CZECHOSLOVAK AGGREGATE PRODUCTION IN THE INTERWAR PERIOD*

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The purpose of this article is to present estimates of the Czechoslovak gross domestic product from 1913 through 1937 and to interpret these data in terms of certain crucial economic policy decisions. In the first part of the article, the major methods of estimation of the G.D.P. using a sector of origin approach are briefly discussed; a fuller description is presented in the appendix. The second part examines the major economic dilemmas facing the Czechoslovak government and the most important actual policy decisions. In order to provide quantitative perspective on the Czechoslovak successes and failures, national product and export series for all the Central European nations are also presented and briefly discussed.

I. INTRODUCTION

For many years the major quantitative aspects of aggregative economic activity in Central Europe in the interwar period remained practically unexplored. Within the past 15 years, however, useful national product or income estimates in constant prices for the entire period have been developed for all nations in the area except Czechoslovakia.

The purpose of this article is to present estimates of the gross domestic production by sectors of origin for Czechoslovakia for 1913 and for 1920 through 1937, and to interpret these results in terms of certain major policy decisions. In order to provide perspective we make comparisons with the experiences of other Central European nations as well. In the first part of this article we outline the methods used in calculating the Czechoslovak series, placing a detailed explanation of our estimation procedures in a statistical appendix. In the second part we interpret the major results.

II. ESTIMATES OF CZECHOSLOVAK GROSS DOMESTIC PRODUCTION

We calculated the Czechoslovak G.D.P. by combining constant price series

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TABLE 1

VOLUME INDICES OF THE CZECHOSLOVAK GROSS DOMESTIC PRODUCT AND ITS COMPONENTS: 1913, 1920 THROUGH 1937[a]
1929 = 100

Year	Total Gross Domestic Product	Agriculture, Forestry Fishing	Industry	Construction	Transportation and Communications	Trade	Housing	Finance, Services, Public Administration
1913	65.7	79.7	53.9	53.1	60.7	61.5	85.4	76.1
1920	59.4	63.9	47.0	47.1	62.6	50.3	85.4	81.3
1921	64.2	73.3	50.4	46.7	68.4	54.9	85.8	84.6
1922	62.5	73.3	47.7	48.0	65.0	52.7	86.2	82.8
1923	67.7	78.6	52.6	53.7	68.6	57.7	86.9	90.4
1924	74.7	76.1	66.8	62.9	78.8	68.6	88.2	91.8
1925	83.5	92.1	76.7	69.0	82.1	79.7	89.6	91.5
1926	83.2	89.2	75.9	73.0	85.9	78.5	91.0	92.6
1927	89.4	94.3	84.7	79.6	89.6	86.6	93.0	96.0
1928	97.3	103.0	93.9	102.8	95.7	95.7	96.4	97.6
1929	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1930	96.7	96.7	95.4	95.6	91.8	95.6	102.6	102.2
1931	93.4	97.2	88.7	97.3	83.6	90.4	105.3	102.6
1932	89.7	111.8	74.9	85.4	73.0	82.1	108.5	102.5
1933	85.9	109.5	70.9	63.7	66.8	78.4	110.7	101.5
1934	82.6	95.6	71.8	56.4	65.6	76.4	111.6	102.0
1935	81.8	87.9	74.1	53.9	68.1	76.8	112.0	101.8
1936	88.5	94.5	81.5	59.8	73.4	84.0	112.7	109.6
1937	98.4	105.2	93.3	65.7	91.3	95.6	113.9	110.7

[a]Notes on the individual series are presented in the text below and the Appendix. The 1913 results are for the interwar territory; their derivation is discussed only in Appendix I.

for seven sectors of origin with 1929 value-added weights. The results are presented in Table 1 above for the period from 1913 through 1937.

A. Available Data

The new Czechoslovak republic inherited a relatively well functioning statistical service which previously served the Austro–Hungarian empire. The quantity and quality of published statistics during the interwar period is relatively high, particularly in those sectors of the economy with state participation. There are, however, certain important lacunae, especially in regard to industrial output and labor force. Although we have based our estimates primarily on official published materials, we have been fortunate to obtain some unpublished statistics from official agencies and certain unpublished estimates by Czechoslovak statisticians.

For some of the estimates discussed below alternative series are also available. In explicating our estimates we also discuss briefly the most important of these alternative series and indicate in what ways our estimates represent an improvement.

B. The 1929 Cross-Section Weights

We have chosen the 1929 G.D.P. to calculate the value-added weights for the sector indices for two reasons: First, 1929 falls in the middle of the period under examination; and second, very good data for the G.D.P. calculations are available.

The most documented and thorough estimates of the Czechoslovak national product in current prices for the interwar period were made by one of the co-authors and cover the period 1921 and 1929 through 1944.[1] These estimates, improved and updated,[2] serve as the basis of our sectoral weights. The data are presented in Table 2 below.

An alternative estimate of the sectors of origin of the 1929 Czechoslovak G.D.P. has been made by Jaroslav Krejčí.[3] The major differences lie in his greater weight for industry and construction and his lower weights for trade and transportation and communications. Although his estimation procedures are described in only the most sketchy fashion, we believe his calculations to contain considerable double accounting and impermissible inclusions.[4]

[1]Miloš Stádník, *Narodní důchod a jeho rozdělení, se zvláštním zřetelem k Československu* (Prague: Nákladem knihovny sborníku věd právních a státních, 1946).

[2]Miloš Stádník, *Some Problems of Economic Growth in Czechoslovakia* (Prague: Ekonomický ústav Československé adademie věd, 1968).

[3]Jaroslav Krejčí's main results are presented in his article "Intertemporal Comparability of National Income in Czechoslovakia," *The Review of Income and Wealth*, Series XIV, 3/1968, pp. 247–267; additional notes on the estimates are given in his "Vývoj Československého hospodářství v globální analyze," *Politická ekonomie*, XVI, 6/1968, pp. 581–97.

[4]More specifically, social insurance contributions by employers and distributed profits appear to be counted twice and, furthermore, certain pensions are included in the wage estimates. These and a series of other shortcomings of the Krejčí estimates are outlined in considerable detail by Miloš Stádník in "Poznámky k práci Jaroslava Krejčího 'Intertemporal Comparability of National Income in Czechoslovakia'," forthcoming.

TABLE 2

SECTORS OF ORIGIN OF THE 1929 CZECHOSLOVAK DOMESTIC PRODUCT[a]

	Origin of G.D.P. at Market Prices, Million Crowns	Percentages
Agriculture, forestry, fishing	16,488	22.5
Industry: mining, manufacturing, utilities	25,143	34.2
Construction	3,003	4.1
Transportation and communications	7,050	9.6
Trade	7,567	10.3
Housing	2,670	3.6
Finance, services, public administration	11,436	15.6
Total	73,357	100.0

[a]These data come from Stádník, "Some Problems . . . .," *op. cit.*, p. 30 Because they are explained fully in the Stádník publications, we do not present a discussion on how they were derived.

C. The Time Series Estimates

1. Our series for agricultural output is composed of crop and animal production indices combined by value-added weights. These components are presented in Table 3 below. The crop production index is calculated from physical series for 33 major crops with adjustments made to net out seed and fodder crops. The animal production index is composed of 11 physical series with adjustments for changes in the stock of animals that are not reflected in the data on meat production.

TABLE 3

INDICES OF CROP AND ANIMAL PRODUCTION

Year	Crop Production	Animal Production	Total
1909–1913	85.3	75.0	79.7
1920	53.1	72.9	63.9
1921	71.5	74.8	73.3
1922	69.4	76.5	73.3
1923	84.2	73.9	78.6
1924	66.5	84.0	76.1
1925	88.1	95.4	92.1
1926	79.7	97.0	89.2
1927	91.0	97.0	94.3
1928	100.9	104.7	103.0
1929	100.0	100.0	100.0
1930	85.9	105.6	96.7
1931	74.5	116.0	97.2
1932	108.9	114.2	111.8
1933	97.4	119.5	109.5
1934	72.3	114.9	95.6
1935	74.5	99.0	87.9
1936	71.0	114.0	94.5
1937	78.1	127.6	105.2

An alternative series of the volume of agricultural production which was calculated in the late 1930's is available for the later years covered by our index. Unfortunately, we were unable to obtain sufficient details on the way in which it was constructed to be able to explain the considerable variation between this index and ours.[5]

2. In the manufacturing sector the growth of three industrial branches (electric power, mining, and metals) is fully covered by direct output data. The paucity of physical series in the other manufacturing branches led us to measure the output for four bench-mark years (1927, 1930, 1933, and 1936) by deflating current values by appropriate price indices. Production movements between the bench-mark years were interpolated with the aid of data on the total number of shifts worked in the individual branches. The period 1920 through 1927 is measured by a limited number of physical output series for the chemicals, paper and food processing branches. The output of the textiles branch is measured by inputs of basic materials. Finally, the output of the machinery, building materials, non-metallic mineral products, printing, leather and shoes, and wood-working branches is measured by the total of shifts worked, adjusted by labor productivity increases derived from the other manufacturing branches. Weights used for aggregation are detailed value-added figures derived from the 1935 industrial census.

Two alternative industrial production indices are available. Professor Karel Maiwald calculated the first pre-war measure and quite properly labelled the results a "provisional index."[6] He used the very few direct quantity data available and relied mostly on such substitute series as exports, imports of raw materials, consumption of fuels, or freight transportation. His weights are arithmetic averages of employment distribution among branches in 1921 and 1930, the distribution of horse-power in 1926, the estimates of sales in 1927 and 1930, and an approximation of the desired value-added magnitude derived by applying the U.S. ratios of value-added to sales to the Czechoslovak sales data. Professor Dobrý has recently attempted to develop a new measure, following essentially

[5]The current value series is presented by J. Bruthans, "Hodnota zemědělské výroby v Československu," *Obzor národohospodářský*, 1/1938, pp. 16–22. The volume index (using 1931/32 prices) is presented by J. Krejcí, "Intertemporal . . . ," *op. cit.*

Bruthans' series and ours differ in a number of respects. Apparently he deflated the current value series but we do not know the way in which he calculated his price series. He also handled crops consumed by animals in a manner different than we. A major difference in animal production between the Bruthans series and ours arises in his apparent exclusion of animals "on the hoof." One instance of the importance of such stocks in our series may be seen for the period 1934–1936 where slaughterings fell considerably in 1935 and dropped slightly below the 1935 level in the next year, while stocks fell slightly in 1935 but rose greatly in 1936, thus making the animal production index take a sharp dip in 1935 and a sharp rise in the following year.

[6]Karel Maiwald presented his procedures of estimation in "Pokus o provisorní sestavení indexu průmyslové výroby ČSR," *Statistický obzor*, XII, Nos. 9–10/1931, pp. 602–639, and updated these results periodically. The series is also reported by J. Krejčí, "Intertemporal . . . ," *op. cit.* In the text some comment is given about the very rough methods which Maiwald used in obtaining volume series for the various branches. The heterogeneous character of his weights, which contributed to the provisional character of his estimates was due to the fact that he did not have at his disposal a full census of manufacturing with which to derive proper value-added weights.

Maiwald's estimating procedures.[7] Unfortunately, his index contains many technical errors and is of little use.[8] While our own index leaves much to be desired, we believe it is superior to both Maiwald's and Dobrý's measures.

3. For transportation and communications separate volume indices were calculated and combined using value-added weights. The transportation index contains five different physical series covering all major passenger and freight services; the communications index contains 13 different series and also covers the entire field.

4. Calculating an adequate series for construction raised a great many problems and, after considerable experimentation, an approach similar to the industrial production index was adopted. The current value of construction for bench-mark years 1927, 1930, 1933, and 1936 were deflated by an index of construction costs in Prague. Other years between 1927 and 1936 were interpolated with the aid of data concerning the number of shifts worked. The series from 1920 to 1927 was estimated by an index of the number of shifts with the assumption of no change in labor productivity.

In order to gain some idea about the reliability of this construction index, we also calculated a construction input index which was a weighted average of two input series: workers in construction and domestic consumption of stone, glass, and clay products (which includes a number of building materials). In the years for which the comparison was made, the two series did not greatly differ and this, in turn, gives us greater confidence in the output calculations.

An alternative series based on the number of completed housing units is also available.[9] Even when this series is supplemented by information about construction of offices and other buildings, the results are of questionable reliability, since rural construction, road building, and repair work are not covered. Such an output series differs considerably from the deflated output index or the input index that we have calculated.

5. Several methods are open to calculate an output series for trade. Since trade primarily represents the transferral of agricultural and manufactured products from the producer to the consumer, we calculated the index of trade output from the volume of agricultural and manufactured goods that reached the market. (For agriculture, this meant removing home grown products consumed by the farmer.) Such a procedure is, we feel, far better than using an employment series or some deflated retail trade index.

6. The index of housing services was calculated from a physical series of the number of housing units plus data on the new units and the old units that were abandoned for each year. Such a series does not take into consideration changes in housing quality (e.g., deterioration) or changes in the age structure of houses, which, at least for the depression years, should give the index an upward bias.

[7]Anatol Dobrý, "Zákadní směry vývoje Československého průmyslu v létech 1913–1938 a některé otázky sociálně-politické," *Československý časopis historický*, XII, 5/1964, pp. 726–753.

[8]For a thorough criticism of Dobrý's work, see Václav Průcha, "Nezdařený pokus o konstrukci indexu Československé průmyslové výroby," *Statistika*, 8/1965, pp. 365–368.

[9]Such a series is presented and used by Krejčí, "Intertemporal . . . ," *op. cit.*, in his calculations of aggregate production.

7. Finally, we estimated production in finance, services, and public administration from an index of employment for these sectors. Use of such input data seems permissible since it is doubtful that labor productivity changed greatly in these sectors during the period under examination.

D. Evaluation and Comparisons

Several alternative series are available for part or all of the interwar period. The various series are presented in Table 4 below.

TABLE 4

ESTIMATES OF AGGREGATE CZECHOSLOVAK PRODUCTION[a]
1929 = 100

	Our estimates		Clark estimate	Krejčí estimates		Toms estimate
Year	G.D.P.	M.P.	G.D.P.	G.D.P.	G.N.P.	N.M.P.
1913	65.7	62.8	79.0	—	—	—
1914	—	—	—	—	—	100.4
1920	59.4	54.0	—	—	—	30.6
1921	64.2	59.3	—	—	—	52.3
1922	62.5	57.5	—	—	—	55.9
1923	67.7	62.4	—	—	—	59.4
1924	74.7	70.8	—	—	—	72.0
1925	83.5	81.6				81.2
1926	83.2	81.0	75.6	85.7	—	76.1
1927	89.4	87.9		90.7	—	84.8
1928	97.3	97.3	106.8	100.2	—	94.1
1929	100.0	100.0	100.0	100.0	100.0	100.0
1930	96.7	95.4	103.9	95.0	97.0	106.1
1931	93.4	91.1	101.8	93.4	97.3	105.0
1932	89.7	86.4	94.5	86.6	88.7	101.4
1933	85.9	81.7	90.4	82.7	87.5	97.1
1934	82.6	77.5	96.1	82.7	87.4	92.7
1935	81.8	76.5	87.4	80.5	83.8	88.4
1936	88.5	83.4	87.2	87.2	89.8	98.8
1937	98.4	95.3	94.1	99.1	96.5	102.9

[a]Our material product series is presented in order to compare our results with the calculations of Toms. We estimated material product from our G.D.P. calculations excluding the housing sector and the finance, services, and public administration sector.

Sources of the other series are: Colin Clark, *The Conditions of Economic Progress*, 3rd ed. (London: Macmillan, 1957), p. 116; Jaroslav Krejčí, *op. cit.*; and Miroslav Toms, *Nástin vývoje národního důchodu v Československu, 1937–1948* (Prague: Ekonomický ústav Československé akademie věd, 1966).

Colin Clark's estimate was a pioneering effort but since it was based on a limited number of readily available series, it must be considered only as a first approximation. Similarly Toms' estimates of the net material product are presented as an afterthought in a pamphlet that discusses national income during the Second World War. He did not present any explanation about his statistical methods, but we have reason to believe that he deflated a series for the net material

product in current prices by a wholesale price index. If true, his measure is no better than Colin Clark's.

The Krejčí estimates are the best alternative series. We have already expressed doubt about his sector weights and have certain criticisms of some of his sector growth series as well. For industry he used Maiwald's provisional index which, as we noted above, has serious deficiencies. For construction Krejčí used an output index based on the number of new housing units which, as we argued, is incomplete. For transportation and communications he used an index based only on six physical series. For banking and insurance, he used a series based on the G.D.P. minus government without giving any real justification for this procedure.

We are convinced that our industry, construction, transportation and communications, and banking and insurance series (which constitute roughly 50 percent of G.D.P.) are considerably better than Krejčí's and that the other series are equal or better. And for these reasons we argue that our index for G.D.P. is more reliable. Nevertheless, with all the differences in our respective approaches, it is surprising that his and our G.D.P. series are so similar for the years in which they overlap.

Krejčí also presented some estimates for the G.N.P. which were derived by deflating end-use sectors and it would be appropriate to analyze these as well. Unfortunately, he does not explain the derivations and we have been unable to ascertain his statistical procedures in order to evaluate the reliability of his findings. Nevertheless, it should be noted that from our calculations of the foreign sector, it appears that his G.D.P. and G.N.P. calculations are inconsistent.

We are aware that our methods of estimation leave much to be desired and that we are severely handicapped by lack of adequate data in certain sectors. The 1913 estimate is particularly rough and must be considered only indicative of the general order of magnitude. We feel confident, however, of the accuracy of our interwar estimates in agriculture; mining, utilities, and a large part of manufacturing; transportation and communications, trade, housing, and public administration. These sectors and branches cover roughly two-thirds of the G.D.P. For the remaining third of the G.D.P. our estimate can be justly criticized; however, because of the paucity of published data, it is doubtful that our estimates permit much improvement.

III. Interpretation of Results

A. Trend and Cycles

The Czechoslovak G.D.P. grew at an average annual rate of 2.2 percent for the period 1920 through 1937 and at an average annual rate of 6.2 percent for the period 1920 through 1929.[10] A portion of the growth in the early 1920's represented a return to prewar production levels. Nevertheless, it appears that the most important immediate source of growth during the 1920's was the creation of new productive capacity through investment. In 1929 gross fixed asset formation accounted for roughly 14 percent of the G.D.P.; and from 1920

[10]These growth rates were calculated by fitting an exponential curve to the data in Table 1.

through 1929 gross investments as a share of G.D.P. had risen. Relevant data are shown in Table 5 below.

In the first half of the interwar period the manufacturing and construction sectors provided the greatest impetus for growth, with the former showing an average annual growth rate of roughly 8 percent. In the latter half of the period the same sectors showed the greatest decline and recovered most slowly from the depression.

TABLE 5

VOLUME OF GROSS FIXED ASSET FORMATION, 1920–1937[a]
1929 = 100

Year	Gross Fixed Asset Formation	Gross Domestic Product	Ratio of Gross Fixed Asset Formation to G.D.P.
1920	42.4	59.4	71.3
1921	37.3	64.2	58.0
1922	41.3	62.5	66.0
1923	44.1	67.7	65.2
1924	53.1	74.7	71.1
1925	63.4	83.5	76.0
1926	69.2	83.2	83.3
1927	75.2	89.4	84.2
1928	93.7	97.3	96.3
1929	100.0	100.0	100.0
1930	96.5	96.7	99.8
1931	94.6	93.4	101.2
1932	82.0	89.7	91.5
1933	67.3	85.9	78.4
1934	66.4	82.6	80.5
1935	70.6	81.8	86.4
1936	79.8	88.5	90.1
1937	85.2	98.4	86.6

[a]We estimated gross fixed asset formation as the sum of the series for construction and domestic consumption of machinery (domestic production plus imports minus exports). Machinery consumption was estimated as two thirds of domestic consumption of metal products (machinery plus consumer durables). Although this method of estimation is rough, the margin of error should be relatively small.

A series for gross investment is provided by Krejčí, "Intertemporal . . . ," *op. cit.* And a series for net investment is estimated by Karel Novotný, "K metodice konstrukce dlouhodobých časových řad o vývoji základních fondů," *Statistika*, 3–4/1968, pp. 118–125. Neither of these two series covers the entire interwar period.

The interwar development path is characterized by a general upswing from 1920 through 1929, with only two years showing slight production declines. Between 1929 and 1935 production fell so as to reach a level roughly one-fifth below the 1929 level. After 1935 there was a recovery so that the 1929 level of production was almost reached by 1937, the year before dismemberment of the Republic through the Munich agreement. Although industrial production began to increase after 1933, the depression trough was extended for two more years because of declines in agricultural output and construction.

In the growth period of the G.D.P. in the 1920's, two cycles of three to four years duration can be identified. The trough of the first occurred in 1922 (the year of the revaluation) and of the second in 1926 (of which one contributing factor was the slowdown in the growth of exports caused by the German recession). If the pattern had repeated, the trough of the third was due to appear in 1929–30, but this coincided with the downturn of the economy and is, therefore, not distinct. The depression continued to deepen and the year of the greatest yearly decline occurred in 1933, the year in which the trough of the fourth cycle might be expected to appear. The fall and recovery of aggregate production in the 1930's mask any kind of shorter cyclical behavior. Analysis of cycles is further complicated because cyclical patterns within the different industrial sectors varied among each other. Any conjectures about "natural" tendencies of the economy to three to four year cycles must, in the light of these results, remain highly tentative.

The pattern of growth and cyclical activity in Czechoslovakia were in many respects unique and in order to explore these matters more thoroughly, it is necessary to turn to a more detailed examination of domestic policy and to a comparison with the experience of other Central European nations.

B. Major Policy Decisions and Their Impact

Three sets of economic problems faced the new Czechoslovak Republic in the immediate postwar years; disentangling itself from the overwhelming economic interdependence with the nations forming the old Austro–Hungarian Empire and readjusting its production and trade in order to overcome the legacies of the highly protectionist Empire; suppressing a rampant inflation caused by the rapid increase of money during the war years; and achieving a social stabilization by means of a redistribution of income that had turned sharply against wage earners as a result of the war.

In spite of these problems the Czechoslovak economy completely avoided the world crisis of 1920/21. Further, during the early twenties the prewar production levels were rapidly achieved, exports grew swiftly, unemployment remained at acceptable levels, and after 1921 wholesale and retail prices were stable or declining.

Two very basic policy decisions underlay these remarkable achievements: the currency reform and conservative monetary policies initiated by the first Minister of Finance, Alois Rašín; and the consistent following of a policy of an outward orientation of growth, rather than the more autarkical pattern pursued by other Central European nations or half-hearted measures which gave certain European nations the advantages of neither autarky nor extensive foreign trade.[11]

[11]Of the numerous arguments put forward in the various Central European nations for pursuing an autarky policy, the infant industry argument—coupled with governmental policies to encourage the placing of these new industries in the more underdeveloped regions—seems to us to have been the most cogent. Such a dual policy was not, however, apparently followed. A systematic comparative study of the development strategies of the Central European nations has yet to be made.

In the first months of 1919 the new Minister of Finance enacted a monetary reform that had three major aspects.[12] First, it separated the bank notes circulating on Czechoslovak territory from those in the other parts of the former Monarchy; this measure not only created a national currency but, in the process, also reduced currency in circulation by about 20 percent. Second, the reform set limitations to the creation of money and, furthermore, set up special taxes to remove further notes from circulation. These measures, in conjunction with the balanced budget policy, acted to stem the inflation. Finally, a floating exchange rate was adopted for the new Czechoslovak crown which eased certain balance of payments difficulties and, as it turned out, also acted to encourage foreign trade.

The economic stabilization was also accompanied by a certain social stabilization. During the first three years wages and salaries rose at a considerable pace so that the distribution of income was brought more into the prewar mold. Social unrest was quieted by a series of remarkable (for that time) measures including among others the eight-hour day, a land reform, unemployment benefits, aid to war widows and orphans, and education measures. The Socialist parties responsible for these laws acted in a much more cooperative spirit than in neighboring states where considerable social turbulence prevailed.

Toward the end of 1922 Rašín misread certain short-run events (including capital flights into Czechoslovakia) and revalued the currency. This provoked a deflationary crisis at home and resulted in certain bankruptcies, a short-run rise in unemployment, and a decline in growth. The effects of this unfortunate measure were mitigated by a fall in both wages and prices which slowly restored the purchasing parity of the domestic currency with key foreign currencies at the 1921 level (i.e., the index of wholesale prices, adjusted by the new exchange rate, reached the approximate level vis-a-vis the pound, dollar, and Swiss franc as before). Czechoslovakia was further aided by the occupation of the Ruhr which led to a considerable rise in German imports from Czechoslovakia at the expense of France and Belgium. After the German and Austrian currencies were stabilized in 1924 and German and Austrian funds began to leave Czechoslovakia, certain foreign exchange controls were imposed to ease the transition and were not lifted until 1928.

The initial monetary stabilization made Czechoslovak exports competitive and the relatively fast reaction of the economy to Rašín's blunder in 1922 maintained this competitiveness. As a result exports rose at a rapid rate throughout the entire period (see Table 8).

Comparing export and G.D.P. series it is clear that the growth rate of the former considerably exceeded the latter. Exports served during most of the period to maintain aggregate demand at high levels. Further, the buoyancy of exports, combined with relatively low rates of interest and an active capital market, served as important stimuli to investment and thus contributed in an important manner to the extraordinary growth of the G.D.P. during the 1920's.

[12]Alois Rašín's justification for his measures is given in his *Financial Policy of Czechoslovakia during the First Year of Its History* (Oxford: Clarenden Press, 1923). For a more thorough evaluation of his policies, see Zora Prochazka, *Czechoslovakia's Foreign Trade and Economic Development in the Interwar Years*, unpbl. Ph.D. dissertation, Harvard University, 1960.

The composition of trade and production is also important to consider. Czechoslovakia was the most highly industrialized part of the Austro–Hungarian Empire: 43 percent of the total manufacturing labor force of the Empire was employed in Czechoslovakia in a territory inhabited by only 27 percent of the total population. In particular branches the share of Czechoslovakia was even more disproportionate: e.g., in textiles Czechoslovakia employed almost three quarters of the labor force of the Empire; and in mining and primary metal industries, more than half.

After the war decision-makers in all of the successor states faced a critical strategic decision. On the one hand they could adopt an inward-looking economic policy which would result in the closing down of most of those industries in which there was relative overproduction (*vis-a-vis* domestic consumption) and in the building-up of those industries in which domestic production did not fulfill domestic consumption. Or they could adopt an outward-looking economic policy which would result in a growth of foreign trade and relatively little dislocation of domestic industry.

Although this decision provoked considerable controversy in some of the successor states of the Empire, in Czechoslovakia the decision toward an outward-looking policy was taken with relatively little discussion or dissension. Such a choice had, however, two adverse results which were not recognized at that time. First, orienting the nation toward heavy involvement in world trade meant that the previously most subsidized industries would gradually decline. Since most of Slovakia's nascent industry fell into this category, the Slovak lands did not participate fully in the nation's general economic prosperity. Second, Czechoslovakia's dependence on world trade increased so that by 1929 merchandise exports were about 28 percent of the G.D.P. (at factor prices). Since the volume of exports fell by almost 60 percent in the following four years, the effect on aggregate demand is evident.

One last aspect of trade policy deserves brief mention. Since the bulk of Czechoslovak trade in the prewar period was with Central and East Europe whose potentials as markets for exports greatly decreased after the war, two major steps had to be taken to increase Czechoslovak exports: the geographical distribution of trade had to be drastically changed and the structure of production had to be oriented toward those commodities in rising Western demand. The first step was, of course, more simple for the government since almost all of the work was carried out by the private sector. However, this meant a vigorous fight against the German export offensive that began after the stabilization of the mark in 1924. The second step was a more long-run business in which the government could play an important role, particularly in encouraging new productive facilities oriented toward goods in high world demand to be placed in particular regions of the nation, tied in with the construction of the requisite social overhead capital. The Czechoslovak government did not, however, seize this policy opportunity.

The final set of policy choices to be discussed here concern governmental policy reactions to the Great Depression. Classical economic policies served Czechoslovakia well during the immediate postwar years; but with the onset of the economic decline in the early 1930's, a great deal of policy ambivalence arose

that prolonged the decline. On the one hand fiscal policy appeared progressive: the government budget showed persistent deficits and a number of emergency

TABLE 6

GROWTH OF AGGREGATE PRODUCTION IN CENTRAL EUROPE[a]
1929 = 100

Country	Austria	Czechoslovakia	Germany	Hungary	Yugoslavia
Concept	G.N.P. 1937 Prices	G.D.P. 1929 Prices	National Income 1913 Prices	National Income 1938/39 Prices	G.D.P. 1953 Prices
1913	95.1	65.7	83.3	75.5	72.1
1920	63.2	59.4	—	63.9	67.5
21	69.9	64.2	—	—	69.2
22	76.2	62.5	—	—	71.2
23	75.4	67.7	—	—	74.7
24	84.2	74.7	—	74.1	79.7
1925	89.9	83.5	84.9	89.0	83.6
26	91.4	83.2	81.5	85.2	89.0
27	94.2	89.4	96.7	89.0	88.1
28	98.6	97.3	98.8	96.8	95.2
29	100.0	100.0	100.0	100.0	100.0
1930	97.2	96.7	93.9	97.8	98.4
31	89.4	93.4	84.4	93.1	95.9
32	80.2	89.7	76.5	90.6	88.1
33	77.5	85.9	84.1	98.8	90.5
34	78.1	82.6	92.2	99.5	93.5
1935	79.7	81.8	100.5	104.4	92.4
36	82.1	88.5	111.0	111.4	103.2
37	86.5	98.4	117.7	108.9	105.0

[a]The territories involved in these series remain the same for all years. The Austrian estimates come from Anton Kausel, "Oesterreichs Volkseinkommen, 1913 bis 1963," *Monatsbericht, des Oesterreichischen Institutes fuer Wirtschaftsforschung* (Vienna: 1965), XIV, Sonderheft.

The German estimates come from Walther G. Hoffman *et al.*, *Das Wachstum der Deutschen Wirtschaft seit der Mitte des 19. Jahrhunderts* (Berlin: Springer, 1965), p. 455. The prewar data are adjusted for territorial changes following the estimate of Suphan Andic and Jindřich Veverka, "The Growth of Government Expenditure in Germany," *Finanzarchiv*, N. F., Band XXIII, Jan./1964, p. 241. The national income data exclude income from abroad.

The Hungarian estimates are by Alexander Eckstein, "National Income and Capital Formation in Hungary, 1900–1950," in Simon Kuznets, ed., *Income and Wealth*, Series V, International Association for Research on Income and Wealth (London: Bowes and Bowes, 1955), pp. 152–223. The years are not calendar years but fiscal years beginning July 1. The prewar datum is an average for 1911–1913.

The Yugoslav data are for the post World War II territories and were calculated by Ivo Vinski, "National Product and Fixed Assets in the Territory of Yugoslavia, 1907–1959," in Phyllis Deane, ed., *Studies in Social and Financial Accounting, Income and Wealth*, Series IX International Association for Research in Income and Wealth (London: Bowes and Bowes, 1961), pp. 206–233. The prewar datum is an average for 1909–1912. Many of the subindices comprising the G.D.P. are computed primarily in constant interwar prices. From 1926 through 1932, the Vinski results are very similar to those of Steven Stajic, "Realni nacionalni dohodak Jugoslavije u periodima 1926–1938 i 1947–1956," *Ekonomski problemi* (Beograd: Ekonomski institut FNRJ, 1957), pp. 2–58, who used 1938 weights. From 1934 through 1937, however, the Vinski and Stajic estimates diverge considerably, with the latter showing a much greater rise.

relief measures and income transfer programs were initiated. In addition, the government encouraged an import substitution policy by raising tariffs which, in the case of agriculture, considerably aided one particular sector of the economy. On the other hand the policy-makers followed a conservative monetary policy which aggravated the crisis and maintained the gold parity of the crown long after most other major trading nations had devalued. The major results of such a contradictory monetary and fiscal policy in the face of the depression can be quickly summarized: by 1937 aggregate production had not fully recovered the 1929 level and exports had stagnated. In addition, the economic events and the prolonged depression during the early 1930's had a considerable impact on political and social life which, in turn, had some disastrous consequences for the Czechoslovak people in the subsequent decade.

C. Economic Growth in Other Central European Nations

Comparison of the Czechoslovak experience with other Central European nations gives additional perspective. Relevant data for such comparisons are

TABLE 7

GROWTH OF PER CAPITA AGGREGATE PRODUCTION IN CENTRAL EUROPE[a]
1929 = 100

Country	Austria	Czechoslovakia	Germany	Hungary	Yugoslavia
Concept	G.N.P. 1937 Prices	G.D.P. 1929 Prices	National Income 1913 Prices	National Income 1938/39 Prices	G.D.P. 1953 Prices
1913	93.7	69.1	90.4	83.8	79.4
1920	65.2	63.7	—	68.8	77.8
21	71.6	68.6	—	—	77.9
22	77.8	66.1	—	—	79.0
23	76.8	70.9	—	—	81.7
24	85.5	77.5	—	77.5	85.8
1925	91.0	85.8	87.0	91.8	88.7
26	92.2	84.8	82.9	87.2	93.0
27	94.8	90.6	97.7	90.3	90.7
28	98.9	98.3	99.4	97.5	96.7
29	100.0	100.0	100.0	100.0	100.0
1930	96.9	96.1	93.4	97.0	97.0
31	88.9	92.2	83.5	91.9	93.1
32	79.5	87.9	75.4	88.9	84.4
33	76.6	83.7	82.4	96.3	85.5
34	77.1	80.0	89.8	96.3	87.2
1935	78.6	78.9	97.3	100.7	85.0
36	80.9	85.0	106.7	106.9	93.6
37	85.3	94.1	112.4	104.0	94.0

[a]For most countries the population data came from the same sources as the production data. These sources were supplemented by data from the U.N. *Demographic Yearbook 1960* (New York: 1960) and, for Czechoslovakia, Ingvar Svennilson, *Growth and Stagnation in the European Economy* (Geneva: E.C.E., 1954), p. 237. For Yugoslavia an estimate had to be made for the prewar years and 1920 and were estimated on the basis of data in Vinski, *op. cit.*, and the above-cited U.N. source.

presented in Tables 6, 7 and 8. The data show that Czechoslovakia, which was one of the economically most developed nations in Central Europe, was one of the two nations that most rapidly achieved prewar production levels. Furthermore, all sectors participated in this recovery. The other nation that quickly achieved prewar production levels was Yugoslavia, a highly underdeveloped nation where the major problems of recovery revolved primarily

TABLE 8

GROWTH OF THE VOLUME OF MERCHANDISE EXPORTS[a]
1929 = 100

	Austria	Czechoslovakia	Germany	Hungary	Yugoslavia
1913	115.8	—	85.2	143.8	—
1920	—	39.2	—	—	—
21	—	55.7	—	53.2	—
22	82.7	55.9	—	72.8	—
23	77.3	61.9	—	46.9	—
24	87.5	71.0	49.7	63.0	—
1925	95.1	80.4	67.8	82.8	—
26	88.8	81.0	78.3	84.9	—
27	100.9	95.4	79.0	69.7	85.8
28	106.2	99.4	89.2	67.5	79.8
29	100.0	100.0	100.0	100.0	100.0
1930	89.6	91.6	94.1	97.4	97.0
31	75.6	79.3	84.4	72.6	78.4
32	56.1	47.9	56.7	50.6	65.9
33	54.5	41.2	51.7	74.2	76.2
34	55.8	47.8	48.1	72.3	79.4
1935	58.5	49.8	52.6	73.5	83.9
36	60.4	55.1	58.1	90.6	84.6
37	75.9	70.3	65.5	97.3	110.1

[a]The Austrian data came from Kausel, *op. cit.*, p. 42, and include not only merchandise but services as well. For 1922–1923 we chained a volume index of exports presented by the League of Nations, Economic, Financial and Transit Department, *Memorandum on Balances of Payments and Foreign Trade Balances*: Vol. II, *Trade Statistics of Sixty-Three Countries* (Geneva: 1925) and other volumes in this series. The 1913 datum is for the interwar Austrian territory but excludes trade with the Czech lands.

The series for Czechoslovakia was calculated by Zora Pryor in the following manner. Merchandise exports were divided into 54 classes roughly corresponding to the tariff classes. Each of these was deflated by a price index calculated from goods composing in almost all cases over 50 percent of the volume of exports in that class, and the constant price series were then combined. All-in-all, prices for 227 goods were used in the calculations. The base volume weights for the price indices were 1929 quantities. All data came from various issues of Statní úřad statistický, *Československá statistika* (Prague: irregular, entire period). An import index was calculated in a similar manner and these were used in conjunction with the production indices to derive the domestic consumption indices used in Table 5.

The German data come from Hoffman, *op. cit.*, p. 531. The prewar data are for the entire prewar German territory. Exports include both merchandise and services.

The Hungarian data came from League of Nations, *Review of World Trade, 1938* (Geneva: 1938). The prewar datum and the data for 1921–1923 come from a volume index presented by League of Nations, *Memorandum . . . , op. cit.* Although the prewar datum is claimed to represent trade of the postwar Hungarian territory, its meaning and method of computation are not known.

The Yugoslav data come from League of Nations, *Review . . . , op. cit.* Data for other years are not available.

around agriculture. All of the nations in Central Europe faced similar problems of economic dislocation but instituted quite different policies; such comparisons reveal more clearly the correctness of Rašín's early financial measures.

In the 1920's aggregate production in Czechoslovakia grew somewhat faster than in any of the other nations of the former Austro–Hungarian Empire. Moreover, because Czechoslovakia recovered so quickly from the war, a higher portion of Czechoslovak growth can be attributed to the creation of new productive capacity through investment.

In the 'thirties Austria and Germany showed greater declines and Hungary and Yugoslavia showed smaller declines in aggregate production than Czechoslovakia. Nevertheless, the upturn in Czechoslovakia came several years later than in any of the other nations and with the exception of Austria, Czechoslovakia showed the least recovery from the depression by 1937.

At the end of the period aggregate production in Czechoslovakia was somewhat higher *vis-a-vis* 1913 than in any of the other Central European nations. On a per capita level the difference between Czechoslovakia and the other nations was even more pronounced. The primary reason was due to a rapid recovery to prewar levels and a relatively fast growth rate in the 'twenties. If we measure growth from 1920 to 1937, the Czechoslovak performance does not appear so spectacular (see Table 9) and several of the Central European nations matched or surpassed the Czechoslovak growth rate.

As we have emphasized throughout this section, the role of foreign trade was crucial for Czechoslovakia. In 1929, as noted above, Czechoslovakia had the greatest dependence of any of these nations on trade[13] and, therefore, the behavior of exports is more critical in explaining Czechoslovakia's high growth in the 'twenties and low growth in the 'thirties than for the other Central European nations.

Unfortunately, comparative statistics are more difficult to obtain. Czechoslovak exports appeared to grow faster than those in Austria and at roughly the same rate as Hungarian exports during the 1920's. During the 1930's exports in Czechoslovakia fell more than in any of the other nations and, with Germany (its largest trade partner), recovered most slowly. From trade-propelled growth in the 'twenties Czechoslovakia seemed to experience the most trade-propelled decline. In this regard it is worth noting that Yugoslavia, which had the least decline in exports during the Great Depression, also had the fastest growth of aggregative production in that period.

The benefits of the early monetary stabilization in Czechoslovakia are quite apparent; and the advantages and disadvantages of the outer directed trade policy should be quite easily seen as well. Several additional facets of this experience can also be seen through comparison with post World War II economic experiences.

[13]The ratio of merchandise exports to the G.N.P. or G.D.P. at factor prices in 1929 was 28 percent in Czechoslovakia; 20 percent in Austria (26 percent including services); and about 15 percent in Germany and Hungary. Data are not available for Yugoslavia but we believe the ratio to be low. These percentages are based on estimates of the G.D.P. which are based on the aggregate production data cited in Table 6. The merchandise exports come from the League of Nations sources cited above.

TABLE 9

POSTWAR RECOVERIES AND GROWTH IN CENTRAL EUROPE[a]

Country	Total Aggregate Production		Per Capita Aggregate Production	
	Years to Recover Prewar Levels	Average Exponential Growth Rates in Interwar Period	Years to Recover Prewar Levels	Average Exponential Growth Rates in Interwar Period
Post World War I (1920 through 1937)				
Austria	9	0.7	8	0.5
Czechoslovakia	4	2.3	4	1.5
Germany	8	1.6	7	1.0
Hungary	6	2.7	6	2.0
Yugoslavia	4	2.2	4	0.8

[a]The comparisons for the post World War I period may be misleading since the German series begins only in the mid 'twenties. From 1925 through 1937 the exponential growth rates of the national products for the five nations were respectively: −1.6, 0.0; +1.6, +1.7; and +1.1 percent. (Since these were calculated with a least-squares regression, they do not correspond to the growth rates calculated from the end-points of the series.)

In the 19 years following the end of World War II, the Czechoslovak G.D.P. grew considerably faster than the same period following World War I. The major difference in these two growth rates can be traced to the impact of the Great Depression, an economic catastrophy that did not occur in the second postwar period. The aggregate economic performance of the Czechoslovak economy from 1920 through 1929 matched growth in a period of similar length following World War II.

One other point of similarity also requires brief attention. We noted above the possible existence of cycles of three to four years duration, at least during the first half of the interwar period. Recently a number of Czechoslovak economists have pointed out the existence of cycles in the period following World War II.[14] Measured from the troughs in a manner similar to that for the interwar period we also find small cycles lasting from 2 to 4 years.[15] Although we can find an interaction between policy decisions and cyclical activity in the post World War II period in a similar manner as we did for the interwar period, the similarity in length of these cycles in the two periods suggests that structural similarities in the Czechoslovak economy during these two periods may be greater than previously suspected.

IV. SUMMARY AND CONCLUSIONS

In the first part of this essay we present constant price estimates of the Czechoslovak gross domestic product for 1913 and from 1920 through 1937.

[14]E.g., Josef Goldmann, "Fluctuations and Trends in the Rate of Growth in Some Socialist Countries," *Economics of Planning*, IV, 2/1964, pp. 88–98.

[15]The troughs of cycles appeared in the G.D.P. in 1951, 1953, 1957, 1960, and 1964.

We calculated these from production series for the various sectors of origin and combined the sectoral indices with 1929 value-added weights. We feel certain of the accuracy of our estimates for about two-thirds of the G.D.P. and believe that our estimates for the remaining third are the best that can be made with the available published data.

The data reveal that the G.D.P. of Czechoslovakia grew at a rapid pace up to 1929, then declined sharply, and failed to recover fully before 1937. Exports appeared to be the most crucial component of aggregate demand and by 1929 the nation was heavily dependent on foreign trade. The drop in exports of roughly 60 percent after 1929 was probably the most important economic factor underlying the decline in gross domestic production and the slow recovery.

A number of crucial policy decisions lay behind this behavior of aggregate production and included: the early Rašín monetary reform that stabilized the currency and prices and allowed the new nation to compete successfully on world markets; the choice of an outward looking development strategy, rather than a strategy of import substitution and autarky followed by other Central European nations; and conflicting anti-recession policies that prolonged the fall in output in the 'thirties.

In comparison to the aggregate economic performance following World War II, growth of G.D.P. was quite respectable in the period from 1920 to 1929; however, the depression in the 1930's had no parallel in the second postwar period. Some similarities in cyclical behavior of the economy in the two postwar periods can, however, be observed.

Statistical Appendix

A. Sources

Official statistics were published in three major sources. First, there were the national statistical yearbooks: Státní úřad statistický, *Statistická příručka republiky Československé* (Prague: 1920, 1925, 1928, 1932); Statistická ročenka republiky Československé (Prague: 1934, 1935, 1936, 1937, 1938); and Ústřední statistický úřad, *Statistická ročenka protektorátu Čechy a Morava* (Prague: 1941, 1942). Some of these also appeared in French and German editions. Second, there was the official gazette of the Statistical Office: Státní úřad statistický, *Zprávy* (Prague: irregular but covering the entire period). Some of these also appeared in French and German editions. Finally, there were the publications of the statistical office presenting particular statistical studies: Státní úřad statistický, *Československá statistika* (Prague: irregular, entire period). Included in this series is a volume covering wholesale prices (which we used in our agricultural and industrial calculations: "Velkoobchodní ceny a velkoobchodní indexy," *Československá statistika*, svazek 140 (Prague: 1937). Again, there are French and German editions for some of these volumes.

Supplementing these official sources were two extremely useful periodicals: *Obzor národohospodářský* and *Statistický obzor*. For particular sectors other sources are given in the discussion below.

B. Agriculture

The crop production index was calculated in two steps. First a production index was calculated from physical production series for 33 major crops, using as weights the average wholesale prices in the period from 1928 through 1930. Seed crops and fodder crops were excluded so as to avoid double accounting and thus the index represents a "semi-net" production index.

The commodities included are: wheat (winter, spring, spelt), rye (winter, summer), barley (winter, spring), oats, maslin, millet and buckwheat, edible beans, edible peas, rape, poppies, flax, lentils, hemp, mustard, hops, tobacco, potatoes (early, fall), chicory, sugar beets, cabbages, cucumbers, onions, apples, pears, cherries, sour cherries, prunes, plums, apricots, peaches, walnuts, gooseberries, and red currants. The data came from various issues of the yearbook, supplemented in several cases by various issues of the *Zprávy*. The wholesale prices came from the Státní úřad statistický, *Československá statistika*, Volume 140, cited above.

In the second step seed inputs were calculated from data on acreage and on seed norms and were removed. The acreage data came from the yearbooks; the seed norms, from Stádník, *Narodní důchod . . . , op. cit.* These were, unfortunately, the only inputs that could be calculated for the entire period and removed from the crop series, although current price data for the 1930's indicate that the other inputs probably remained a relatively constant proportion of our semi-net index. (Such current price data are given in *Ibid.*)

Insofar as the unaccounted inputs varied as a percentage of outputs, our results are biased. Nevertheless, the extent of any such bias should not be very significant.

The animal production index was calculated in two steps. First, an index of production of eleven animal products was calculated, using as weights the average wholesale prices in the 1928 through 1930 period.

These physical series included weight of slaughtered pigs, cattle, calves, sheep, goats, horses, and mules as well as production of honey, wax, raw cocoons, and wool. Unfortunately, we could not obtain time series for two other important animal outputs, milk and eggs. The data came from the yearbooks, various issues of *Zprávy*, and the League of Nations, *Statistical Yearbook* (Geneva: yearly). From 1922 through 1932 the data included only domestic slaughtering; from 1933 to 1936, foreign slaughtered animals imported were also included although the amounts involved were very small and the index could not have been appreciably affected. Estimates for 1937 had to be made on the basis of commercially slaughtered animals in 1937 and previous years because data on the farm-slaughtered animals were not collected. The price data came from *Československá statistika*, Volume 140.

In the second step, data on animal stocks were used to calculate annual changes so that animal production included both animals killed in the slaughterhouse and changes in animals on the hoof. Stock data are available in the yearbooks for 1920, 1925, 1930 and then each succeeding year. Between 1920 and 1925, and between 1925 and 1930, an arithmetic average yearly change in stock had to be calculated. For 1920 and 1921, data on slaughtered animals are not available and, therefore, estimates of production had to be made from the

estimated stock and an assumption that the ratio of production to stock remained about the same between 1920 and 1925. Although this is not a very satisfactory method, no better procedure is available.

The animal and crop indices were combined using value-added weights of 45.3 and 54.7, respectively. These were derived from data underlying the calculations of Stádník, *Národní důchod . . . , op. cit.*

The aggregate index excludes production of fishing, hunting, and forestry. However, production in these branches was relatively small and their omission should not substantially affect the results.

C. Industry: Mining, Manufacturing, and Utilities

This sector was divided into 12 branches and production indices for each were calculated. The branches are: electric power; mining; metals; machinery and metalworking; stone, glass, and clay products; chemicals; woodworking; paper and paper products; printing; textiles; leather and shoes; clothing; and food, beverages, and tobacco.

Direct quantity indices covering practically the entire output are available for electric power, mining, and metals. For the remaining branches of manufacturing we used the following estimation procedure.

First, for the years 1927, 1930, 1933, and 1936 we constructed an index for each branch by deflating current values of production by appropriate price indices. Current production values for domestic sales were obtained from the "taxable base" of the general turnover which, however, excluded exports and government purchases since they were not subject to the turnover tax. However, after the domestic sales in constant prices were calculated, exports in constant prices could easily be added; because of lack of data, however, no estimates for government purchases were attempted. The tax data came from various issues of *Zprávy*. The deflators were either wholesale price indices, weighted by the 1935 gross values (for stone, glass, and clay products; paper and paper products; textiles; leather and shoes; and food, beverages, and tobacco) or by an index of costs (for machinery; chemicals; woodworking; printing; and clothing). The cost indices were weighted by the 1935 value of purchases and included labor costs, fuels, and basic raw materials; it is assumed that the cost index approximates the desired price index.

Second, the growth within the three year periods (1927–1930; 1930–1933; and 1933–1936) was obtained by interpolating by the number of shifts worked in each branch. The year 1937 was estimated by growth of employment, adjusting for productivity changes whenever possible. The data on shifts came from various issues of *Zprávy*.

Third, we estimated manufacturing production in the period 1920 through 1927 in two ways. For certain branches we were able to construct production series, with the particular commodities weighted by 1935 wholesale prices. These branches included chemicals (output series for fertilizers, artificial sweeteners, artificial silk, raw tar, and output of refineries); paper (output series for paper and cardboard); textiles (input series of raw cotton, jute, raw rubber and gutta percha, fuel, and labor); food, beverage and tobacco (output series for sugar, dressed meat, wine, salt, alcohol, beer, liquors, mineral waters, soft drinks,

starch, cigars, cigarettes, and tobacco). For the remaining branches (machinery and metal working; stone, glass, and clay products; woodworking; printing; shoes and leather; and clothing) we estimate production by the number of shifts worked, adjusted by productivity gains registered in the metal, chemicals, paper, textile, and food, beverage and tobacco branches. Labor data came from various issues of *Zprávy* and the output data from various yearbooks.

We combined the 12 branch series with value-added weights derived from the 1935 Industrial Census. Value-added was defined as sales less purchases from other firms that covered practically all industry. Within the 12 branches weights were either more detailed value-added statistics (for chemicals; stone, glass and clay products branches) or wholesale prices (for mining and metals branches) or in one case physical weight (paper branch). The 1935 Census was used to derive the basic weights because it was the only complete industrial census in the period. Experiments with estimates of 1929 value-added weights from Stádník, *Some Problems of Economic Growth in Czechoslovakia, op. cit.*, yielded very similar results. The 1935 data are from *Statistická ročenka protektorátu Čechy a Morava, 1941, op. cit.*, pp. 176–179.

D. Construction

A procedure similar to industry was followed for the construction estimates. From data on the "taxable base" current value of production was estimated for 1927, 1930, 1933, and 1936. These were deflated by the index of construction costs in Prague. All years between 1927 and 1936 were interpolated by the number of shifts worked. The estimates for 1920 through 1927 were measured by the number of shifts worked, assuming no changes in productivity. All data came from various issues of *Zprávy*.

The input index or construction is composed of two series, one for the number of shifts worked in construction and the other from domestic consumption of stone, glass, and clay products. Although construction materials could not be isolated from other stone, glass, and clay products, they constitute the bulk of this branch and an index of construction materials alone should not greatly deviate from an index for the entire branch. The labor and materials indices were combined using 1929 values of these components in total construction that are presented by Stádník, *Some Problems . . . , op. cit.*

E. Transportation and Communications

For transportation we constructed an index from physical series representing the services of railroads, airplanes, buses, streetcars, and boats on the inland waterways.

For railroad and for bus transportation, composite indices of passenger services (passenger/kilometer) and freight services (ton/kilometers) were made, the weights being determined by the 1929 receipts for the respective units. For air and streetcar transportation, we used only passenger series. For inland waterway transportation we constructed a series for the period 1924 through 1937 using freight carried on the two major rivers (Danube and the Vltava); we estimated the 1920 to 1924 index by volume series from scattered data on

freight loadings and from extrapolations. The data for all five types of transportation came from various issues of the statistical yearbook and the *Zprávy*.

The five different indices of transportation were combined with weights derived from the labor force engaged in each mode of transportation in 1930. Although this method does not include a measure for the varying capital intensities of each mode, no adequate estimation procedure for such value-added weights could be derived. The labor force data came from the 1934 yearbook.

We constructed the communications index from physical series for postal, telephone, and telegraph services. The postal index had eight different components (total surface letters and postcards; insured letters; airmail letters; regular packages; airmail packages; newspapers and magazines; money orders and other documents; and C.O.D. mail). The telephone index covered local calls, domestic long distance calls, foreign long distance calls, and telegraphs sent by telephone. The telegraph index covers regular telegrams and pneumatic tube messages. The various physical series were weighted according to the receipts per message unit in 1929; the three modes of communication were combined according to total recipts for each mode. The data for all these series came primarily from the *Zprávy*, supplemented in a few cases by data from the yearbook.

We combined the transportation and communications indices using value-added weights. These weights came from materials underlying the data used in calculating Table 2 in the text.

F. Trade

As we indicated in the text the "production" of trade is the transferral of manufactured and agricultural goods from the producer to the consumer. We therefore constructed an index based on the volume of these goods reaching the market.

For agriculture current price data are available for the 1930's showing that on the average 63 percent of agricultural value added remains on the farm in the form of consumption of farm families, wages in kind paid to farm workers, and pensions in kind paid to retired farmers by their sons. (These data come from Stádník, *Národní důchod . . . , op. cit.*) We therefore assumed that for the entire period, 37 percent of agricultural production reached the market. In manufacturing, we assumed the 100 percent of total production reached the market. The amounts of these two sectors reaching the market were calculated in 1929 crowns according to the value-added weights of Table 2 and were combined to derive the overall trade index.

G. Housing

Census data on the entire housing stock are available for 1921 and 1930 in the statistical yearbooks. We made interpolations between these two years using data on the net annual number of housing units constructed (data taken from the yearbooks) as a guideline. Extrapolations of the housing stock for 1920 and for 1931 through 1937 were made on the basis of these data on net housing

unit construction. We then assumed that housing services were proportional to the housing stock.

H. Finance, Services, and Public Administration

We constructed series for these sectors from labor force data. The available benchmarks are the census data on the labor force in 1921 and 1930 and the Stádník data (derived from social insurance information) for 1935 and 1937 that are available in his *Some Problems . . . , op. cit.* The estimation problem involved considerable interpolations and for this purpose a somewhat different procedure was employed for the different branches.

We divided public administration into four sectors: civil servants, excluding teachers; teachers; military; and priests (who were supported by the state). For civil servants a number of special surveys were made during the 1920's and 1930's (published in the *Zprávy* and the yearbooks) and, in addition, social security information is publicly available from 1930 on in a book by Ludmila Jeřábková and Miluše Salzmanová, *Vývoj důchodového zabezpečení v ČSSR (1930–1956)*, (Prague: Výzkumný ústav socialního zabezpečení, 1965). (The data in this source conflict somewhat with the survey data on civil servants and because the social insurance data seem more reliable, they were used whenever possible). For the 1920's, therefore, we made interpolations of civil servants using as a guideline the survey data, and for the 1930's we used the social insurance data as guidelines. For teachers, data on almost all branches of teaching are available for almost the entire period in the same two sources and these were used as guidelines for the interpolations. For the military, certain data are easily available in various League of Nations publications on national armed forces and these could be employed. And for priests an exponential interpolation was used for the 1920's period and was supplemented by certain social insurance data for the 1930's.

Services and finance presented a greater problem. For medical personnel sufficient data are available in the yearbooks and the *Zprávy* for a series to be constructed for the entire period; and for the liberal professions, certain unpublished social security data for the 1930's were obtained to make the estimates for this period. For the other services and finance, we have only the benchmark years and, therefore, for the remaining years interpolations were made on the assumption of a constant growth rate between the benchmark years (by exponential interpolation). Of all of the estimates in this essay, these service calculations are the only ones in which known unpublished social insurance data would substantially improve them. Unfortunately, attempts to obtain such unpublished data proved unsuccessful.

I. A Link with the Prewar Period

In agriculture a crop production index was computed for the Czech lands (Bohemia, Moravia, and Silesia) and for the Slovak lands (Slovakia and Ruthenia) separately for an average of the period between 1909 through 1913 and 1920.

For the Czech lands we calculated an index of 16 crops. Prewar data for

the Czech lands came from the K. K. Statistische Zentralkommission, *Oesterreichisches statistisches Handbuch 1909* (Vienna: 1910) and subsequent annual issues for 1910, 1911, 1912, and 1913. For certain crops only 1913 data were available. Crop data for each province were adjusted according to the changes in land area between 1913 and 1920 by assuming that acreage productivity was the same throughout the province.

For the Slovak lands we were able to calculate an index only for 6 major crops. Prewar data came from L'office central de statistique du Royaume de Hongrie, *Annuaire statistique hongrois*, Nouveau cours, 1909 (Budapest: 1910) and subsequent annual volume 1910, 1911, 1912, and 1913. The Slovak and Ruthene counties were adjusted in those cases where the new frontier line divided the county, according to the land area changes and the same assumption as above. The land area data are given in Központi statisztikai hiavatal, *Magyar statisztikai evkönyv* (Budapest: 1930).

These Czech and Slovak indices were then chained to the production of the respective areas in the post World War area to compute the total crop index.

For animal production we had to make an estimate from stock data and the assumption that the relationship between the stock of animals and the current production of animal products was the same as in the early 1920's. Stock data for 1910 in the post World War I area are available in the early statistical yearbooks.

In the industrial sector physical series are available in the electricity and mining branches to link 1913 to the interwar period. For the other sectors we used series for shifts worked and assumed no change in productivity between 1913 and 1920.

Physical series linking the two periods are also available for metals but these data are open to some question. They show a production in 1913 of 98 percent of the 1929 level and indicate an unbelievably large decline in labor productivity in metal production between the prewar and interwar period. Therefore, we used a labor series instead to estimate 1913 metals production. If the physical series are used for metal, 1913 production of industry stands at 59.0 percent of the 1929 level.

For communications, data are available for a number of physical series for the Czech lands in 1913 and 1923. Assuming that communications production in the Slovak lands paralleled the Czech lands, we estimated total communications production in 1913.

For housing services no data are available on which estimates can be based. We therefore assumed that the housing stock was the same in 1913 and in 1920, i.e., that housing construction kept up only depreciation of the stock.

For all the other series, the only links between 1920 and the prewar period are labor force data and, therefore, these were used. Using census data for 1910 and 1921, we made proper adjustments for changes in coverage and area, assumed that labor productivity did not appreciably change between the two years, and finally assumed that production in these sectors increased 5 percent between 1910 and 1913.

As noted in the text, the link with 1913 is very rough. It does, however, permit some idea about relative magnitudes to be gained.

J. Additional Comments

We used a 1929 base to weight the various sectoral indices. Within the sectoral indices, however, several different base years were used, depending on the availability of data. The most important exception to the 1929 base is the use of 1935 value-added weights for the industrial production index. We do not expect that these variations from the 1929 base would appreciably affect the total G.D.P. index.