. In Tarn's computation (representing a revision and elaboration of earlier ones made in collaboration with Robert W. Campbell), the difference in date must also be a factor. This may be true too for the computation of Thornton. It is not clear, however, to what extent, if at all, parities for 1955 from which she begins (actually compiled from much the same in-

TABLE 12

Explicit or Implied Ruble-Dollar Price Ratios, Soviet and U.S.
Nonfarm and Industrial Value Added

	Rubles per Dollar	
	With U.S. Weights	With Soviet Weights
Bergson: Value added, nonfarm, 1955	12.7	7.9
with rubles adjusted	9.5	5.7
With rubles net of turnover tax		
Nutter: Value added, industry, 1955 ^a	8.7	7.3
Tarn-Campbell: Value added, industry, USSR, 1959, U.S., 1963 ^b	4.6	3.9
Thornton: Value added, industry, 1960 ^c	7.4	4.7

NOTE: Complete citations are given in footnotes to Table 11, above.

^a *Growth of Industrial Production*, p. 380.

^b *Soviet Studies*, April 1968, pp. 484-85. Parity with Soviet weights implied in alternative computations of Soviet value added of 1955 in rubles of 1959 and dollars of 1963. Parity with U.S. weights implied in alternative computations of U.S. value added of 1963 in rubles of 1959 and dollars of 1963. Post-January, 1961, rubles converted here to pre-January, 1961, rubles at the rate of ten of the latter to one of the former.

^c *Journal of Political Economy*, December 1965, p. 631. Post-January 1961 converted here to pre-January 1961 rubles as in footnote *b*.

formation on ruble-dollar relations as I use) are adjusted to relate to 1960. That is the year on which she focuses.⁴¹

⁴¹ To be somewhat more specific regarding the different calculations, Nutter's deflators (see Table 11, footnote a, above) are explicit rather than implied, and are derived by aggregating average parities for "intermediate products and consumer non-durables," on the one hand, and "machinery and equipment" on the other. Those for "intermediate products and consumers' durables" are calculated from value added data in national currencies and output relatives, and thus rest on assumption (i). Assumption (ii) is introduced because some of the parities considered for machinery and equipment relate to prices rather than value added per unit.

Thornton (Table 11, footnote d, above) describes her computations only summarily. Essentially value added in each of three sectors, "light industry," "food-processing," and "all other industry" is deflated by parities relating to product prices. While the parities are adjusted for turnover taxes, the calculation evidently still involves assumption (ii). Tarn (Table 11, footnote b, above) proceeds rather by the alternative method of aggregating output relatives with value added weights, though for machinery and equipment this output relative is determined by deflation. His calculation thus rests on assumption (i).

While the foregoing methodological features must be consequential, one wonders

The Soviet writer A. F. Revenko describes the methods and procedures used in deriving his index of Soviet industrial output relative to that of the United States, but supplies hardly any details of the actual computations. Essentially the concern is to measure "gross output by the factory method," as understood in the USSR. This requires adjustment of American production data to allow for differences between the United States and the USSR in plant specialization. That must often be difficult to do. Comparative data are compiled primarily by the aggregation of physical quantities in identical prices. Recourse is also had, however, to deflation in order to include output of "incomparable" products and the like.

Gross National Product

In the study already cited, Pryor and Staller compile comparative data on Soviet and U.S. output not only for agriculture but for other sectors. For industry they rely on the calculations of Tarn and Campbell that were considered above, but by aggregating sectoral data they find that in 1955 the Soviet gross national product was 44 per cent of that of the United States. That is with output valued primarily in dollar prices, but with "services" assumed to be less productive in the USSR than in the United States. With services taken to be equally productive in the two countries, the corresponding figure is 50 per cent.⁴² With such a treatment of services, I find that in 1955 in dollar prices the Soviet gross national product was 45 per cent of the United States. These comparative results must be read, of course, in the light

whether more detailed aspects may not sometimes be at least comparably so. Suffice it to mention the use by Nutter of a U.S.-weighted parity for machinery and equipment that is taken from Becker, *Prices*, without adjustment for the difference between July 1 and average 1955 prices (one of the infrequent general revisions of Soviet wholesale industrial prices occurred on July 1, 1955) and for the omission of metalworking machine tools; his crude extrapolation of that parity to obtain a corresponding one with Soviet weights; the use by Tarn of ruble-dollar ratios, which were clearly often determined rather arbitrarily in the CIA study drawn on, as parities for different types of machinery and equipment; and Thornton's apparent use as parities for "all other industry" of ruble-dollar ratios for producers' durables that Bornstein adapted, I believe, in part more or less arbitrarily from Becker, *Prices*.

Dollar and ruble price trends from 1955 to later years if anything should have been somewhat favorable to the ruble. See *National Income-1966*, pp. 160-61, and above (footnote 23).

⁴² *Economics of Planning*, 1966, no. 1, pp. 2, 15.

of divergencies noted between my calculations and those of Pryor and Staller for agriculture and between my calculations for the nonfarm sector and those of Tarn and Campbell for industry.

CONCLUSIONS

My calculations, although inexact, may shed further light on the comparative volume and structure of output in the USSR and the United States. In 1955, at the end of the fifth Five Year Plan, the USSR still lagged far behind the United States in total output. Thus, Soviet GNP is found to be but 28 per cent of that of the United States if valued in rubles⁴³ and 45 per cent of that of the United States if valued in dollars (Table 1).

Relations of different uses and sources of output in the two countries are very broadly similar to that for the GNP itself, but there are often incongruities. To refer to only a few of outstanding interest, reflecting the special nature of the growth process in the USSR, particularly the famous "Soviet model," and related defense policies, that country compares much more favorably with the United States in nonconsumption than in consumption. Thus, Soviet nonconsumption is 43 per cent of American nonconsumption in rubles and 63 per cent in dollars. Soviet consumption, however, is but 22 per cent of American consumption in rubles and 37 per cent in dollars (Table 1).

As late as 1955, however, application of the Soviet model had only very partially compensated for the "later start" by the USSR. The result, as not always understood, was that the USSR still compared much more favorably with the United States in farm than in nonfarm output. In agriculture, the Soviet Union produced 66 per cent as much as the United States in rubles and 74 per cent as much as the United States in dollars. In the nonfarm sector, however, the USSR was but 20 per cent as productive as the United States in rubles and 33 per cent as productive in dollars (Table 9).

Because of the larger population in the USSR, comparisons in per capita terms are necessarily less favorable to that country than those of an absolute sort. Suffice it to say that the Soviet GNP per capita is 23 per cent of that of the United States in rubles and 38 per cent in

⁴³ Here and later, ruble data cited are of the adjusted variety.

dollars. The corresponding figures for per capita consumption are but 19 and 31 per cent. In per capita nonconsumption, however, the USSR is 36 per cent of the United States in rubles and 53 per cent in dollars (Table 2).

As the cited findings illustrate, we encounter at almost every point in striking degree the familiar phenomenon of index number relativity. Measures in terms of alternative valuations diverge markedly. This is perhaps not very surprising in view of the still relatively limited advance of industrialization in the USSR compared with the United States. The index number relativity is hardly more pronounced than that observed in a comparison of Italian per capita output with that of the United States (below, Table 15). According to a number of indicators, the USSR and Italy should have been at a broadly similar stage of industrialization in the years considered.⁴⁴ Moreover, as for Italy, so for the USSR, the calculation in foreign national prices is less favorable to the foreign country than is that in dollars. That is, of course, in conformity with the pattern for Western countries generally that Gilbert and Kravis observed long ago.⁴⁵ It is also the pattern that is theoretically to be expected.⁴⁶ Its appearance here, therefore, is surely to the good.

Index number relativity reflects differences in price and output structure, and conformity of the relativity observed here to the normal pattern is to the good at least in part because that is further reassurance on the matter alluded to at the outset: the usability of ruble prices for national income measurement. From the same standpoint, though, it should be observed that, as revealed in data compiled for this study, the Soviet price structure differs not only from that of the United States but also from that of Italy, a country which, to repeat, seems to be at a similar economic stage as the USSR. The differences are sometimes striking (Table 13). Perhaps most notable are the low prices of producers' durables relative to foodstuffs in the USSR, compared with not only Italy but even the United States. Expectations of many proponents to the contrary notwithstanding, socialism, as found in the USSR, has clearly meant cheap machines rather than cheap food.

⁴⁴ See Bergson, *Productivity*.

⁴⁵ See footnote 3, above, and Table 13, footnote a, below.

⁴⁶ See Bergson, *Productivity*.

TABLE 13
 Explicit or Implied Ruble-Dollar Price Ratios, 1955, and
 Lira-Dollar Price Ratios, 1950 ^a
 (ratio for GNP = 100)

	Prevailing Rubles per \$1		Adjusted Rubles per \$1		Lira per \$1	
	With Soviet Quantity Weights	With U.S. Quantity Weights	With Soviet Quantity Weights	With U.S. Quantity Weights	With Italian Quantity Weights	With U.S. Quantity Weights
GNP	100	100	100	100	100	100
Consumption						
All	122	118	110	111	102	102
Food ^b	197	160			122	88
Housing	21	12	25	16	36	21
Health care and ed.	48	61	52	64		
Health care	44	71			96	55
Education	49	46			56	40
Govt. admin.						
All	54	48	60	52	41	64
Wages	43	21	52	27	35	20
Other	168	141	160	139	202	154
Defense						
All	56	51	63	64	72	91
Military personnel	38	22	42	26	37	21
Other	81	61	96	76	136	125
Gross investment						
All	90	69	106	85	139	103
Producers' durables	65	59			247	159
Construction	111	65			90	56

^a For ruble-dollar ratios; see appendixes A and B; lira-dollar ratios, Milton Gilbert and Associates, *Comparative National Products and Price Levels*, Paris, OEEC, 1958.

^b For ruble-dollar ratios, includes alcoholic beverages.

Here and elsewhere, however, peculiarities in the Soviet price structure have to be read in the light of the distinctive nature of the "Soviet model" generally. From that standpoint, the peculiarities must often connote a correspondence of ruble prices to "scarcity values" rather than the reverse, and necessarily it is conformity of a country's prices

to its own scarcity values that counts for national income measurement. But, while implications of the present study for the ruble price structure are properly underlined, I cannot reopen the large issue concerning the limitations of ruble prices for national income valuation, and so will say no more about that question.

In this essay, I took as an ultimate desideratum the compilation of data on national income that might illuminate comparative production potential. However the ruble-dollar price ratios are read, the national income measures compiled are certainly remote from the sort ideally prescribed by theory for that purpose. As still is not always grasped, though, on an analytic plane divergent index numbers such as have been observed imply a related divergence in capacity to produce different output mixes. Thus, relative to that of the United States, Soviet output is, to repeat, smaller in rubles than in dollars. Theoretically, the implication is that Soviet productive capacity compares more favorably with that of the United States regarding its own output mix than regarding the American one. With all the limitations of our measures, that is certainly a plausible result.⁴⁷

I have referred to three Soviet calculations of comparative output in the USSR and the United States, one of agricultural output in rubles and dollars, another of national income in dollars, and a third of industrial output in dollars. It should be observed that in the case of the second and third, the authors expressly choose to value output in dollars rather than rubles. That is done avowedly for diverse reasons, principally the relatively low value attached to "means of production" compared with "means of consumption" when computations are in rubles. As a result, with a ruble valuation, the calculated volume of Soviet relative to American output is "artificially" reduced.⁴⁸ According to the calculations of this essay, with the dollar valuation stressed in the USSR, Soviet output is raised relative to that of the United States. Indeed, though the contrary is sometimes asserted in the

⁴⁷ It must be assumed that "production possibilities," or more correctly the "feasibility locus," is concave or at least not very convex to the origin. See Richard H. Moorsteen, "On Measuring Productive Potential and Relative Efficiency," *Quarterly Journal of Economics*, August 1961; *Real SNIP*, Chap. 3; Bergson, *Productivity*.

⁴⁸ Kats, *op. cit.*, pp. 49-51; A. F. Revenko, *Sopostavlenie pokazatelei proizvodstva SSSR i SSHA*, Moscow, 1966, pp. 49-51.

TABLE 14
Gross National Product, Selected Final Uses, and Sectoral
Contributions, USSR and United States, Comparative
Volume, 1955 and 1965 "
(United States = 100)

	1955		1965	
	With Ruble Valuation	With Dollar Valuation	With Ruble Valuation	With Dollar Valuation
GNP	27.5	45.2	35.0	57.5
Consumption	22.5	36.8	24.4	40.3
Nonconsumption	43.0	62.6	72.7	98.1
Value added, farm	66.1	74.2	71.9	76.5
Value added, nonfarm	20.0	33.3	29.3	51.6
GNP per capita	23.2	38.1	29.5	48.5
Consumption per capita	18.8	31.0	20.6	34.0
Nonconsumption per capita	36.3	52.8	61.4	82.8

"Data for 1955 in Tables 1, 2, and 9, extrapolated to 1965 on following basis:

GNP: For 1965, as per cent of 1955, taken to be 178.4 for USSR and 140.3 for the United States, as indicated by data in Stanley H. Cohn, "Comparative Growth Record of the Soviet Economy," in John Hardt et al., "Recent Soviet Performance: Selected Aspects," Research Analysis Corporation, August 1968, p. 18; *National Income-1966*, pp. 4-5.

Consumption: For 1965, as per cent of 1955, taken to be 160.2 for USSR, as indicated by David W. Bronson and Barbara S. Severin, "Recent Trends in Consumption and Disposable Money Income in the USSR," in JEC, *New Directions*, Part II-B, p. 521. The corresponding index for the United States is taken to be 146.3, as indicated by the following data in billions of 1958 dollars:

	1955	1965
Personal consumption expenditures	274.2	396.2
Government purchases of goods and services, less public construction, for "health and hospitals," "sanitation," "veterans benefits and services: hospitals and medical care"; "education"	15.5	27.6
All	289.7	423.8

For personal consumption expenditures, see *National Income-1966*, pp. 48-49. Government purchases of goods and services for indicated items in current dollars from *ibid.*, pp. 62-69, 80-81. I deflate by the implicit GNP deflator for state and local expenditures, as given in *ibid.*, pp. 158-59.

Nonconsumption: Calculated as a residual.

Value added, farm: For USSR, net farm output, adjusted, less nonfarm material inputs to agriculture, the 1965 amounts of which are taken to be 135.7 and 190 per cent

Notes to Table 14 (concluded)

respectively of the corresponding 1955 totals (appendix Table 7). See Douglas B. Diamond, "Trends in Output, Inputs and Factor Productivity in Soviet Agriculture," in JEC, *New Directions*, Part II-B, p. 348. For the United States, the difference between net farm output and "intermediate products other than rents," the 1965 amounts of which are taken as 121.8 and 133.3 per cent respectively of the corresponding 1955 totals (appendix Table 9). See *National Income-1966*, pp. 28-29.

Value added, nonfarm: Calculated as a residual after allowance for farm value added and the following data on selected final services in 1965 in 1955 prices (billions):

	USSR		United States	
	In Ad-justed Rubles	In Dol-lars	In Ad-justed Rubles	In Dol-lars
Health care, ed., govt. admin., wages	123.2	59.3	74.7	37.4
Defense: military pay and subsistence	21.3	9.7	19.3	8.8
Housing, gross outlays	<u>14.5</u>	<u>11.2</u>	<u>71.4</u>	<u>54.7</u>
All	159.0	80.2	165.4	100.9

For the USSR, I extrapolate from 1955 data in appendix Table 1, by reference to employment data in Murray Feshbach, "Manpower in the USSR," in JEC, *New Directions*, Part III, pp. 746, 770-73, and *Real SNIP*, p. 364; and data on housing space in Oleg Hoefding and Nancy Nimitz, "Soviet National Income and Product, 1949-55," RAND RM-2101, Santa Monica, Calif., April 6, 1959, pp. 100-103; *Real SNIP*, pp. 315-316; and Abraham S. Becker, *Soviet National Income, 1958-1964*, Berkeley, Calif., 1969, pp. 335ff. For the United States, I extrapolate from 1955 data in appendix Table 6 by reference to employment data in *National Income-1966*, pp. 110-11, and data on housing outlays in 1958 prices in *ibid.*, pp. 48-49.

GNP, consumption and nonconsumption per capita: For 1955 population, see Table 2. Population 1965, for USSR, 230.6 million; for the United States, 194.6 million.

USSR, the increase is marked.⁴⁹ Granting the limitations of ruble prices, however, that result far from being "artificial" is, as indicated, the expected one.

I have focused in this essay on 1955, a year for which available data are favorable to calculations such as mine. It may be hoped that with further research similar calculations will become possible for more recent dates. Meantime, we are able to extrapolate some of the major findings by using available related measures of changes in physical volume over time in the two countries.

If the results (Table 14) are at all near the mark, we may conclude that over the decade 1955-65 the USSR has gained on the United States in every sphere, but very unevenly. Hence, structural differences

⁴⁹ V. Starovskii, "Sopostavlenie ekonomicheskikh pokazatelei SSSR i SSHA," *Voprosy ekonomiki*, 1960, no. 4, p. 107.

that prevailed initially are sometimes ameliorated, as where the Soviet relative standing in respect of nonfarm output gains on that in respect of farm output. But they are sometimes compounded; for example, the Soviet relative standing in consumption, if anything, suffers in comparison with that in nonconsumption. As reported, Soviet consumption has risen sharply since the mid-fifties, but so too has U.S. consumption. As it turns out, the USSR still surpasses the United States much more in the growth of nonconsumption than of consumption. Interestingly, in total volume of nonconsumption, the USSR actually matches the United States in 1960, with valuation in dollars, though it still lags with valuation in rubles.

I have focused on comparisons of the USSR with the United States, but other countries too have been compared with the United States, and the USSR may be thus contrasted, if only indirectly, with them as well. Thus, in terms of per capita GNP the USSR apparently was more or less on a par with Italy in 1955 and still remained so in 1965

TABLE 15
Comparative GNP per Capita, by Final Use,
Italy and United States, 1955 and 1965 ^a
(United States = 100)

	1955		1965	
	With Foreign National Valuation	With U.S. Dollar Valuation	With Foreign National Valuation	With U.S. Dollar Valuation
Per capita:				
GNP	24	35	32	46
Consumption	24	34	30	42
Nonconsumption	23	36	36	56

^a For 1955, see Milton Gilbert and Associates, *Comparative National Products and Price Levels*, Paris, OEEC, 1958, pp. 36, 86. Magnitudes in this source for 1955 extrapolated to 1965 by reference to calculations for the United States explained in notes to Table 14, and to data in Organization for Economic Cooperation and Development, *General Statistics*, January 1965, p. 77, and *Economic Survey of Europe in 1966*, New York, 1967, Chap. 1, p. 2.

(Tables 14 and 15). In contrast to the extreme disproportion between consumption and nonconsumption in the USSR, however, the two sorts of outlays enjoy practically the same balance in Italy as in the United States in 1955. By 1965, Italy stood higher relative to the United States in nonconsumption than in consumption, but the disproportion is still hardly comparable to that in the USSR. The USSR thus has only been able to match Italy in overall growth while enjoying much less of its fruits in the form of consumption than has that country. The partial reason must be that nonconsumption includes not only growth-inducing investment but defense outlays, and that the latter have been relatively larger in the USSR than in Italy. Familiar doubts about the efficacy of the famous Soviet growth model, however, seem here compounded, but this must be the subject of another inquiry and cannot be pursued now.

COMMENT

RUSH V. GREENSLADE, Central Intelligence Agency

First, I wish to comment briefly on the data and procedures used in Bergson's comparisons of the United States and the USSR and then at greater length on the economic significance of the comparisons.

Bergson's compilation of the existing data is complete. I do not believe there is any way to improve the coverage of the comparisons substantially unless the Russians publish more. Soviet economic data, as most economists are aware, are fragmentary, poorly defined, misleading, and on occasion simply untrustworthy. We are all indebted to Bergson for having carried out the voluminous job of data checking and testing and evaluating which was required in the construction of these comparisons. ✓

THE DATA

The comparability and representativeness of the product and price sample leave much to be desired, as Bergson fully explains in his paper. He points out that the quality of Soviet goods is frequently below nominal standards because of a pervasive seller's market, and hence are inferior to supposedly comparable U.S. goods. This low and vari-

able quality of goods is worth emphasizing because of its direct bearing on the bias in the comparison. In addition, it points up the problem of interpretation arising from the absence of market-determined prices in the USSR, which I will discuss below.

As regards representativeness the sample is limited to those prices which the Russians have published. This leaves out not only the prices of goods that the United States produces but the USSR does not, but also those prices the Russians want to leave out. In the field of producers' equipment, it also leaves out the nonserial production of machines, the so-called one-time orders. There is good reason to believe that the ruble-dollar ratios for serially produced goods are lower than for custom-made goods or one-time orders. Furthermore, one-time orders, according to recent Russian reports, include many serially produced goods modified only in trivial ways, and hence significantly overpriced. I assume the incentive to mislabel and overprice machinery operated in 1955 as well as in recent years. Then as now, enterprise performance was measured and judged by an index of value of output. The selective bias in the sample of machinery and equipment helps to explain why the ruble-dollar ratio for investment equipment, and military equipment, is so low.

The problem of diversity is one that is not explicitly discussed by Bergson. The mix of products, both intermediate and final, is decided in the USSR by enterprises and planners who are overwhelmingly concerned with cost and physical quantities of production. The influence of customers, excepting probably the armed forces, who are also concerned with the utility of the products, is minimal. One important aspect of mix is the diversity or variety of goods.

This problem is not simply the usual problem that poorer countries have less diversity than richer countries. The Soviet menu of consumers' goods and services is a short one, far shorter than its putative per capita income would justify—as visitors to both the USSR and Europe (East or West) testify. In poor countries where markets operate, at least we can say that consumers have that diversity relative to quantity that they are willing to pay for. In the USSR we know that quantities are emphasized at the expense of variety not only because of administrative necessity—the things left out are things the administra-

tive system finds hard to produce—but also because extension of variety is always likely to reduce economies of scale somewhat.

This discussion of diversity refers to the effect of the reduced shopping list on measurement. Because of it the dollar value of Soviet product is overstated and the ruble price of U.S. product is understated. This question must be separated from the questions of whether the Soviet system could increase variety at final or intermediate levels and whether by so doing it would raise or lower efficiency. The degree to which an increase in the variety of final goods, as ordered by Gosplan, would increase consumer utility and, hence, offset the reduction in quantity depends on the system's success in choosing the right varieties. Likewise, the degree to which an increase in the variety of intermediate goods at the expense of quantity would increase or decrease the quantity of final goods depends on the efficiency of the system in choosing and producing the right varieties. Speculation as to the effect of such changes has no bearing on the measurement issue. The measurement issue is that the variety of final goods is restricted in the Soviet economy to a far greater extent than in market economies of comparable per capita incomes and this dimension of performance is not reflected in the comparison of the United States and the USSR.

THE PROCEDURES

In dealing with miserly data doled out by a noneconomizing system, the investigator must adopt many compromises. Bergson's procedures are as good as various possible alternatives, as far as the plausibility of the results are concerned. However, a few statements about alternatives may help to reveal the difficulties and uncertainties in such a comparison.

The first problem is measuring farm income in kind. The issue is between measuring this kind of income at farm gate prices (average realized prices of farm commodities) or at retail prices less transportation and distribution value added. In the ruble measure of Soviet national income the question is whether one includes in the price of commodities consumed in kind some value for imputed rent; the average realized prices do not, but the retail prices would, since they include the famous Soviet turnover tax. In the dollar valuation of Soviet income in kind the question is how much home processing to

impute to peasants and how to value it. As Bergson himself suggests, his use of farm gate prices probably underestimates the degree of processing in the peasant consumption in kind. In any event, I agree with Bergson that the use of ruble-dollar ratios for retail prices probably overstates the dollar value of Russian peasant consumption by underestimating the distribution and transportation shares of food prices in the United States.

Another problem is the question of illegal activities for private gain. There is, according to rumor as well as the Soviet press, a great deal of private service, of private processing of state materials, and also of simple sale for private gain of stolen state goods. Bergson, wisely perhaps, chose not to try to account for these activities of unknown magnitude. Nevertheless, consumption, I suspect, is significantly understated by the omission of these activities.

EVALUATION OF THE COMPARISONS

I subscribe to Bergson's summary appraisal that biases in the ruble-dollar parities are mostly favorable to the ruble, that is, the ruble is overvalued. Possibly, however, the understatement of farm income in kind and the omission of some private activities may partially offset the overvaluation in dollar prices. This is not intended as a comment on direction of bias as much as it is on degree of uncertainty.

SIGNIFICANCE OF THE COMPARISONS

Bergson's objective is a comparison of the production potential of the two economies as opposed to a comparison of welfare. The comparison in dollars can be thought of as the relative capacity of the two countries to produce the Soviet mix of output. The assumption is that the United States could shift resources at initial relative prices to produce an output mix proportional to the Soviet mix. The comparison in rubles assumes a shift of the Soviet economy to the U.S. mix. This interpretation clearly depends heavily on market-determined prices, and market processes for transferring resources between uses. The near absence of market-determined prices and market processes in the USSR casts a great deal of doubt on the usefulness and validity of the interpretation. It is likely that the United States had the potential in 1955 to shift reasonably well to the Soviet mix, except for natural

resource constraints, such as oil deposits. But these constraints can normally be overcome by foreign trade. Presumably, this would be true of any larger and technologically more advanced country in comparison with a smaller one, and the smaller and poorer country would have less of an ability to shift its output mix, for example, the United States against Switzerland. However, by considering the alternatives provided by foreign trade, the problems of changing patterns of use could be thought of as soluble even by a smaller economy.

The Soviet economy, in contrast, is quite different institutionally. Not only is it far inside its technical production possibilities function, but its processes for and efficiency in transferring resources contrasts with those of market economies. Its inability to take full advantage of foreign trade exemplifies an inherent difficulty in allocating resources to their highest value uses. The problem is not in actually moving labor or redirecting capital assets. Indeed, in 1955 the USSR was carrying out a massive movement of labor and capital to plough up the New Lands of Kazakhstan and West Siberia for wheat growing. However, the movement of resources is carried out by administrative direction and not by market forces, and the output results are frequently disappointing. The resources are deployed not only for the end uses desired by the leaders but in the industry branches specified by them. This is to say that the entrepreneurship is performed through sweeping policies decided by a relatively few high-level leaders, and there is no automatic trial and error process to clean up the wreckage in their track. The New Lands program was a success but Khrushchev's later attempt to build a large, modern, chemical industry quickly was not. Similarly, his plan for catching up with the United States in meat production fell far short and was a massive waste of badly needed grain. Examples could be multiplied to indicate that the leaders frequently err and that, at best, they perceive only a few of the possible opportunities. These institutional rigidities suggest a relatively low efficiency in transferring resources.

There are two kinds of empirical evidence directly relating to the mobility of resources in the USSR. Recent studies have shown that the elasticity of substitution of capital for labor in the USSR is very low—in the neighborhood of 0.2 or 0.3 against 0.5 in the United States. Secondly, the time for completion of new investment projects, by which

most redirection of resources is accomplished, is much longer than in Western market economies. These difficulties in transferring resources bear on the significance of the comparison of the USSR and the United States in ruble prices. I would think that the USSR would have great difficulty in shifting toward the U.S. mix.

In order to shift to the U.S. mix the USSR must not only expand quantities of some categories of goods and reduce others but it must also radically expand the variety of models, styles, etc., to reach, let us say, even the Italian level of diversity, let alone the U.S. one. Secondly, the expansion of many goods requires complementary services. For example, the Russians are currently attempting an expansion of passenger automobile production, from 300,000–400,000 a year to a million a year, with the help of the Fiat Company of Italy. I anticipate they will succeed in two or three years, perhaps. However, it will be much more difficult to achieve corresponding quantities of highways, maintenance and repair service facilities, and spare parts. Seemingly, chronic difficulties in providing retail, personal, and repair services have hampered Soviet programs for housing, consumer durables, and consumption in general for decades.

The Soviet economy is in a state of widespread disequilibrium in the micro-allocation of resources. Indeed, one of the most important uses of the comparison of the United States and the USSR is to support that statement, as Bergson has shown.¹ In addition, however, no forces seem to be working toward reduction of disequilibrium. This implies either that the Soviet feasibility locus² is more convex than that of a market economy or that its probable shape is much more uncertain. The uncertainty is compounded by the observation that the slope of the relative price plane along which shifting of output mix is assumed to occur surely cannot be assumed to be tangent to the feasibility locus. The prices that are available are state- or enterprise-determined, and not market prices equating supply and demand.

My intent is not to dwell on the inefficiency of the Soviet economy, but to point out the consequences of its institutional arrangements for

¹ See A. Bergson, *Economics of Soviet Planning*, New Haven, Yale University Press, 1964.

² This phrase, as used by Bergson, expresses the thought that the USSR's output is far inside its technical production possibilities curve.

the problems of measurement. The ruble measure of relative size almost surely overstates the relative ability of the Soviet economy to produce the U.S. mix of output, significantly more, I suggest, than the lira measure of comparative size of the United States and Italy, which Bergson presents, overstates the ability of the Italian economy.

A final problem is that production potential cannot be separated from welfare or utility. Production must produce utilities or it is not production. A major weakness of the Soviet economic system is its relative inability to produce what customers want or need. The problem for an international comparison is not only the relation of Soviet preference functions to Western or U.S. preference functions, but the extent to which the USSR is producing in detail according to any utility function, even one that might be said to express planners' preferences. This is in part the quality problem which Bergson recognizes, and which may result in a large overstatement of USSR production, particularly of services. But, in addition, it is a problem of the mix of production.

Consider the low price of producers' equipment relative to consumer goods in the USSR as compared with the United States or Italy, as cited by Bergson.³ If this were a meaningful comparison, one would expect the USSR to be exporting machinery and equipment in substantial quantities. But on the contrary, the USSR in 1955 did not export nearly as much machinery and equipment as it imported in trade with the West, and still does not. Indeed, currently it is a large net importer of machinery and equipment from Italy. The inability to export those types of machines which seem to be relatively cheap is the result of lack of durability, lack of repair services and spare parts, and unresponsiveness to individual consumers' needs for special tailoring or modification of equipment. The export market places a radically different valuation on these goods than the internal pricing system.

In this sense, the comparison of the United States and the USSR in dollar prices overstates the utility of the Soviet mix. Or to reverse the statement, the dollar comparison understates the ability of the United States to produce a mix equivalent to the Soviet mix in utility. The dollar value of the Soviet output is obtained by pricing goods and

³ See Table 13.

services at dollar prices of physically comparable U.S. goods (of venerable vintage in some cases) or, in their absence, at cost. Many of these goods would cost more to produce in the United States than better and more up-to-date substitutes. In the case of innumerable types of machinery, it would cost more to produce the Soviet design in the United States than a superior U.S. design. According to the dollar comparisons the USSR has been producing more farm equipment than the United States since at least 1955, and cumulatively, over the whole period of fifteen years probably more than twice as much. Yet it is hardly disputable that the United States currently gets a great deal more agricultural work done per year by machines than the USSR.⁴ It is clear that the United States could have generated a stock of farm equipment capable of carrying out the volume of machine processes actually achieved in the USSR over the last fifteen years with a much smaller annual expenditure on equipment and spare parts. The U.S. machinery would be of a different design and mix, more productive, more durable, easier to repair, more efficiently used, etc. It need not be mentioned that the corresponding U.S. requirement for labor to produce the Soviet output would still have been drastically smaller than in the USSR.

The import of these arguments (granting my allegations of fact) for the meaning of the comparison of a central administered bureaucratic production system with a market system is something like this. Production potential in a market environment implies a potential contingent only on a change in demand. The ability of the productive organizations to carry out the shift is not essentially questioned. However, the ability of the Soviet economy to shift investment goods or defense equipment and research and development to production in the style and diversity of U.S. consumer goods, i.e., to the production of meat, of vegetables and fruit, of single-family dwelling units, etc., at estab-

⁴ The cumulative value of farm equipment in the USSR for 1955-68 inclusive in 1955 rubles is 15,500 million rubles. This excludes spare parts (see *Narodnoe khoziaistvo SSSR* for various years). Converted at Bergson's dollar-ruble ratio of 2.63, the value in 1955 dollars is \$41 billion. U.S. production of agricultural equipment in current prices for 1955-68 is about \$23.5 billion. (See Bureau of the Census, *Annual Survey of Manufactures*, for 1955-66; 1967 and 1968 extrapolated by the Federal Reserve Board index of farm equipment.) This statistic includes spare parts. Deflated to 1955 dollars, the U.S. total would be less than half the USSR total. Both U.S. and USSR data exclude tractors.

lished prices is questionable under present management institutions. The meaning of the comparisons is uncertain in the sense that the interpretation of the comparative ability to produce alternative mixes is contingent on some unspecifiable kind and degree of managerial reorganization in the USSR. Perhaps the meaning of these comparisons should be construed very literally. The dollar value of Soviet GNP is what it would cost to produce the Soviet mix in the United States (but not what the U.S. market would be willing to pay for it). The ruble valuation of the U.S. product is the cost of producing under Soviet conditions a product the composition of which is restricted to goods produced in the USSR.

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INTRODUCTION

The introduction to Bergson's paper—stating that the comparison of the real national incomes of the Soviet Union and of the United States in the West “began to be considered primarily in the appraisal of Soviet military potential”—reminds one of the beginnings of national income (and wealth) estimations and comparisons approximately three hundred years ago.

In fact the emergence of the first national income concepts (and more generally that of the science of statistics in the form of political arithmetic) is closely interwoven with rather similar needs for international comparisons at that time. Sir William Petty, when he constructed the first national income estimates in 1665 and 1676 for England, at the same time tried to compare the income and resources of England with those of France and the Netherlands. Not unlike researchers three centuries later (sitting in Cambridge, Massachusetts, or in Moscow) he was not entirely able to repeat, for the other two countries in which he became interested, the more detailed estimates he had prepared for his own country. So for France and the Nether-

NOTE: Responsibility for the views expressed here is entirely mine. Neither the United Nations, with which I am currently affiliated, nor the Hungarian Central Statistical Office, where I formerly served, are in any way accountable for the opinions expressed here by me.

lands his evaluation was based on population figures and on his estimates of productivity in various occupational groups in the two countries. On the basis of his findings, he derived ten "Principal Conclusions," three of which were: ¹

That France cannot, by reason of Natural and Perpetual Impediments, be more powerful at Sea, than the English or Hollanders

That the People, and Territories of the King of England, are Naturally near as considerable, for Wealth, and Strength, as those of France

That the King of England's Subjects, have the Stock competent, and convenient to drive the Trade of the whole Commercial World.

In history books it is also mentioned that because of their delicate nature and to avoid diplomatic complications with France, the calculations of Petty were published with the permission of the king only after Petty's death, in 1690 and 1691.²

The second set of national income estimates for England, prepared by Gregory King first for the year 1688 and then for 1695, were also accompanied by numerical estimates for France and Holland. King estimated the national income of all three countries in pounds sterling, but again (and quite naturally) his estimates for England were much more detailed than those for the other two countries.

This detour into the times of Petty and King may remind us about the seldom mentioned impact of war and military rivalries on our science. Most people are aware of the important impact of such rivalries on the development of surgery or nuclear physics. However, in the field of economics and statistics not only the general public, but quite a few professionals are unaware of some important influences of a similar nature.³ It would not serve much purpose to lament about this state of affairs (apparently quite unchanged over the last three centuries) but still it is hard to rejoice unreservedly about some otherwise

¹ William Petty, *Economic Writings*, ed. C. H. Hull, Cambridge, Engl., 1899, vol. 1, pp. 247-48.

² Naturally this fact ought to be of only historical interest in our enlightened times, when the kings of England and the czars of Russia have long ceased to rule over what is today the United States of America and the Union of Soviet Socialist Republics.

³ For example, the larger-scale application of national accounting (and indeed the organization of the Central Statistical Office in the United Kingdom) is not too widely recognized in its relationship to the war efforts of Britain during the crucial years of the early 1940's.

impressive gains made in economics and statistics on such a basis. Economists and statisticians probably do not share the feelings of grave responsibility expressed by many nuclear scientists for the results of their professional activities. Despite the material differences between nuclear physics and economics and statistics, in the light of the apparent historical trends, complacency is probably not the best attitude for our profession either.

It should be noted that Bergson is placed in the good company of Sir William Petty and Gregory King, the truly great forebears of our science, because his work follows the same tradition and because he has had to face the same kinds of unique problems during his investigations. It is hoped that since he has been placed in that company, and the respect due him for his great efforts has been expressed, he will not feel aggrieved if one turns now to dwell on various aspects of these unique problems.

CONCERNING THE OVERALL RESULTS OF THE COMPARISON

Probably a natural first reaction to the very interesting investigation produced by Bergson is to look at its overall numerical results, i.e., to the relationships estimated for the national income of the USSR vis-à-vis the United States. According to Table 14 of his study, the 1965 GNP of the USSR valued in rubles is estimated as 35 per cent of that of the United States, and in dollars as 57.5 per cent of the GNP of the United States. One way to look at these figures is to compare them with estimates of a similar nature published in the Soviet Union.⁴ As it is shown below in terms of dollar valuation a tentative attempt can be made at such a comparison with the use of the data published in the latest issue of the Soviet statistical yearbook.

According to the latest official estimates of the Central Statistical Administration of the USSR the national income of the Soviet Union in 1968 was 243.1 billion rubles.⁵ At the official exchange rate the dollar equivalent of this sum is given as \$270.1 billion.⁶

⁴ L. I. Nesterov and Y. N. Ivanov (both from the Statistical Office of the United Nations) made available quite a few new Soviet publications in the area of USSR-U.S. comparisons for the preparation of the present comments, for which sincere thanks is expressed here.

⁵ *Narodnoe khoziaistvo SSSR v 1968 godu*, USSR Central Statistical Administration, Moscow, 1969, p. 569.

⁶ *Ibid.*, p. 146.

In that same table the dollar value of the Soviet national income is also given with a correction for the differences between the price levels of the USSR and the United States. From the context of the table it can be inferred that the national income of the USSR—which is estimated to be \$326.4 billion⁷—is given at U.S. prices. In order to achieve conceptual comparability the national income of the United States is given by the yearbook according to the methodology applied by the Central Statistical Administration. The estimate for the U.S. national income in 1968 is \$513.2 billion.⁸

Thus using the methodology applied by the Central Statistical Administration, and dollar rather than ruble valuation, the national income of the USSR in 1968 was 62.8 per cent of that of the United States in the same year.

It is somewhat interesting to compare this with the extrapolation of results from other sources, using the statistical indexes of the growth of the national income of the Soviet Union and the United States as published in the same issue of the yearbook.

As mentioned above, in the present study by Bergson, the 1965 GNP (not national income, which was compared above) of the USSR valued in dollars is given as 57.5 per cent of the U.S. value. (See Bergson's Table 14.) In the Soviet statistical yearbook (page 144) the 1968 level of the USSR's national income is 26 per cent higher and that of the United States is 15 per cent higher than in 1965.

Using for extrapolation these figures (which relate to the growth of the national income as opposed to that of the GNP) in combination with the 1965 percentage established by Bergson for the USSR compared to the United States (in dollar values and adhering to the GNP concept) yields 63 per cent for the USSR for 1968—a remarkably close figure to that published on the base of the Soviet national accounting methodology with the adoption of U.S. prices for the valuation of the Soviet national income.

While the data included in the yearbook do not extend to comparisons in ruble valuations for the two countries involved, it can be noted that in the above-mentioned estimate for 1968, 243.1 billion

⁷ *Loc. cit.*

⁸ *Loc. cit.*

rubles are equated with \$326.4 billion, implying the equivalence (in the given context) of 134 U.S. cents with 100 kopecks.

Admittedly the extrapolation of the Bergson results for 1965 to 1968 with other indicators (i.e., with those related to GNP rather than to the national income in the materials product system sense) would produce results only somewhat different. Even in terms of a GNP-oriented comparison it would appear permissible, for a crude extrapolation for the short period involved, to disregard whatever distortions arise because of the assumption that the service sector grew at the same rate as that observed for the other GNP components.

At any rate the rather marked closeness of the two dollar-valuation estimates can be interpreted either from a more formal and critical or from a rather broad standpoint.

The relative closeness of the results obtained by researchers on either side of the Atlantic is gratifying to me. Apparently this is a broad view of the problem, based on the assumption that even within a single country the national income and product estimates performed by the agencies having access to a very wide range of data are subject to variations and/or errors. It is conceivable that two competent and independent teams of statisticians within a single country, having access to the same basic data and following the same broad accounting principles, could come out with somewhat different results for the GNP (or national income) of their country in any given year. International comparisons are even more subject to limitations, especially if they are performed in a noncollaborative manner, as here. Consequently, while the formal accuracy of one or the other of the two estimates may be questioned, the closeness of the two numerical results should be interpreted as a very reassuring fact about the order of magnitude of the levels of the two countries.

Adherents of a more formal standpoint (whom I do not wish to join) would probably base their dislike of the quoted results on the following logic: The Soviet estimate adheres to an MPS (materials product system) concept for both countries. The Bergson study is based on a GNP-related concept. The differences in the share of services within all economic activities in the United States and the USSR are quite marked. Consequently, either the Soviet estimate or that of

Bergson must be off the mark. (A real skeptic among them would probably add: It is possible that both of them are.)

It is not my task to defend either Professor Bergson or the Soviet estimators against any of these "rigorous" critics. In the final analysis, in fact, only a very thorough study of all the details of the two estimates (amounting to a repetition of the calculations, which I certainly cannot do) could justify definitively the broad standpoint advocated in the present notes. However one—admittedly not decisive—argument against the formal attitude may deserve mention.

The adoption of the logic cited above and a strict argument in favor of either of the two results may lead to strange assumptions, such as the following: Bergson is perhaps *overstating* and/or the Soviet Statistical Yearbook is perhaps *understating* the dollar value of the Soviet GNP (or Soviet national income) since a priori the relationship between the two countries should show a higher percentage for the Soviet Union on an MPS basis than on a GNP basis.

If the results of the two estimates are as close as in this case, someone stressing the sole reliability of the result of the Bergson estimate may find that he has to agree to a higher MPS ratio in favor of the Soviet Union than that published in the USSR. Again, someone accepting absolute validity for the Soviet estimate may agree that, a priori, a GNP ratio between the two countries ought to be smaller than that estimated for the USSR vis-à-vis the United States on the MPS basis.

According to such reasoning, an accompanying and consistent U.N. national accounts system estimate for the published Soviet calculations may lead to a "lower" result for Soviet GNP than that produced by Bergson (hence the assumption of the implicit "*overstatement*" by Bergson in favor of the Soviet Union). On the other hand an accompanying and consistent MPS estimate for the Bergson study may produce a "higher" result for Soviet national income than that produced by the Soviet statisticians (hence the assumption of the implicit "*understatement*" in the Soviet Statistical Yearbook).

To avoid any misunderstanding I wish to underline that I do not share the reasoning outlined above or the implicit assumptions mentioned. In fact I firmly believe that in the given context the broader point of view on the subject—as opposed to a formalistic approach with

possibly strange implications—is both more appropriate and more constructive.

It is interesting to note that recent estimates developed by the United Nations Economic Commission for Europe (based largely on the short-cut method of F. Jánossy and published in the *Economic Survey of Europe in 1969*) are rather closely in the middle range of the two limits produced by Bergson for the USSR-U.S. comparison. (Some remarks on the ECE work are contained in the appendix to this comment.)

METHODOLOGICAL PROBLEMS

In commenting on a few methodological problems, it is desirable to state the significance of the objective of Professor Bergson's paper as the study of the "comparative 'production potential'"⁹ rather than the investigation of the quite important but more elusive welfare concept.

If one thinks of the various possible uses of the results of real product comparisons (as mentioned below) it is clear that the choice made by Bergson in this respect is not only the more practical one but also the one which suits the majority of the final purposes listed here for the use of international comparison results:¹⁰

Assessments of welfare levels (standard of living, real incomes, etc., compared in different countries)

Studies of economic efficiency

Comparisons of economic and military power

Agreements concerning cost-sharing between nations (in the budgets of international organizations, common defense arrangements, etc.)

Formulation of foreign aid policies (taking into account the capabilities of the donors and the needs, the level of economic development, etc., of the recipients)

Economic policy or planning (the comparative data serving as information or even as a set of development targets)

⁹ See first paragraph of his paper, above.

¹⁰ See "Plans for International Product and Purchasing Power Comparison" (mimeo), U.N. Statistical Office and University of Pennsylvania International Comparison Unit, August 1968, p. 5.

- Analysis of foreign markets (the purchasing power of markets abroad, price competitiveness of different countries, etc.)
- Integration processes (judging the possibilities and impact of specialization, cooperation, common markets, the movements of the factors of production, etc.)
- Construction and verification of economic theories (models of growth, etc.)
- Statistical purposes (to obtain weights for regional or world indexes etc.)

One would think however that if the basic data permit it, a more explicit decomposition of the underlying factors leading to the differences observed in the comparison of the "productive potential" of the two countries studied would be of great interest.

Admittedly no way can be found for any "complete separation" of the influence of prices on quantity comparisons or vice versa. Still if the necessary basic information is available the performance and the showing of the more detailed results for such comparisons in the following form ¹¹ is of some help:

Quantity comparison with the price weights of the base country:

$$\Sigma Q_1 P_0 / \Sigma Q_0 P_0$$

Quantity comparison with the price weights of the other country:

$$\Sigma Q_1 P_1 / \Sigma Q_0 P_1$$

Price comparison with the quantity weights of the base country:

$$\Sigma P_1 Q_0 / \Sigma P_0 Q_0$$

Price comparison with the quantity weights of the other country:

$$\Sigma P_1 Q_1 / \Sigma P_0 Q_1$$

Especially for the analysis of production potential a somewhat more direct investigation of the influence of the quantity and price measures (and weights) on the results obtained can be of great interest. For

¹¹ Milton Gilbert and Irving B. Kravis, *An International Comparison of National Products and the Purchasing Power of Currencies*, Paris, Organization for European Economic Cooperation, 1954, p. 63.

example the interpretation (in the context mentioned above) of the statement of Bergson that it was his aim "to use price ratios with Soviet weights to deflate ruble outlays and ratios with U.S. weights to deflate dollar outlays"¹² presents some difficulty for the reader. Generally, it appears appropriate to underline here that for studies of this nature the significance of the "quantity approach" is somewhat greater than that of the "price approach."¹³

The methodological problems related to the price observations are also quite complex.¹⁴ On the one hand it would be quite unfair to dwell upon the nature and possible deficiencies of the basic price information available to Bergson for his study. His control over any deficiencies of this sort was obviously limited. Still the uneasiness one feels about some problems of the basic data is hard to eliminate. Obviously, this is no comment on the quality of the very detailed investigation done by Bergson. However, even the most excellent compilation and evaluation of basic data (in this case, price observations) may not eliminate such uneasiness in the reader, especially as to the problems of matching identical or comparable products for pricing.

Clearly there is no need to idealize price data collection by any government statistical organization. If one reads the report of the Stigler Committee¹⁵ or other relevant materials, the situation in this respect would not appear ideal in many ways. Still the same documents also give a much better feeling for the complex efforts undertaken to improve price data collection. It appears enough to refer to the study of sampling problems for the U.S. Bureau of Labor Statistics Consumer Price Index¹⁶ as opposed to the much more unexplored question of the representativeness of Sears, Roebuck prices.¹⁷ The

¹² See last paragraph of *The Calculations*, in his paper.

¹³ Especially because of the problems related to the system of relative prices in the USSR, extensively investigated in Bergson's *The Real National Income of Soviet Russia since 1928*, Cambridge, Mass., Harvard University Press, 1961.

¹⁴ Because of the relative lack of emphasis on quantity observations in the paper it would not appear useful to dwell here on problems related to the quantity approach.

¹⁵ Report of Price Statistics Review Committee, *The Price Statistics of the Federal Government*, New York, NBER, 1961.

¹⁶ *The Consumer Price Index: History and Techniques*, BLS Bull. 1517, 1966.

¹⁷ One should not be too much surprised if the estimators of the dollar values of the USSR national income in the Central Statistical Administration in Moscow also had a Sears, Roebuck catalogue on their shelves.

sample of prices used for the USSR in the study quite possibly has its limitations as well.

Under the given conditions there is apparently no remedy for these problems. Noncollaborative comparisons—as it can be demonstrated from Petty and King to Bergson and the Soviet yearbook—by their nature have these kinds of limitations. The only possibility of overcoming this obstacle lies in the bilateral, cooperative approach to such studies advocated below.

CONCLUSIONS

On the preceding pages due respect was paid to Professor Bergson for undertaking this very complex and very demanding study. Taking into account all the difficulties such studies have to face, his investigation is certainly quite impressive. The closeness of the overall ratio obtained for the USSR vis-à-vis the United States in dollar values is also very interesting.

Naturally there remain numerous methodological, political, numerical, and other points on which disagreement could be aired. But in view of the overall significance of such studies, and in order to stimulate the thinking about the possibilities for overcoming the inherent limitations of all investigations conducted in a noncollaborative manner, the more constructive approach of discussing the questions of collaborative comparisons is attempted.

The road to bilateral cooperative arrangements for studies aimed at USSR-U.S. comparisons is obviously not an easy one. The results of such comparisons are obviously not only of an academic interest.

Fully recognizing all the difficulties involved in the arrangement of a cooperative study it still does not appear superfluous to list some of the comparative advantage of the cooperative approach over even the best organized and most ingenious unilateral work in this area.

Apparently, only with the cooperation of the national statistical services of these two great countries would it be possible to base the comparisons on the most reliable primary data for quantities, prices, and expenditures. Anyone familiar with the intricacies of national accounts estimates must admit that without access to the great variety of data available within the statistical services and in other govern-

mental and nongovernmental organizations, the reliability of estimates must suffer considerably.

In the case of quantity and price data, the direct help and involvement of national statistical services, at least in two important aspects, it is quite indispensable. On the one hand, without such assistance it is extremely difficult to assess the representativeness of the items included in the sample in relation to the vast total population of goods to be compared. It is quite possible that the quantity or price information somehow available to private research is not unreliable per se. However, another matter is whether the information available is well enough chosen for inferences to be drawn from it with respect to the total population of goods. The best possible sampling frame is certainly available only to national statistical services.

Another important aspect of the involvement of the statistical services (and through them of other national authorities) in the procurement of price and quantity data is related to the possibilities of achieving a much higher degree of comparability (and/or quality adjustments) for the products and services studied. Anyone with experience in this area can testify about the formidable difficulties encountered here—even when such help is made available. Without such help the task is really overwhelming.

It should also be mentioned that in choosing the most effective general methodology it is advantageous to have the cooperation of the national statistical services. While quite a few methodological procedures may look impeccable in theory, only with the cooperation of the two sides involved in such an undertaking is it possible to judge their effectiveness within the statistical-economic context of the two economies being compared. This is not to say that success is secured only with complete unanimity as to the best methodology for a comparison. Nevertheless, the discussion of the methods—even if complete agreement cannot be reached—may be of enormous help in selecting the best path for the solution of the innumerable problems which have to be faced.

Other remarks on the advantages of a cooperative approach could be made. However, this is hardly needed since most of the arguments are rather self-evident. It can be safely assumed that the vast majority of researchers would agree to such an assessment. Probably the more

experienced they are in "unilateral" work in this area—like Bergson—the more they could say about the possible advantages of a cooperative approach.

The real difficulty, they would say, is not in their doubts about the advantages of the cooperative approach but in its feasibility. Naturally, on this crucial point they may be right. On the other hand, perhaps not enough has been done to explore the possibilities in this area.

Possibly, direct cooperation for such a study may be too difficult to organize. Perhaps the exploration of proper arrangements for indirect cooperation, possibly with the help of an international organization, would yield somewhat better results.

At least one remark should be made about the latter approach. An international organization could, with the help of the national statistical services, certainly go further than private researchers—and still work on its own responsibility, i.e., without necessarily implying responsibility by the countries for the results so achieved.

At the same time an international organization could prove to be a place where ideas concerning the optimal ways to achieve comparability could be best exchanged and where the interpretation of the results could be safeguarded against unilateral or extreme views or against propagandistic use.

It is hoped that the widespread efforts for such comparisons by many researchers in the two largest producers of the present-day world economy will not remain unrewarded in the future. There can be little doubt that even a measure of cooperation in this field would materially improve the depth of such investigations.

One could argue that much of the above is not directly related to the impressive work of Bergson in this area. It is contended, however, that his stimulating paper should encourage everyone interested in research in this field to explore every possibility for improvement in this important realm of economic studies which had its beginnings in efforts of men like Sir William Petty and Gregory King.

APPENDIX

The significance of extensive direct cooperation of the national statistical services of the countries studied in international comparisons does not decrease even if such work is carried out by international organiza-

tions (which usually have better contacts with their member countries and whose multinational staff has better access to sources of data and a rather wide knowledge on methodological differences, etc.).

The comparisons recently performed by the U.N. Economic Commission for Europe can be mentioned in this respect. For the *Economic Survey of Europe in 1969* a rather detailed study was prepared with the aid of certain short-cut methods, based on physical or "nonmonetary" indicators of output and/or consumption, using regression techniques. The approach adopted for the study largely followed the method as developed earlier in Hungary by F. Jánossy.¹⁸ This work is a quite interesting and certainly worthwhile attempt at finding a less expensive type of method than that followed by those who delve into the difficulties of making detailed price and quantity comparisons. Nevertheless, the interpretation and acceptance of the results is not without difficulties.

According to the calculations, the 1965 per capita gross domestic product of the USSR was about 40.5 per cent of that of the United States.¹⁹ These estimates fit comfortably within the two limits given by Bergson for the per capita GNP relationship of the two countries in the same year (29.5 per cent in ruble values and 48.5 per cent in dollar values).²⁰ Naturally the same can be said about total GDP (about 48 per cent on the base of the ECE calculations), which is also neatly within the range of the estimates given by Bergson—35 per cent and 57.5 per cent.²¹

Considering the different methodology applied by Bergson and the ECE, the closeness of the results is quite remarkable. One is tempted to conclude (as in the case of the comparison of the Bergson figures with those of the Soviet Statistical Yearbook in dollar values) that broadly speaking the results confirm each other.

While this may be the best conclusion to be drawn, a few problems nevertheless remain. Although the overall results of these three estimates are rather close to each other, in certain respects the discrepancies are quite pronounced. In the case of Bergson's estimates compared

¹⁸ F. Jánossy: *A gazdasági fejlettség mérhetősége és új mérési módszere*, Budapest, Közgazdasági Kiadó, 1963.

¹⁹ See table at end of this appendix.

²⁰ See Bergson's Table 14.

²¹ *Ibid.*

to those in the Soviet yearbook, for example, the comparisons of the output originating in industry and agriculture are rather different. Compared with the ECE estimates for consumption (USSR per capita total consumption is given as about 32 per cent of the United States in 1965) the two limits given by Bergson are 20.6 and 34 per cent (in ruble and dollar values) and the assumed differences in the scope of consumption would not appear to explain completely the closeness of the ECE estimate to the higher (dollar-valuation) figure given by Bergson.

Other problems could be mentioned as well. On a priori grounds it would appear doubtful whether the figures computed by the ECE for Hungary and the USSR are good approximations for the comparison of these two countries (for 1965 the per capita GDP is given as \$1,015 for Hungary and \$1,053 for the USSR). Most Western estimates assume a somewhat larger difference in favor of the USSR as do the calculations performed within the Council for Mutual Economic Assistance (the latter being based on a different concept). On the other hand Bulgaria fares somewhat "worse," according to the ECE study in per capita GDP (compared to the USSR) than according to the CMEA comparisons (performed on an MPS basis).

Considering the great interest, and much better analytical possibilities, in the more detailed results of such comparisons, the closeness of the overall estimates does not seem to give sufficient assurance about the divergencies seen in certain aspects.

One interesting feature of the ECE study is the publication of the standard errors of the estimates. In the case of the USSR the "confidence limits" at a 5 per cent significance level (as a percentage of the average estimate) are given as ± 24 per cent. For the United States the same limits are ± 10 per cent and for Hungary, ± 15 per cent. This attempt at judging the reliability of the figures published is certainly most welcome. Nevertheless, if one takes them seriously, the differences observed by the ECE for the Hungary-USSR comparison cannot be taken as having material significance.

All in all the foregoing remarks mean to illuminate only one point, namely, that the work performed by international organizations is likely to have a marked advantage over unilateral efforts only in those cases where (and to the extent that) the direct and extensive cooperation of the countries studied can be obtained.

USSR and U.S. Comparative National Income 207

Per Capita Gross Domestic Product, 1965

	At Official 1965 Exchange Rate	ECE Physical Indicators; Estimates in "Average" Prices	Standard Error of Estimate (dollars) ^a	Confidence Limits at 5 Per Cent Significance Level (as per cent of average estimates) ^a
Austria	\$1,273	\$1,459	\$ 57	±8
Belgium-Luxembourg	1,782	1,886	74	±8
Denmark	2,132	1,820	76	±9
Finland	1,750	1,585	87	±11
France	1,922	1,616	58	±8
Greece	677	758	63	±18
Ireland	943	1,239	66	±11
Italy	1,021	1,190	50	±9
Netherlands	1,537	1,796	64	±7
Norway	1,910	1,668	58	±7
Portugal	405	733	57	±16
Spain	680	939	55	±12
Sweden	2,536	2,171	86	±8
Switzerland	2,274	1,863	105	±12
Turkey	284	333	25	±16
United Kingdom	1,802	1,929	73	±8
West Germany	1,913	1,854	64	±7
Japan	868	1,293	92	±15
Canada	2,500	2,218	90	±9
United States	3,553	2,597	126	±10
Australia	2,057	1,889	71	±8
New Zealand	1,999	1,850	107	±12
Bulgaria	-	877	87	±21
Czechoslovakia	-	1,427	110	±16
East Germany	-	1,437	92	±13
Hungary	-	1,015	73	±15
Poland	-	989	93	±20
Romania	-	697	63	±19
Soviet Union	-	1,053	121	±24
Yugoslavia	-	692	55	±17

SOURCE: U.N. Economic Commission for Europe, *Economic Survey of Europe in 1969*, Part I, Chap. 4, App. Table V.

^a Based on the assumption of randomness of the sample; see text.

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National income is a summary statistic, one number to describe the size of a complete economy or to compare the sizes of two economies. Bergson presents the number and explains how he got it, what sources of data were used, and how the data were combined. There is, however, a sense in which the number is not fully explained. Users of income comparisons—politicians, economists, and interested laymen—would find the summary statistic more informative if they were told precisely what it is that is being summarized. When one reads that Russian household consumption per head is between 17 per cent and 22 per cent of American household consumption per head, one finds oneself asking “What do the Russians eat?” and “How are they housed?” and “How extensive are their medical services?” One would like to know precisely what goods and services Americans have that the Russians do not. The information might be presented in a long table comparing American and Russian incomes quantity by quantity and price by price in as much detail as the data allow, with footnotes specifying assumptions made in identifying Russian and American quantities and in choosing prices. Perhaps one can get this information from the primary sources Bergson cites, but the amount of detective work required would be considerable, for the construction of the Russian accounts seems to be a vast joint effort of many scholars continually cribbing from one another and developing layer upon layer of estimates. It would be helpful if Bergson could cut through all this and take us back to prices and quantities per head.

In introducing the study, Bergson says that income comparisons may have two objectives: “appraisal of comparative ‘production potential’ or appraisal of comparative ‘welfare.’ I take as a desideratum here the appraisal of comparative production potential.” This objective leads Bergson to compare ratios of income at adjusted rubles (suitable for production comparison) as well as at prevailing rubles (suitable for welfare comparison). I would like to make a few remarks on relations between welfare and production comparisons and on the extent to which they may be distinguished. I will not discuss complications that

arise from the existence of international trade, nor will I discuss the comparison of income classified by industry. I shall concentrate on comparison of final goods and services in closed economies.

In Table 2 of Bergson's paper, we see that the ratio of Russian to American income is 38.1 per cent at American prices, 22.1 per cent at prevailing rubles, and 23.2 per cent at adjusted rubles. Let us think of America as the base year and of Russia as the current year so that the first of these numbers is the Laspeyres index and the latter two are variants of the Paasche index. To say that one intends an income comparison to reflect "welfare" or "production potential" is to say that one has certain questions in mind which one hopes to answer by means of the data. Two questions might reasonably be asked about production.¹ First, what fraction of the American output could Russia produce if Russia chose a basket of goods and services in the same proportions as goods and services in the American basket? Second, what fraction or multiple of the Russian output could America produce if America chose a basket of goods and services in the same proportions as goods and services in the Russian basket? I shall refer to the answer to the first question as the true production comparison at the American mix of goods and services, and to the answer to the second question as the true production comparison at the Russian mix of goods and services. The two true ratios of Russian production potential to American production potential will be designated T_{PA} and T_{PR} .

Similarly, there are two welfare questions: First, what multiple of the typical Russian income would one need in Russia to be as well off as the typical American? Second, what multiple of the typical American income would one need in America to be as well off as the typical Russian? I shall refer to the answer to the first question as the comparison by American standards and to the answer to the second question as the comparison by Russian standards. The two ratios of income answering these questions will be designated T_{WA} and T_{WR} .

Relations among the true welfare comparisons, the true comparisons of production potential, and the observed Paasche and Laspeyres indexes are illustrated in Figure 1. Russia has a comparative advantage

¹ See A. Bergson, *The Real Income of Soviet Russia since 1928*, Cambridge, Harvard University Press, 1961, Part I; and R. Moorstein, "On Measuring Productive Potential and Relative Efficiency," *Quarterly Journal of Economics*, 1961, pp. 451-67.

FIGURE 1a

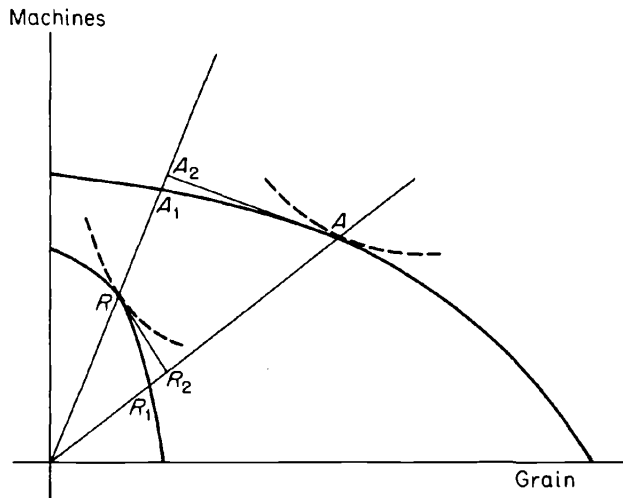
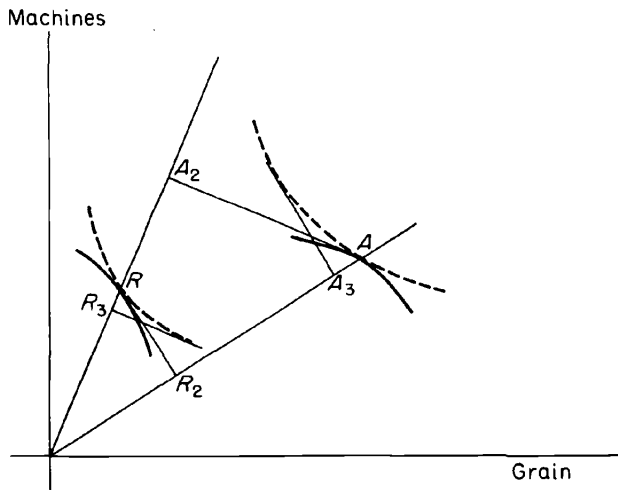


FIGURE 1b



NOTE: In Figure 1a, $T_{PA} = R_1/A$; $T_{PR} = R/A_1$; $P = R_2/A$; $L = R/A_2$. In Figure 1b, $T_{WA} = R_3/A_2$; $T_{WR} = R_2/A_3$. For fuller explanation of figures, see text.

in machines and America has a comparative advantage in grain, but as the curves are drawn America can produce more grain and more machines than Russia at any mix of output. The American output is designated A and the Russian output is designated R . The heavy curved lines through A and R are American and Russian production possibility curves, and the curved dashed lines are indifference curves. Tastes are the same in both countries in the sense that the countries have one set of indifference curves in common. The relative prices of grain in America and Russia are slopes of the "budget constraints" AA_2 and RR_2 .

As illustrated in Figure 1a, the Paasche and Laspeyres indexes of output are $P = R_2/A$ and $L = R/A_2$, and the true productivity indexes are $T_{PA} = R_1/A$ and $T_{PR} = R/A_1$. Figure 1b is the same as Figure 1a wherever the points are labeled identically. The point A_3 is a projection onto the line from A to the origin of the tangent to the American indifference curve at Russian prices. Thus R_2/A_3 is the ratio of Russian income to the income in rubles needed to make a Russian as well off as an American. The true welfare comparisons at American standards and at Russian standards are: $T_{WA} = R_3/A_2$ and $T_{WR} = R_2/A_3$. From Figure 1 it may be seen that two sets of inequalities must always hold: $T_{PA} < P < T_{WR}$ and $T_{WA} < L < T_{PR}$. These inequalities are true as long as the indifference curves are convex, the production possibility curves are concave, and the indifference curves are tangent to production possibility curves at the chosen mix of output.

The reason for developing these inequalities here is to deal with the question of whether and under what circumstances the Paasche and Laspeyres indexes are upper and lower limits to the true indexes we are searching for. It follows directly from the inequalities that when the Paasche index exceeds the Laspeyres index the two indexes may bracket the two true indexes of production potential but cannot under any circumstances bracket the welfare indexes. Similarly, when the Laspeyres index exceeds the Paasche index, the two indexes may (and probably do) bracket the two true welfare indexes, but the true indexes of production potential lie outside the range of the Paasche and Laspeyres indexes.

Bergson's data furnish an example of the latter case. Since the Laspeyres index (38.1 per cent) exceeds the Paasche index (22.1 per

cent), it follows that $T_{PA} < P < L < T_{PR}$. (The middle inequality is an empirical fact; the other two inequalities are a logical consequence of the concavity of production possibility curves.) In a sense, the observable indexes of comparative real income are the wrong limits to the numbers Bergson is searching for. Should the Americans try to produce a basket of goods and services in proportion to the Russian basket, they could produce something less than 2.3 times the Russian income ($2.3 = 1/0.38$). But nothing in the statistics indicates how much less. There is no lower limit at all, and for all we know the true figure might be less than 1. Similarly the Russians, if they tried to produce a mix of outputs proportional to the American mix, would produce something less than 22 per cent of the American output, but again there is no lower limit. That, unfortunately, is all that can be inferred from the data.

Difficulties arising from the absence of outer limits in comparisons of production potential are compounded by problems encountered in choosing commodities to be compared. The diagrams have been drawn as though the division of output into a finite number of commodities were God-given. In fact, we choose the commodities, and the result of the comparison is influenced by our choice. Suppose that Russia and America grow different varieties of wheat. Before a comparison of income can begin, someone must draw equivalences between Russian and American wheat by weight, by calorie content, by protein content, by world prices, or whatever. And prior to this decision someone must decide that Russian and American wheat are one and the same commodity for the purpose of income comparison. For the sake of the argument, suppose that differences of soil and climate in Russia and America are so great that Russian wheat will not grow in America and American wheat will not grow in Russia. I think we would still classify Russian and American wheat as the same commodity but our reason for doing so would be that they are nearly perfect substitutes *in use* despite the fact that there is no substitution between them *in production*. In these circumstances our ideal of an income comparison reflecting pure "production potential" becomes completely unattainable. Either we must say that America simply cannot produce the Russian mix of goods and vice versa, or we must deal in comparisons

where considerations of welfare have been brought to bear in organizing statistics at a lower level. Bergson has chosen the latter course, and I think it is the right one, but in interpreting his data as measures of production potential we must recognize that either he or someone else who prepared the primary data has had to introduce considerations of utility, welfare, and taste to work the primary data into a form amenable to income comparison.

The issue of the existence of upper and lower limits to the true ratios of welfare and production potential may be clarified by reinterpreting the relation between the Paasche and Laspeyres indexes, and by considering three simple cases of the situation described in Figure 1. It is a fact that

$$L > P \leftrightarrow \sum_i v_i p_i q_i < 1$$

and

$$L < P \leftrightarrow \sum_i v_i p_i q_i > 1$$

where v_i is the value of the output of the i th commodity in the base year, p_i is the change in the price of the i th commodity between the base year and the current year as a multiple of the average change in prices, and q_i is the change in the quantity between the base year and the current year as a multiple of the average change in quantities. Thus to say the $L > P$ is to say that the p_i and q_i tend to be negatively correlated or that the economy is moving along demand curves between the base year and the current year. To say that $P > L$ is to say that the p_i and q_i are positively correlated and that the economy is moving along supply curves between the base year and the current year.

The three paradigm cases are the "taste case" illustrated in Figure 2a, the "technology case" illustrated in Figure 2b, and the "tax case" illustrated in Figure 2c. The top half of each figure is a simplification of Figure 1, and the bottom half conveys the same information as the top half in the language of demand and supply curves.

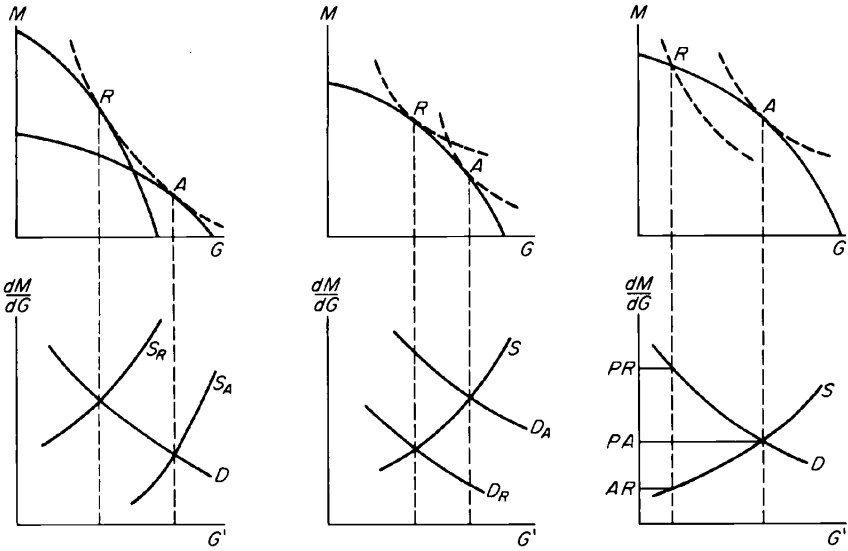
In the taste case, indifference curves are homothetic, that is to say, every indifference curve is a scaled up or scaled down version of every other curve, price ratios depend only on proportions of grain and machines consumed, and all income elasticities equal 1. In interpreting Figure 2a, one might imagine either that the Russians and Americans

FIGURE 2b

FIGURE 2a
The Taste Case

The Technology Case

FIGURE 2c
The Tax Case



M = number of machines.

G = tons of grain.

G' = output of grain as a percentage of the output at A divided by output of machines as a percentage of the output at A .

PA = relative price of grain and machines in the United States.

PR = relative price of grain and machines in prevailing rules.

AR = relative price of grain and machines in adjusted rubles.

NOTE: In Figure 2a, indifference curves are homothetic. In Figure 2b, production possibility curves are homothetic. In Figure 2c, both sets of curves are homothetic and $L > P$ at prevailing rubles, $P > L$ at adjusted rubles.

are equally well off or that the American indifference curves are scaled up or down so that the American curve containing the point A coincides with the Russian curve containing the point R . The demand curve for grain in the bottom half of the figure is the locus of the relative quantity of grain and the relative price of grain as traced out along any indifference curve. Similarly, the height of each supply curve is the derivative of the corresponding production possibility curve. Between A and R the supply curve shifts, causing a movement along

a common demand curve; price and quantity are negatively correlated and

$$T_{PA} < P < T_{WR} = T_{WA} < L < T_{PR}$$

The true welfare indexes are equal and are bounded by P and L , but the indexes of production potential lie outside these limits.

In the technology case, the production possibility curves are homothetic, and the indifference curves are not. One of the production possibility curves is scaled up so that the two production possibility curves coincide. Indifference curves differ because tastes differ or as a consequence of income effects. Here the demand curves shift between A and R and the supply curve is constant; consequently,

$$T_{WA} < L < T_{PR} = T_{PA} < P < T_{WA}$$

In this case, the true productivity indexes are bracketed by P and L , but the welfare indexes lie outside these limits.

In the tax case, production possibility curves and indifference curves are both homothetic, and American and Russian relative prices differ because the countries have different systems of taxation. For convenience, suppose that the American tax structure is ideal and that the Russian tax structure is not. A Russian excise tax on grain creates a spread between the demand price of grain (the slope of the indifference curve at R) and the supply price of grain (the slope of the production possibility curve at R). The demand price is what Bergson calls price in prevailing rubles, and the supply price is what Bergson calls price in adjusted rubles. As there are two prices at R , a movement from A to R may be thought of as being along a demand curve when prices are in prevailing rubles or along a supply curve when prices are in adjusted rubles. Consequently, $P < T_{WR} = T_{WA} < L$ when prices are measured in prevailing rubles, and, $L < T_{PA} = T_{PR} < P_{(AR)}$ when prices are measured in adjusted rubles. This is a statistician's ideal, with two sets of Paasche and Laspeyres indexes, one set bounding true welfare indexes and the other set bounding true production indexes.

Bergson's data look more like the taste case than the technology case because the Laspeyres index is greater than the Paasche index even at adjusted rubles.² There is a tendency toward the tax case, for

² These results are consistent with a large body of evidence that the structure of taste is more stable than the structure of technology in international comparisons

the Paasche index, while always less than the Laspeyres index, is somewhat greater at adjusted rubles than at prevailing rubles—23.2 per cent as against 22.1 per cent in Bergson's Table 2.

The influence of taxes may be greater than these data suggest. First, it is almost impossible to account for all sources of divergence between demand prices and supply prices in both countries. Bergson's conversion of prevailing rubles into adjusted rubles accounts for some sources in Russia and none at all in the United States. A full and complete conversion of prices to adjusted rubles and adjusted dollars might substantially reduce the spread between the Laspeyres and Paasche indexes. Second, the spread between the two indexes might have been widened by the way services were evaluated. It is my impression that for some items such as education and defense, where direct measures of output are hard to come by, Bergson assumed that the marginal products of Russian and American workers were the same. I cannot very well criticize Bergson for doing so because I have made the same assumption in less justifiable circumstances, and because he frequently had no alternative. Nevertheless, this assumption may overstate Russian output. The Russians, who appear to be less efficient than the Americans in making goods, may also be less efficient in rendering services. If so, quantities are overstated and prices are understated accordingly because prices are imputed by dividing quantity into value. This may account for some of the very low Russian prices in Bergson's Table 13, especially wages in public administration and defense.

REPLY BY BERGSON

I can comment on only a few of the many interesting questions that the discussants of my paper raise. To refer first to Dan Usher: Hicks and Samuelson showed long ago how index numbers of real national

and in comparisons over time. In studies of economic growth, this is called the Gerschentron effect. See E. Ames and J. Carlson, "Production Index Bias as a Measure of Economic Development," *Oxford Economic Papers*, March 1968; P. Jonas and H. Sardy, "The Gerschentron Effect: A Re-examination," *Review of Economics and Statistics*, February 1970; and Y. Toda, "On International Comparison of Consumption: Studies in Index Number Theory and Measurement," Ph.D. dissertation, Harvard University, 1969.

income might serve as observations on changes in production capacity, as represented by the production possibility schedule. Essentially, if such schedules are, as usually assumed, concave from below, one may infer from $\Sigma p_1 x_2 \cong \Sigma p_1 x_1$ that the basket of goods produced in 2 is beyond the capacity of 1. Hence, production possibilities in 2 are greater than in 1 in the vicinity of the observed point in 2. Similarly, if $\Sigma p_2 x_1 \cong \Sigma p_2 x_2$ the basket of goods produced in 1 is beyond the capacity of 2, and production possibilities in 1 are greater than in 2 in the vicinity of the observed point in 1.

Note that, as so often in index number theory, inferences are only of an ordinal sort. Production capacity is said to be greater in one situation than in another, and that is all. Moreover, as Hicks and Samuelson made clear, even these inferences, strictly speaking, presuppose valuations of an ideal kind: Relative prices correspond to marginal rates of transformation. In the article that I cited, however, Moorsteen showed that with such valuations real national income data may also be construed as representing comparative magnitudes of production capacity. Thus, data in the prices of 2 measure the ratio of capacities to produce 1's composite, and data in the prices of 1 measure the ratio of capacities to produce 2's composite. The measures are precisely accurate if production possibility schedules are linear. Otherwise, they are more or less approximate, depending on the degree of concavity or convexity of the schedules.

In my essay, I refer also to a previous study of mine (*Real SNIP*), which may have contributed further to this analysis. Thus, data in prices of either 1 or 2 are observations on relative capacities to produce either mix. Under certain conditions, however, data in prices of 1 are, as Moorsteen assumed, more accurate than data in prices of 2 as observations on relative capacities to produce 2's composite. Similarly, data in prices of 2 are more accurate than data in prices of 1 as observations on relative capacities to produce 1. The conditions are: (i) Production possibility schedules are, as with Hicks and Samuelson, concave from below, or at least not very convex; and (ii) the Gerschenkron effect holds, that is, data in prices of 2 are more favorable to 1 than data in prices of 1, and conversely.

To all this, Professor Usher has now added a further proposition. To conform with his notation, let us designate by T_1 and T_2 the true

measures of changes in production capacity in respect of 1's composite, on the one hand, and 2's composite, on the other. Also, L is the index of real national income measured in 1's prices, and P is the index of real national income in 2's prices. Then, if $L > P$ and production possibility schedules are concave from below,

$$(1) \quad T_1 < P < L < T_2$$

In effect, the two true measures fall outside the two index numbers. If $P > L$, the two index numbers may bracket the two true measures, but, as I indicated, the case where $L > P$ is the one favorable to Moorsteen's argument. And, to come to my essay, with the United States as 1 and the USSR as 2, $L > P$ in my calculations. Usher therefore properly stresses that case. What, however, follows?

Usher apparently considers (1) as practically fatal to calculations such as I present, at least where the concern is to measure production capacity. Rather than bracketing the true measures, the usual index numbers leave them unrestricted. Differences in production capacity, therefore, remain quite indeterminate. That surely is too pessimistic a conclusion. After all, if $L > P$, we may still infer that $L < T_2$ and $T_1 < P$ whenever production possibility schedules are concave from below. Those would seem to be interesting implications.

More important, Usher apparently sees index numbers of real national income as serving only to delimit the true measure of production capacity. Moorsteen, to repeat, showed that such index numbers may also be viewed as approximations to true measures. That is not at all the same thing. At least, an index number may be an upper or lower bound for a true measure, and yet be considered a poor approximation to it. Alternatively, we may be uncertain whether a true measure lies above or below an index number, and still feel it to be closely approximated by that number. The degree of approximation of an index number to a true measure does indeed depend on the curvature of the production possibility schedules. That is not known with any certainty, but it is open to inquiry, and meantime it does seem illuminating to view index numbers, as Moorsteen does, as not only delimiting but approximating relative production capacity.

Indeed, should we view them, as Usher does, only in the former way, the situation would be if anything worse than what he portrays. Even

if $P > L$, as he is aware, the two index numbers may still not bracket the true measures. If production possibility schedules are concave from below, it may be inferred as before that $L < T_2$ and $T_1 < P$, but we may or may not have $T_2 < P$ and $T_1 > L$. And purely a priori, we cannot be sure that schedules are concave to begin with.

To repeat, however, $L > P$ in my essay. That is also a usual case, for the Gerschenkron effect has been encountered again and again in real national income calculations. Implications of the data for production capacity when $L > P$, therefore, are of particular interest.

While Usher refers to Moorsteen's article, he does not consider my elaboration of it in *Real SNIP*. It may be worth noting, therefore, that for the case where $L > P$ and production possibility schedules are concave, (1) is already more or less implied in my analysis there. Usher, however, has made the matter explicit. That is to the good, but the consequences do not seem nearly as serious as he supposes.

I have followed Usher thus far in assuming that, as with Hicks and Samuelson, prices are such as to yield ideal valuations. In the real world, that is hardly so, and the ruble prices of the USSR are no exception to that rule. In my essay, I try to deal with the resultant problem by translating into "adjusted rubles" index numbers compiled initially in terms of prevailing ruble prices. The adjusted ruble standard is an expedient whose rationale and limitations I have discussed at length in previous studies. I am no more able here than I was in my essay to explore that theme again.

It should be observed, though, that Moorsteen's interpretation of real national income may, if anything, gain in interest relative to Usher's because of the divergencies of ruble prices from scarcity value. By all accounts, these divergencies go hand in hand in the USSR with a marked shortfall from production possibilities. That is as might be expected, and one need not ponder long to be aware also that in such circumstances real national income data can serve at best as observations, not on production possibilities, but on some kind of "feasibility locus" reflecting the prevailing inefficiency. The nature of that locus and the manner in which it may be observed are among the matters that I have sought to explore elsewhere.¹ For fairly obvious reasons,

¹ See especially, Bergson, *Productivity*.

though, uncertainties about whether one or another true measure lies above or below one or another index number seem only to be compounded in this case. It is reassuring, therefore, that national income data even so may be at least broadly indicative of production capacity as represented by the feasibility locus.

Prevailing dollar prices also have their limitations. These did not seem serious enough to warrant the sort of revaluation made for data in prevailing ruble prices. There probably is the more reason at this point, however, to stress the Moorsteen interpretation of real national income data compared with Usher's.

If national income data are so difficult to construe theoretically, why trouble to apply the theoretic analysis at all? At the risk of underlining the obvious, perhaps I should explain that, esoteric as the theory is, it still seems to facilitate organization of the inquiry and interpretation of the results. Not to be underestimated either, I think is the value of the discipline imposed on practitioners in limiting subjective judgments in an area where opportunities for such judgments are proverbially large; and at the same time in helping assure a desirable uniformity in conventions in different investigations. All this presupposes, however, an understanding that production capacity is apt to be elusive empirically, and that what can be achieved at most is not a precise and definitive measurement, but a contribution to informed appraisal. Usher apparently would have us seek only the ideal. It would be a sad day for economics if such a counsel of perfection were ever widely heeded.

Usher explores theoretically the use of real national income data to measure not only production capacity but welfare. In my essay I focused exclusively on production capacity, and so will not try to react to Usher's discussion of welfare. Perhaps I should explain, however, that I stressed production capacity chiefly because difficulties in compiling appropriate data for that application only seem compounded where the concern is with welfare and where, accordingly, relative prices are supposed to correspond to marginal rates of substitution. Most importantly, such a desideratum is especially difficult to approach in the USSR in the comparative valuation of consumers' and capital goods. That is so whether welfare is envisaged (as it usually is) in terms

of consumers' preferences, or (as is often suggested it should be) in terms of planners' preferences. The reasons for the difficulty are of a familiar kind, and need not be labored.

In replying to the discussants of his own essay, Afriat too has inquired further into the pure theory of production capacity measurement. While the inquiry apparently was stimulated by the exchange between Usher and me, I must leave comment on it to another occasion. Afriat, however, ascribes to me an aversion to exact concepts. If he had troubled to acquaint himself with my previous efforts, in writings cited in my essay, to formulate an appropriate conceptual framework for production capacity measurements, I doubt that he could have labored under such a misapprehension. Perhaps my reply to Usher will also indicate how far Afriat is from the mark. In properly seeking theoretic rigor, however, we must be careful not to succumb to a stultifying empirical perfectionism. With all their limitations, national income data have something interesting to tell us about production capacity, if we will only listen.

There is little basis to try either to add to or subtract from Greenslade's interesting comments. He seems to assume, though, that in compiling price data for the USSR we are limited to quotations which the Soviet government sees fit to release. In fact, the sample of commodities for which comparative ruble and dollar price quotations can be assembled leaves much to be desired, but at least for consumers' goods it is compiled not only from Soviet official releases but to a considerable extent from foreign observers' reports.

Greenslade is certainly right that Soviet planning has tended to sacrifice variety for volume of output, and no doubt the sacrifice has often been inordinate. For many goods, even the reduced costs realized under the protracted serial production that the limitation on variety made possible must have exceeded their worth to users. That must have been so for producers' as well as consumers' goods. Since the goods in question are apt to be produced in relatively large quantities in the USSR, I agree that there may be further cause here of overstatement of Soviet output relative to the United States where the concern is to appraise welfare. Where the concern is to measure production capacity,

it is not easy to see why the inordinate stress on volume should cause bias one way or the other.²

Theoretic treatments of production capacity measurement usually abstract from international trade. As Greenslade points out, however, such trade affords the opportunity to any country to carry out commodity transformations that may be costly to realize through domestic resource transfers. Indeed, given trade, transformations are always possible along a linear schedule, at least if the country in question does not trade on so large a scale as to affect world prices. With transformations along a linear schedule, however, circumstances are ideally favorable for interpretation of national income data in the Moorsteen manner. One is tempted to see in trade, therefore, a way of circumventing difficulties of production capacity measurement such as have been discussed. What is then measured, though, is in effect "purchasing power" in world markets. That is of interest, but for clarity it should be considered that it is not the same thing as production capacity, as usually understood, and that too is of interest.³

Greenslade is troubled by the problem posed for the compilation and interpretation of comparative national income data for the USSR and the United States by the pervasive replacement in the former country of market processes by centralist planning and by the associated inefficiency. I am too; but, as indicated, I have tried to deal with these issues elsewhere and cannot reopen them in any serious way here.

On such a problematic question as the comparative national income of the USSR and the United States, I am naturally gratified to learn of the close agreement between my results and those of the ECE study

² Even for welfare appraisal, only the calculations in rubles should be affected, and, for obvious reasons, a bias there seems, if anything, more likely in the calculations in adjusted rubles, which correspond to Soviet factor cost, than in those in prevailing rubles, which often diverge from such costs in the direction of user values.

Note that so far as quantity has been stressed inordinately over quality in the case of producers' goods, Soviet output currently must be below the level that could have been achieved if previously the mix of producers' goods had been a more economical one. Greenslade rightly points out, though, that this does not bear at all on the question of whether current Soviet output, as calculated, is overstated or not.

³ Note also that the linear "purchasing power frontier" has a slope corresponding to world prices, and that among the vectors culminating on the frontier the one corresponding to actual output represents not total output, but the output of tradable goods alone.

to which Kenessey refers. In his thoughtful discussion, Kenessey also compares my results with data published by the Soviet Central Statistical Administration (TSU). The comparison is made difficult by the differences in methodology, especially the exclusion of diverse final services from the TSU data for "net material product," and their inclusion in my figures on the gross national product. Does not the use of the Soviet national income concept and the resultant exclusion of services tend to favor the USSR in a comparison with the United States?

That is certainly a plausible theory, and, while Kenessey himself expressly disavows it, I am grateful to him for referring to it, for there is thus an opportunity for me to underline an interesting aspect of my calculations: Paradoxically, the facts on the comparative volume of services in the USSR and the United States are otherwise than is suggested.

The final services omitted from net material product are broadly of the sort that I refer to in my essay as "selected final services." As appears from my Table 1, Soviet GNP suffers rather than benefits, relative to that of the United States, when such services are omitted. That is the result whether the valuation is in rubles or in dollars, but especially in the latter case. What is the explanation? Among the services in question are defense pay and subsistence. Perhaps chiefly on that account, the volume of services relative to goods in the USSR is larger than might be supposed in comparison with the corresponding relation in the United States (see my Table 3). Moreover, as indicated in my essay, the parities used to translate service outlays from rubles to dollars and from dollars to rubles are highly favorable to the ruble.

The comparison between my data and those of TSU must be read in that light. As Kenessey points out, my results are nominally close to those of TSU. On the indicated theory, therefore, one would have to conclude that, allowing for the difference in concepts, either I am somewhat overstating or the TSU is somewhat understating Soviet national income relative to that of the United States. In fact, so far as there is nominal agreement between TSU and me, the implication is, I think, the reverse: Allowing for the difference in concepts, either I am somewhat understating or TSU is somewhat overstating Soviet national income relative to that of the United States.

In comparing the two calculations, however, it should be considered that they differ in other respects besides the treatment of services. As implied, I refer to output gross and TSU to output net of depreciation. Very likely there are other methodological divergencies as well. Only meager information is available on the TSU calculation, but, if we may judge at all from the calculations of the Soviet economist A. I. Kats (see my Table 8 and related portions of my essay), my measures probably also differ from Soviet measures such as those of TSU in basic data and more specific procedures.

Kenessey urges the possible value of cooperation between Soviet and U.S. economists as a means of improving on calculations such as mine. Anyone seriously interested in the advance of real knowledge concerning the two economies can only endorse his suggestion. Let us hope that the time is not far off when it can be implemented.