Performance of Manufacturing Industries During Transformation

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Abstrakt

Cílem příspěvku je analyzovat účinky makroekonomické politiky, institucionálních změn a působení tržního prostředí na strukturu a výkonnost sektoru zpracovatelského průmyslu, příslušných odvětví a podniků v ČSFR a zejména v ČR. Restrukturalizační procesy jsou analyzovány jak z hlediska realokace zdrojů, tak jejich efektivnosti. K tomuto účelu je využit aparát substitučních produkčních funkcí a dále vícekriteriální analýza výkonnosti opírající se o kritéria, jako jsou např. přidaná hodnota, produktivita práce, exportní otevřenost apod.

Z provedených analýz vyplývá, že za globálními výsledky československého, resp. českého průmyslu je skryta značná diverzita. Ta je zřejmá již na úrovni jednotlivých odvětví, ale plně se projevuje zejména na úrovni podniků. Lze tvrdit, že rostoucí rozdíly ve výkonnosti jsou důsledkem rozdílné adaptability ekonomických subjektů na prudce se měnící podmínky. Zároveň je nutno konstatovat, že transformační efekty se v sektoru zpracovatelského průmyslu ještě plně neprojevily. Platí to zejména pro uplatnění kvalifikované pracovní síly, která je považována za nejdůležitější komparativní výhodu české ekonomiky. Nejvyšší výkonnost stále vykazují odvětví těžkého průmyslu, jejichž úloha by měla postupně klesat. Naproti tomu odvětví, která tvořila tradiční jádro čs. zpracovatelského průmyslu, zejména strojírenství, neustále snižují svou výkonnost.

Analytické výsledky vedou k závěru, že úspěšné vyřešení některých zásadních problémů není v silách mikrosféry samotné, a vyžaduje tudíž i aktivní účast vlády.

Abstract

The aim of this paper is to analyze the ongoing effects of macro-economic policy and changes in both the institutional arrangements and the market environment upon the structure and performance of manufacturing industries in CSFR and the Czech Republic. Restructuring processes are analyzed from the point of view of reallocation of resources, as well as efficiency of resources given their allocation. For these purposes, two different methodological approaches are implemented: production functions and multicriterial evaluations using parameters such as: value added, net productivity, export-sales ratio, etc.

The analysis suggests that the general result of the Czechoslovak (Czech) industry is driven by a major diversity in individual enterprises. An assessment of the main indicators of performance, i.e. labor productivity and export performance, shows that the effects of transformation have not occurred to a more substantial extent. This is true mainly for skilled

labor which is viewed as the most important comparative advantage of the Czech economy. On the other hand, the industries with the highest performance appear to be those whose development should be curtailed, i.e. iron and steel industry and heavy chemistry. Surprisingly, the industries which form an underlying profile of the Czech industry, i.e. machinery sectors, have seen a decrease in their performance.

Analytical results indicate that a successful resolution of some the crucial problems is clearly beyond the capabilities of the market and requires governmental action.

Introduction

The growing literature on economic reform in the former communist countries highlights macroeconomic stabilisation, enterprise adjustment and institutional reform as the basic foundations for a successful transition to a market economy.[1] The essential institutional reforms have been extensively discussed, and many of them have already been implemented. While there has been considerable discussion on the mechanics of privatisation[2], there is surprisingly little information on how the reforms have impacted the economic behavior and decisions of enterprises, and on how these enterprises have responded to the new market environment (Estrin et al, 1993; Hughes et al, 1993). To date only a few authors have focused on the economic performance of individual Czechoslovak (Czech) enterprises within the whole economy or its main sectors.

The aim of this discussion, then, is to analyze the ongoing effects of macro-economic policy and institutional changes on the performance of industries and enterprises in CSFR and the Czech Republic. After describing some basic indicators and tendencies characterizing the manufacturing industry across sectors, restructuring processes are analyzed from the point of view of the reallocation of resources, as well as the efficiency of resources given their use. For this, two different methodological approaches, both focusing primarily on value added or similar (net production based) characteristics, are implemented. At the sectoral level, production functions are used. The performance of enterprises is analyzed by means of evaluations using parameters such as value added, net productivity, export-sales ratio, etc. In addition, the changing patterns of firm behavior are addressed as a factor of special interest, for which correlation analysis is applied.

[1] See, e.g., Blanchard et al, 1991; Bruno, 1992; Dyba, Svejnar, 1992; Fisher and Gelb, 1991; Gomulka, 1991; Hrncir, 1990; Klaus, 1991; Lipton and Sachs, 1991; Zieleniec et al, 1991.

[2] The main contributions being by Bures, Ceska, Charap, Dallago, Dedek, Dyba, Divila, Estrin, Jezek, Jonas, Klacek, Klaus, Kluson, Klvacova, Kupka, Mejstrik, Rychetnik, Svejnar, Triska, Turek, Zeleny, and others.

The Economic Gap

It is a truism that the massive reallocation of resources of the kind occuring in the economies of the former East Bloc is extremely difficult to achieve in the short run. Economic transition is everywhere complicated by capital scarcity, which can severly distort emerging-market "signals" as artificial prices are converted into real effective prices. In transition economies, as elsewhere, labor shuffles from place to place more easily than capital. Foreign trade, investment, and capital flows therefore play a crucial role in augmenting existing capital stocks. The following study demonstrates that a substantial gap has appeared in the Czech economy. It lies between those firms which have managed to find new markets and those which have not; between those firms which have held down nominal wages and those which have not; between those firms which have used existing assets productively and those which have not. Evidence shows that the economic gap is widening, and that the overall performance of the Czech economy is coming to rely more and more on a shrinking pool of firms which have proven capable of adapting to changing conditions.

We begin with an overview of the former Czechoslovak economy, followed by an in-depth look at performance differentials in the current Czech economy.

Section I
The Czechoslovak Industry in 1990 - 1992

Overview

The pre-reform Czechoslovak industrial sector was blessed with a fairly qualified work force, now considered the primary comparative advantage of the Czech economy. There had persisted, on the other hand, a large gap in performance between developed market economies and the Czechoslovak industry as measured in a variety of ways: lower labor productivity, lower relative levels of output, a much poorer quality of post-production services, higher relative consumption of energy and raw materials, a higher degree of protection, non-competitive--often obsolete--technology, and finally, an onerous dependence on a single customer, the USSR. The structure of Czechoslovak industry--built largely on heavy industries which relied upon imported raw materials and which utilized complex and wide production schemes--resembled that of large economies with abundant, local raw-material resources. Contrary to common belief, the Czechoslovak economy did not resemble small economies with a flexible, specialized production profile, vulnerable to international markets.

Czechoslovak industry between 1990 and 1992 was afflicted by all the usual externally-induced ailments of Eastern-European transition economies: recessions in Western trading-partner countries, collapse of the CMEA, new conditions of payment, etc. Restrictive macro-economic policies, price and foreign trade liberalization, as well as the implementation of partial convertibility of the Czechoslovak currency, were the initial cornerstones of reform, along with the requisite reorganization of governmental bodies on all levels. Yet a desparate lack of capital meant that fixed assets and technologies could not be updated, that potential borrowers could not get funds, and that any governmental policies affecting the allocation of capital would be hotly disputed.

Structural adjustment and labor productivity

Between 1991 and 1992, industrial output in Czechoslovakia plummeted in absolute terms. This was largely the result of the elimination of vicious circles of wasteful inter-industry transactions in the socialist economy, by which inputs were sold, or goods were produced according to yearly plans rather than real demand. As a result, output was artificaly bloated for these years, as quotas were fulfilled, and downstream firms simply stockpiled

inventories. Moreover, in some cases, falling output alleviated severe environmental problems. This decline, however, was often accompanied by a decrease in labor productivity in most branches (see figures in Table 1 and 2). In industrial enterprises with over 100 employees the production of goods declined by 24.7% between 1990-1991, and (for enterprises with more than 25 employees) by 13.2% in the following year.

Some trade-dependent industries, on the other hand, recovered from the collapse of the CMEA more quickly. As early as 1992, export-oriented companies had found new western markets, and were already increasing exports. Due in part to this export-led growth, the overall rate of decline slowed in beginning of 1992 (indeed the first six months witnessed a slight increase in industrial production since December 1991).

Asset-specific industries--industries with more or less non-redeployable equipment, technologies, etc.--suffered the most, and accounted for the major share of the output decline over the two years. Production from the industries utilizing intermediate inputs--typically those firms with the highest share of total value added--declined more rapidly than industries relying on raw materials. Consequently, mining industries (especially coal mining) and electricity production grew at the expense of manufacturing. The manufacturing production profile shifted in the favor of industries using domestically-found raw materials: a slight increase, for example, in paper-processing and food-products industries in comparable prices, in iron and steel production, and significantly in petroleum and chemical production.

Table 1[3]

Basic Indicators of CSFR Industry, 1991 (Enterprises with more than 100 employees, constant prices, 1990 = 100)

Industries	Goods prod.	Empl.	Labor prod.
Industry total	75.3	88.0	85.6
Fuel (mining of coal	94.5	91.0	103.8
Energy	96.4	96.6	98.8
Iron and steel	78.0	91.6	85.2
Non ferrous metal	56.8	81.7	69.5
Chemical and rubber industry	77.2	90.6	85.2
Machinery	69.7	87.6	79.6
Electro-technical industry	61.0	82.0	74.3
Metal products	66.4	88.3	75.2
Building materials	67.3	84.4	79.7
Wood and furniture	74.5	87.7	84.9
Paper industry	81.5	91.4	89.2
Glass, porcelain, ceramics	74.1	96.0	81.8
Textile industry	64.7	83.4	77.6
Wearing apparel	60.0	86.8	69.2
Leather and footwear	63.3	88.3	71.7
Printing and publishing	73.1	91.7	79.6
Food products	83.4	89.8	92.9

1) goods production / employment

[3]Source: Federal Statistical Office

Table 2[4]

Basic Indicators of CSFR Industry, 1992

(Enterprises with more than 25 employees, the same period of 1991=100)

Industries	Goods Product.	Employment	Labour Prod.
Industry total	78.6	85.0	92.4
Mining of energy raw material	87.8	89.7	97.8
Mining of non-energy raw material	80.4	78.9	101.8
Other mining	86.8	88.1	98.6
Food industries	91.1	93.5	97.4
Textiles and wearing apparel	78.7	82.9	95.0
Leather and footwear	72.2	87.6	82.4
Wood products	68.3	87.5	78.0
Paper, printing and publishing	90.4	86.5	104.5
Petroleum, coal products	90.5	93.5	96.7
Industrial chemicals	85.6	87.2	98.2
Rubber and plastic products	80.6	84.9	95.0
Pottery, china, glass, non-metal products	81.0	84.7	95.6
Metallurgy and metal products	72.2	84.6	85.3
Machinery	64.3	83.1	77.4
Electrical machinery	64.0	75.1	85.3
Transport equipment	62.7	84.0	74.7
Other industries	76.4	80.9	94.5
Manufacturing	77.0	84.1	91.7
Electricity, gas, water	93.6	94.8	98.7

1) In constant prices

[4]Source: Federal Statistical Office

The decline is sharpest for import-oriented industries, least sharp for industries with large export markets, or industries relying on domestic inputs. Real devaluation of the currency, along with and price and foreign trade liberalisation restricted the purchasing power of would-be importers. A fall in domestic investment lead the decline in investment-heavy engineering goods and building materials.

Declines in machinery and electronics were also the result of reduced household demand for consumer durables. The fall in the purchasing power of the population also decreased textile and leather production. These industries were unable to divert exports to other markets, exports which once flowed almost entirely to the former CMEA.

The decline in industrial output was accompanied by reduced employment (see figures in Table 2), although employment fell far less than production, both in 1991 and 1992. Work force reduction was characteristic of all industries. Pattern of employment changes mirrored patterns of production changes fairly closely: the smallest decline occurring in fuel and energy, iron and steel, chemicals, paper and pulp, glass and ceramics, and in the food industry. A more moderate fall in employment took place in wood products. A more marked decrease in employment was characteristic of non-ferrous metallurgy, of the electro-technical industry and of the textile industry. It is interesting to note that employment fluctuations were more or less stable across sectors over time.

Enterprises struggled to maintain the stability of communities which, in many cases, dependended entirely on single firms for employment. They were naturally, therefore, unwilling to lay off large numbers of workers in order to increase productivity.[5] As employment levels fell comparatively less than production, **labor productivity**, of course, fell absolutely in 1991 and 1992 (see figures in Table 1 and 2). Expressed in net production per employee, five branches had the highest levels of labor productivity: energy production, chemicals, fuel production, iron and steel, and paper industry in 1991; refrigeration and tobacco in 1992. The branches with the lowest labor productivity included textiles and leather products. Comparatively lower levels of labor productivity were characteristic of machinery sectors.

[5] There are incomplete and (most probably) biased statistics reflecting difficulties in measuring real output and unemployment in the transition period combined with the reconstruction of the statistical system itself.

In 1991 state-owned enterprises still dominated production of goods in enterprises with over 100 employees (97.6%). The share of joint ventures (i.e. those with foreign capital participation) was merely 2% and private enterprises 0.2% of labor force employed in the industry, and thus had no impact on the development of employment. The situation in 1992 is characterized in Table 3.

Table 3[6]
CSFR ownership structure in 1992

	prod.	empl.	wages	export
industry, total of which	100.0	100.0	100.0	100.0
state enterprises	86.5	86.2	87.0	83.9
private enterprises	7.6	7.4	7.3	7.5
enterprises with foreign capital participation	3.7	1.8	2.1	7.3
other forms of ownership (cooperative, religious etc.)	2.2	4.6	4.6	1.3

The finances of state enterprises, on the other hand, worsened in 1992. The ratio of gross profits to output decreased from 6% in 1991 to only 3% in 1992. Insolvent state firms were heavily responsible for skyrocketing secondary (inter-enterprise) indebtedness which (together with primary debts to banks) forced a delay in the enactment of bankruptcy laws (delayed until the fall 1993). There were significant differences between both republics. Whereas in the Czech Republic the industrial sector as a whole remained profitable, in the Slovak Republic both the gross and net profits of the non-financial sector were negative.

There are several factors explaining the feeble financial position of enterprises: the continuing appreciation of the real effective exchange rate, increased competitive pressure, reductions of subsidies, increased taxation (including fictitious profits and--due to price liberalization--"revalued" inventories), and increases in nominal wages not resulting from increased

[6]Source: Statistical Bulletin of CSFR No. 12/1992, p. 32

productivity (management implemented nominal wage increases at the expense of capital depreciation).

Some experiences of restructuring in developed market economies (DMEs) are relevant. First, they show that in a period of recession capital become a precious commodity, and the shortage of capital makes structural changes very difficult. Second, there is strong motivation to implement new products and technologies in order to survive. But this sort of adaptation in the Czechoslovak economy is further complicated by a fundamental change in the specialization and comparative advantage of the Czechoslovak economy vis-à-vis international markets. Ironically, economic policies implemented in 1991-1992 created better conditions for industries with lower value added and with high demands on energy and materials, or rather with high demands on lower labor force skills, than the other way around as might have been expected. Shifts in industries in similar-sized DMEs were usually toward high-skill, high-technological sectors, and environment-friendly production. In the CSFR, on the other hand, what mattered was whether or not the particular goods could be sold on foreign markets, not their input-factor profile.

Export Performance

As mentioned, several Czechoslovak enterprises managed to re-orient exports which, in the past, were swallowed entirely by the CMEA toward western markets over the course of one year. Typically these were enterprises producing intermediate products, raw materials, and standard goods not dependent on R&D, high skills or complicated sales networks. This quick change saved from inevitable collapse tens of medium-sized and large enterprises which were threatened by the drying up of domestic investment, a fall in consumption, and the end of the Soviet-led trading bloc. (See Table 4.)

Table 4[7]
Territorial structure of CSFR exports, 1989 - 1992
/percentage of total value/

	1989	1990	1991	1992
1. Total exports	100.0	100.0	100.0	100.0
2. Former socialist countries - total	60.8*	49.4* 44.7**	39.4	25.7
Former Soviet Union	30.5	25.2	19.6	10.9
3. Developed market economies - total	31.2**	46.7* 42.0**	52.0	63.7
European Community	18.2**	31.1* 26.4**	40.7	49.4
Federal Republic of Germany	8.3**	17.4* 12.7**	25.2	30.6
4. Developing countries - total	8.0	8.5	8.6	10.6

Explanatory notes: */ including former GDR, **/ excluding former GDR

Territorial structure of Czechoslovak imports has also changed dramatically (see Table 5).

Table 5[8]
Territorial structure of Czechoslovak imports, 1991 - 1992
/percentage of total value/

	1991	1992
1. Total imports	100.0	100.0
2. Former socialist countries-total	39.6	29.1
Former Soviet Union	29.9	22.6
3. Developed market economies	51.3	64.8
4. Rest of the world	9.1	6.1

[7]Source: Foreign Trade of the CSFR, Statistical Office

[8]Source: Czech Statistical Office, Slovak Statistical Office

Exports to western markets grew mainly due to the low level of Czechoslovak wages, "environmental dumping" and falling domestic demand. Export performance measured by the export-sales ratio has increased markedly in metallurgy, wood products and paper industry, as well as in textiles. The export-sales ratios for machinery industries have been nearly constant. A very high export performance (measured by exports per one employee) has been retained by iron and steel, the chemical and rubber industries, the paper industry, and glass, porcelain and ceramics. Machinery has achieved only an average performance within the whole industry. Similar levels have been achieved by leather and footwear products.

In 1991, there was a steady and significant increase in Czechoslovak export performance, especially in comparison with the global performance of manufacturing. In 1989, the export-sales ratio in the Czechoslovak manufacturing industry was lower than 19%; in 1990 it fell to 18.4%. Between January and July, 1991, it rose to 23%, and reached 24.7% in December 1991. In contrast to 1990, 1991 export increases counteracted the overall trend of falling economic performance. These figures were reached in no small part due to a substantial growth in Czechoslovak exports to market economies. It was also the result, however, of a comparatively moderate decline in exports coupled with a more rapid decline in goods supplied to the domestic market, in investments and in consumption. Finally, a moderately higher share in sales for exports to the Slovak Republic (25.3%) in comparison with the Czech Republic (24.5) was also responsible.

The leading exporters were machinery (29%), metallurgy (17%) and chemicals (14.2%). The industry had not succeeded in eliminating the raw-materials, materials and energy-intensive production, and production polluting the environment. This was true mainly for Slovakia, where e.g. the export-sales ratio of ferrous metallurgy was more than 12 points higher than in the Czech Republic.

At the beginning of 1992, the increase in the export-sales ratio continued. In the first four months it reached 29%. In the SR it reached 32.4% and was 4.9 points higher compared to the CR, mainly due to a significant increase in metallurgy exports. Without metallurgy, the export-sales ratio for Slovak manufacturing would be 28% (i.e. 4.4 points lower); the similar adjusted export-sales ratio for Czech manufacturing (without metallurgy) would be only 1.7 percentage points lower.

In 1992 the differences between the republics became more pronounced. In April 1992, the export-sales ratio of metallurgy in the SR was 14.9 points

higher than the CR and amounted to 56.2%. In comparison with the CR, the ratios of other raw-material intensive industries, e.g. paper and cellulose, construction materials and wood-processing, were higher by 11.2, 5.3 and 2.O points respectively. On the other hand, in more labor-intensive industries, the indicator in the SR was lower than in the CR (with generally below-average values).

For Slovak exports, the most important was metallurgy, which exceeded machine and chemical exports by 25%. These three industries together accounted for two-thirds of all Slovak exports. Machinery in the CR maintained its predominant share of exports, though it exceeded metallurgy exports by only 20%. The share of exports of these two industries, together with the chemical industry, was slightly more than 50%. Light industry, therefore, played a more important role in Czech exports than in Slovak exports.

A major diversity across industrial sectors and individual firms lies behind these general results. In table 6 we present evidence of the shift of enterprises in export performance rankings. The analysis shows that during 1991 a major part of enterprises shifted to the ranks of export-sales ratio between 1 and 20%. (Ranks are constructed by means of export-sales ratios.)

Table 6

Rank	1st half of 1992			1st half of 1991		
	CSFR	CR	SR	CSFR	CR	SR
less than 1%	21.1	20.2	23.1	39.7	36.0	47.9
more than 20%	31.5	36.5	19.6	23.5	25.3	19.6
more than 30%	18.8	21.5	12.9	15.0	16.8	10.9
more than 50%	5.8	6.6	4.0	5.2	6.5	4.2

Data in Table 6 show comparatively high differences between both republics regarding the number of enterprises in individual export ranks (details will be given in the next section). From the perspective of the labor force employed in enterprises in these ranks, however, the situation is nearly identical (see Table 7). The main reason is the size of enterprises (in terms of the number of employees) belonging to individual ranks. The average size of Czech enterprises in the export rate rank >20% are about 82% of

the average size of Slovak enterprises. And in the ranks >30% and above 50%, the differences are still higher.

Table 7

Rank	Shares of employees in total employment			Average number of employees	Labor productivity
	CSFR	CR	SR	CS/SR (%)	CR/SR (%)
less than 1%	16.4	14.7	20.6	103.5	76.8
more than 20%	43.0	42.8	43.7	82.4	106.4
more than 30%	29.9	29.1	31.8	65.5	127.5
more than 50%	10.8	10.4	11.8	63.8	118.5

In the SR, there were more workers employed in enterprises which ranked high in export performance, but which had lower labor productivity than in the CR. Table 8 shows the continuing diversification of enterprises in 1992, but at the same time, the decline in the share of low-exporting enterprises (less than 20% of sales)--from 44.2 to 42.2%--during the first four months of 1992. At the same time, the share of well-performing enterprises (with a ratio higher than 50%) increased from 18.5% to 21.1%. This trend is reflected in employment.

There are, then, two "extreme" groups (above and below average.[9] The

Changing Patterns of Behavior

The analysis of the relationship between performance and wages reveals some interesting facts. While in 1991, there existed practically no adjustment mechanism of "rewards" of production factors to their productivity (the same went for the export-sales ratios and wages), a more distinct correlation between average wages, labor productivity and export efficiency can be seen. Yet, the correlation is more significant in the above-average enterprises both in the CR and SR.

Examining export performance with regard to the size of enterprises, we notice a direct dependence of export productivity on the size of enterprises. This trend holds not only for metallurgical plants and chemistry (because of technological requirements) but also for a heterogenous set of light industry enterprises as well (see Table 9).

Table 9

Number of employees	Export efficiency (Kcs per employee)
1 - 200	12 800
201 - 500	24 898
501 - 1000	33 546
1001 - 2000	45 368
more than 2000	52 673
sum	**44 609**

These trends of the first four months of 1992 did not continue into the second half of the year. This is possibly due the slowing of privatisation and an influx of foreign investments, a continuing decline in domestic demand, a growing primary and secondary indebtedness of enterprises, and last but not least, preparations for the upcoming split of the country. It also may be inferred that political reasons were also responsible (parliamentary elections in June with completely different results in both republics, creation of new coalition federal government and governments of republics).

It might be useful to conclude this section with a structural comparison of both economies.

Table 10[10]
Structural comparison in 1992

	CR	SR
GDP (bil.Kcs)	771	286
Industry (%)	52	
Employment (thous)	4 766	2 096
Industry	36	31
Exports (%)		
Food	9	8
Raw materials	7	6
Energy	6	1
Chemicals	42	54
Machinery,transp. equip.	25	17
Other manuf.	12	14
Imports (%)		
Food	8	5
Raw materials	6	7
Energy	16	29
Chemicals	20	18
Machinery,transp. equip.	41	32
Other manuf.	9	8
Exports to (%)		
Economies in transit.	12	13
Former USSR	9	17
Developed countries	68	54
Imports to (%)		
Economies in transit.	6	7
Former USSR	18	36
Developed countries	70	51
GDP per capita (Kcs)	74 754	53 943

[10]Source: OECD Economic Surveys, 1994

As Table 10 shows, aggregate data reveal more similarities than differences between CR and SR. The major difference is the greater dependence of the Slovak economy on eastern markets.

The next section focuses on the economic development of the Czech Republic during transition.

SECTION II
PERFORMANCE OF THE CZECH INDUSTRY IN 1990 - 93

General economic indicators for the Czech Republic are presented below:

Table 11[11]
Economic Indicators, 1990 -1993
(Change against the previous year)

	1990	1991	1992	1993
Goods production	96.4	75.6	86.3	92.6
Sales	101.6	70.2	88.6	92.5
Sales for export	93.2	92.4	85.6	123.9
Average employment	96.5	88.4	88.2	93.7
Average wage	102.8	117.2	119.6	123.8
Labor productivity	99.9	85.6	97.7	98.8

Tables 12 and 13 characterize selected sectoral indicators. As of 1992 a new classification of industries has been introduced, making comparisons with the previous section is complicated.

[11]Source: Figures Reflecting the Czech Economy, No.7, 1994, Czech Statistical Office

Table 12[12]
Basic indicators in 1992 (total industry = 100%)

	prod.	sale	empl.	wages	exp.	val. add.
extraction	7.4	6.2	9.9	12.9	4.6	11.6
food	14.8	13.5	7.5	7.2	5.8	7.6
tobacco	0.7	0.5	0.2	0.2	0.1	0.6
textiles	4.6	3.9	7.2	5.5	7.3	3.8
clothing	0.7	0.6	2.1	1.5	1.6	1.0
leather & shoes	1.7	1.6	2.8	2.4	2.6	1.4
wooden products	2.6	2.4	3.5	2.9	3.9	2.2
pulp & paper	2.4	2.0	1.6	1.5	2.8	1.4
printing	1.0	1.1	1.2	1.2	0.4	1.1
coal & oil	5.6	4.6	1.0	1.2	3.9	2.7
chemicals	5.7	5.0	3.3	3.5	7.3	4.4
rubber	1.9	1.7	1.7	1.7	2.2	1.5
glass, ceramics	2.4	2.2	3.4	3.4	5.0	2.8
non-metal prod.	1.7	1.5	1.7	1.8	1.9	1.7
metal products	10.4	9.1	8.3	9.7	15.3	7.7
metal constr.	3.6	3.6	5.0	4.9	3.7	3.5
machines, instr.	7.9	8.1	14.9	14.0	9.1	8.9
office equipment	0.0	0.0	0.2	0.1	0.1	0.0
electr. machines	2.5	2.5	3.5	3.3	2.6	2.8
radio, communic.	0.6	0.5	1.7	1.3	0.8	0.7
medical & optical instruments	0.6	0.7	1.8	1.5	0.6	0.9
transport equip.	8.5	8.0	8.6	8.3	14.0	7.0
others	1.0	1.0	2.4	2.0	2.9	1.7
recycled materials	0.7	0.6	0.4	0.4	0.7	0.4
electricity, gas, water	10.8	19.2	6.2	7.3	1.1	22.9
total manufacturing	81.8	74.6	83.9	79.8	94.4	65.5

[12]Source: computed on the basis of data provided by the Czech Statistical Office

An in-depth analysis of these indicators suggests that:

- Manufacturing industry accounts for 81.8% of total production and 83.9% of emloyment, but only 65.5% of value added[13].

- The share of the two largest industries of manufacturing--metals and transport equipment--in total exports is almost 30%, but only 15% in total value added.

- Industries with a lower contribution to total manufacturing, such as extraction of raw materials and production and supply of electricity, gas and water, have the largest share in value added (more than one third of the total volume).

- Almost 15% of all workers are employed in machine and instrument production, the corresponding share in total production is only 7.9%, in value added 8.9% and in exports 9.1%. Machinery (including electrical engineering) employs 30.7% of all workers, but produces only 14% of all value added and exports 46.1% of the total volume of exports.

- Some industries with a low percentage of manufacturing such as textiles, shoes, wooden products, glass and ceramics have a higher volume of exports than of value added. On the contrary, some industries contributing a higher percentage of total manufacturing, especially products from the engineering industry, achieve much lower exports in comparison with their value added. Under these circumstances, the Czech economy exports materials instead of labor.

Table 13 shows other important indicators. In contradistinction to Table 12, all of them are in relative form.

[13] Until the end of 1992 value added was computed as the sum of wages, profits, and depreciation of equipment for all produced product, i.e. without any regard to real sales (unlike traditional economic usage).

Table 13[14]
Selected indicators of performance of industries

	export-sales ratio	aver. wage	labour prod.	VA per empl.
extraction	13.9	6 266	398.8	240.9
food	8.2	4 639	1 058.7	207.9
tobacco	2.0	6 186	2 459.7	841.5
textiles	35.3	3 688	346.1	109.4
clothing	47.5	3 532	184.7	94.2
leather, shoes	30.1	4 047	330.5	99.8
wooden products	30.7	4 049	405.3	127.8
pulp & paper	26.8	4 433	809.3	177.8
printing	7.1	5 088	468.2	199.8
coal & oil	16.3	5 980	3 101.3	574.2
chemicals	27.7	5 132	948.9	276.4
rubber	24.9	4 833	603.6	182.2
glass,ceramics	43.3	4 830	383.6	168.7
non-metal prod.	23.6	5 051	523.6	200.1
metal products	31.7	5 632	672.7	190.3
metal constr	19.4	4 736	386.5	144.4
machines,equip.	21.2	4 516	285.8	122.8
office equipment	28.4	4 057	127.6	48.7
el. machines, instruments	19.7	4 614	387.8	165.3
radio, communic.	28.7	3 812	178.0	88.8
med,optic.instr	16.9	4 118	175.5	103.6
transport equip.	33.2	4 649	530.9	167.6
others	53.2	4 152	232.9	146.6
recycled materials	22.7	5 161	1050.2	246.9
electr., gas,water	1.0	5 703	938.1	763.3
manufacturing	23.9	4 587	440.5	161.6
total industry	18.9	4 823	538.3	206.8

[14]Source: computed on the basis of data provided by the Czech Statistical Office

All machinery (rows 17 - 22) exhibit a very low level of productivity measured by value added (only 84.6% of the manufacturing and 66.1% of the total industry). All these sub-sectors achieve only a below-average level of labor productivity.

Allocation of resources and their efficiency

We turn now to a discussion of the impact of the economic reform on allocation of basic production factors and their productivity in the Czech manufacturing industry. For this purpose, the following Cobb-Douglas production function is used:

$$Y = a K^{\alpha} L^{\beta},$$

where symbols are defined as follows:

Y ... output measured by value added
a ... constant
K ... capital (fixed assets)
L ... labor
α ... elasticity of capital
β ... elasticity of labor

Production functions are computed for individual industries and estimates of parameters are based on enterprise data. This procedure gives us a static picture, yet it creates a useful bridge between macro- and micro-levels. Moreover, value added or value added-based characteristics are analyzed at both levels.

Parameters computed on cross-sectional data for 1991 exhibit low elasticity of capital, and also contribute to low marginal productivity of capital. These values are extremely low in the engineering and electronics sectors. For instance, the return to capital in the engineering is 0.048 Kcs of 1 Kcs of capital in use, in production of instruments the return is even lower, and reaches only 0.042 Kcs. Consequently, the marginal rate of substitution is very high. In these two mentioned cases, substitution of one worker costs 5.29 mil. and 6.21 mil. Kcs respectively.

Since industry nomenclature changed in 1992, no precise sectoral comparison with the previous year is possible. Thus, we present only relevant parameters computed for the whole manufacturing sector (Table 14).

Table 14

	MRS (margin.rate of subst.)	capital elast. α	labor elast. β	margin. prod. of capital MPk	Margin. prod. of labor MPl
1991	1423	0.261	0.737	8.8	117.6
1992	1748	0.250	0.743	5.8	101.3

The chief result is that in 1992 labor became more expensive than capital, but simultaneously, labor adds less to value added (marginal productivity worsened). Looking at the industries in 1992 (Table 15), we observe the worst positions for engineering and electronics, even lower than in 1991. Only car production remains viable: returns to capital being 8.6% as compared to, say, 2% for medical and optical instruments. These parameters indicate an enormous overstocking of some sectors with cheap, often obsolete or unusable equipment, and thus a strong need for capital adjustment. Market signals provide only weak incentives to troubled firms.

Table 15

	α	β	MPc	MPl (thous. Kc)*	MRS (thous. Kc)*
industry	0.2191	0.7974	0.0389	116.5	2995
manufacturing	0.2504	0.7429	0.0579	101.3	1748.4
extraction	0.349	0.670	0.0648	141.3	2180.4
food	0.197	0.891	0.495	154.9	3230
textiles	0.416	0.553	0.0900	163.8	1820
clothing	0.085	0.987	0.0481	82.5	1717
leather, shoes	0.331	0.604	0.1261	55.15	437.3
wooden products	0.175	0.819	0.0452	88.7	1964
paper, pulp	0.387	0.598	0.0550	96.4	1754
oil, chemicals (aggregate)	0.250	0.885	0.0543	260.6	4799
chemicals	0.187	0.927	0.412	229.7	5572
rubber	0.396	0.643	0.1071	101.8	951
glass,ceramics non-metal prod. (aggregate)	0.256	0.813	0.0528	122.6	2322
non-metal prod.	0.267	0.823	0.049	136.9	3352
metal products, constr. (aggregate)	0.143	0.916	0.0239	125.7	5261
metal constr.	0.140	0.887	0.0409	105.9	2588
transport. equip	0.434	0.500	0.0859	56.6	659.1
machines,equip. instruments, transp1ort. equip (aggregate)	0.0918	0.855	0.0214	94.4	4411

*) per person, year

Note: All t-statistics are significant at the 5% level. In order to achieve a high reliability, aggregates for some industries were constructed.

Analysing the size structure by means of production functions, we can see some shifts, especially in the first two categories, i.e. between 100 and 500 and 501 and 1000 (Table 16).

Table 16

	size category	K	L	Y	α	β	MRS
1991	100 - 500	118.29	270.03	31.65	0.2899	0.7658	1157
	501 - 1000	299.34	711.22	83.16	0.1894	0.8534	1896
	1001 - 5000	916.49	2068.9	235.83	0.3780	0.5484	1451
1992	100 - 500	151.04	253.29	32.7	0.1917	0.7912	2461
	501 - 1000	518.7	711.47	101.31	0.3318	0.3900	*
	1001 - 5000	1454.5	2004.5	300.61	0.2927	0.8698	2156

K,L,Y ... average respective values
* coefficient of determination < 0.18

Note: All t-statistics are significant at the 5% level.

Enterprise performance[15]

We observe above-average labor productivity and above-average export-sales ratios achieved only by a small group of Czech enterprises in the manufacturing sector for 1992. They represent 25.6% of production, 37% of exports, with an export-sales ratio of 43.1%. They employed 12% of all workers whose average wage was 5 681 Kcs.

811 enterprises were the lowest performers, accounting for 21% of production, 10.2% of exports, and employed 36.8% of workers. Labor productivity for this group of firms was low and wages were relatively costly: only **26.4%** of the productivity level of above-average enterprises, yet **74%** of their wages.

[15] Some performance indicators for 1991 and the first half of 1992 can be found in Tables 5 and 6 in the previous section.

It seems that only a relatively small group of enterprises has been able to adapt. Most of them, surprisingly, are large with more than 500 employees. In this regard, an analogy to Table 8 may be illustrative.

Table 17

Number of employees	Export efficiency (Kcs per person)
1 - 200	56 860
201 - 500	89 645
501 - 1000	125 883
1001 - 2000	120 139
more than 2000	154 843
sum	**125 767**

As tables 5, 6 and 7 include all Czechoslovak enterprises, a direct and precise comparison of performance parameters is difficult. Nevertheless, a considerably growing distance between both extreme groups is evident.

There is an ever-widening differentiation between firms which do well and those whose performance levels have dropped. Computations for the first half of 1993 indicate that this divergence continues: the above-average group exhibits 164% of the average labor productivity, the worst group only 64% of the average. Moreover, the share of the deteriorated group has grown (measured by production, employment, and exports). Table 18 compares both extreme groups of Czech manufacturing in the first half of 1992 and 1993[16].

[16]In the first four months of 1992, there was a very positive shift in favor of the above average group in the Czechoslovak manufacturing (mainly exports), as stated in the previous chapter. It may be assumed that this development was caused to a great extent by an enormous increase of Slovak exports of metallurgical products and other raw materials, especially cement, in this period (both republics) .

Table 18
Simultaneous evaluation of export performance and labor productivity

share in manufacturing (%)	1992 above average	1993 above average	1992 below average	1993 below average
goods production	31.3	32.0	24.5	23.3
exports	48.2	48.1	16.5	14.1
wages	21.7	22.3	34.8	35.0
employment	19.9	19.6	36.5	36.6
labor prod.	157.2	164.0	73.5	63.9

Since April 1992, there is a negative correlation between export-sales ratio and labor productivity in all manufacturing, and the direct relationship between average wage and labor productivity in the above average group is even less significant than one year ago. In all manufacturing, there is only a very low correlation between profit and export-sales ratio (across industrial sectors there is no significant correlation). Looking at individual industries, this correlation has grown in food industry, production of cement, and in metallurgy and transport equipment.

Table 19 shows some basic indicators of Czech manufacturing at the level of individual industries in the first half of 1993; table 20 characterizes the ownership structures to date.

Table 19
Selected indicators of performance (January - June 1993)

Industry	export-sales ratio	goods prod. (bil.Kc)	labor prod. (ths.Kc)
food	11.7	32.9	1 058.7
tobacco	26.2	1.38	2 459.7
textiles	43.7	9.73	346.1
clothing	48.1	1.93	184.7
leather & shoes	30.6	3.58	330.5
wooden products	35.2	6.33	405.3
pulp & paper	25.5	4.58	809.3
printing	8.9	2.08	468.2
coal & oil	20.3	10.6	3 101.3
chemicals	38.9	11.8	948.9
rubber	26.7	4.57	603.6
glass,ceramics	48.1	5.38	383.6
non-metal prod.	23.2	4.37	523.6
metal products	44.0	21.5	672.7
metal constr	27.5	9.14	386.5
machines,equip.	37.4	17.0	285.8
office equipment	48.8	0.10	127.6
el. machines & instruments	25.0	6.57	387.8
radio, communic.	31.6	1.11	178.0
med.,optic.instr	24.0	1.30	175.5
transport equip.	43.3	18.5	530.9
others	54.8	2.44	232.9
recycled materials	37.0	1.53	1050.2

Table 20
Ownership structure in August 1993

	product.	empl.	number of org.
Industry, total of which	100.0	100.0	100.0
State enterprises	77.8	76.6	46.3
Private enterprises	11.2	13.3	37.3
Enterprises with foreign capital participation	5.6	2.9	4.0
Other forms of ownership (cooperative, religious etc.)	5.4	7.2	12.4

SECTION III
CONCLUSIONS

Czechoslovak industry faces an array of complicated tasks:

- to change the behavior of economic subjects with regard to the newly implemented rules of a free market economy;

- to increase enterprise performance--both in quantitative and qualitative terms (including environmental responsibility);

- to produce and export sellable, fully convertible goods and services with a higher share of value added;

- to harmonize costs, sales, profits and cash flow, growth and equilibrium;

- to take a more active part in the international flow of goods, services as well as factors of production, especially capital; to make the growth of trade serve and generate the growth and competitiveness of domestic firms;

- to eliminate the unwanted production caused by the artificial demand stirred up by trade partners of the communist bloc.

Whereas competition tends to force a certain convergence of firm behavior, forty years of state plannning in Czechoslovakia bred large differences in performance among enterprises, with under-producers being automatically subsidized by the central economic authorities. Most of the enterprises with extremely low levels of performance were concentrated in the southern and eastern regions of Slovakia.

The economic gap in Czechoslovak manufacturing in the first years of economic reform (1990-1991) was not generated because entreprenueurship took off in certain industries, but rather, because the bottom fell; performance levels tumbled for a sizeable number of firms, and are continuing their decline. These discrepancies are not disappearing but, on the contrary, have increased substantially. Enterprises with extremely low performance levels are native to all regions of the former federation including the more developed western parts of the country (Bohemia, Moravia).

An assessment of the major performance parameters--viz., labor productivity and export performance--shows that the beneficial effects of transformation have not been felt in skilled-labor industries (the Czech comparative

advantage). The industries with the highest performance levels, surprisingly, appear to be the old behemoths of Czechoslovak industry, the motors of socialist industrialization (iron and steel[17] and chemicals). Meanwhile industries which have formed the underlying profile of the Czechoslovak industry, i.e. machinery sectors, have lost performance. A major motivation of this study is the belief that microeconomic policies covering the whole range of relevant issues such as flexible credits, depreciation schemes, liquidation of obsolete equipment, regional, and export promotion, might correct the (still biased) emerging-market signals in search of new specialisation profiles of Czech (as well as Slovak) industry and its position in the international division of labor. Many results of our analysis indicate that a successful resolution of some crucial problems is clearly beyond the capabilities of the market itself and requires governmental action.

[17]We must admit, however, that some positive restructuring within the industry aimed at product modernization substantially increasing value added has already taken place. It is especially the case of exports.

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