Evolution and Efficiency of Concentration: Manufacturing Industries in the Czech Economy 1989-1992

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CERGE - EI, March 1994

Abstrakt:

Silně koncentrované tržní struktury jsou součástí dědictví centrálně plánované ekonomiky. Cílem studie je anlyzovat do jaké míry se tržní struktury zpracovatelských odvětví průmyslu přizpůsobily během prvních tří let transformace ekonomiky a pokusit se učinit závěry o efektivnosti těchto procesů jak na úrovni odvětví tak na úrovni podniků.

Výpočty koncentračních stupňů a Herfindahlova koeficientu ukázaly, že koncentrace většiny trhů se v období 1989 - 1992 výrazně změnila. Vývoj koncentrace byl nicméně významně odlišný v závislosti na jednotlivých trzích. V roce 1992 byla téměř polovina ze 440 sledovaných výrobkových trhů podstatně méně koncentrována než v roce 1989. Naopak přibližně třetina ze sledovaných trhů vykazála v roce 1992 vyšší koncentraci než v roce 1989. Na zbývajících trzích zůstala koncentrace nezměněna.

Dovozní konkurence zesílila v období 1989 - 1992 na většině zpracovatelských trhů. Výpočet koncentrace při započítání dovozů a odečtení dovozů z domácí nabídky vede k významnénu poklesu koncentrace většiny trhů ve srovnání s výpočty koncentrace bez korekce domácí nabídky pro zahraniční obchod.

Koncentrace odvětví byla pozitivně korelována s průměrnou produktivitou za odvětví. Tato korelace byla silnější v roce 1992 než v roce 1989. V roce 1992 se prosazovala pozitivní korelace mezi koncentrací odvětví a ziskem na pracovníka, nákladovou rentabilitou a průměrnou mzdou za odvětví. Tyto korelace byly významně nižší, resp. negativní v roce 1989.

Tyto vztahy však nelze vysvětlit pouhou úrovní koncentrace ale spíše velikostí podniku. Největší podniky mají významně vyšší výrobu na zaměstance než činí průměr za odvětví. Tato diference se nicméně zmenšuje úměrně růstu koncentrace odvětví. Na úrovni podniků nebyla prokázána významná korelace mezi rentabilitou či ziskem na pracovníka a koncentrací odvětví.

Ve studii je diskutována schůdnost a efektivnost politiky dekoncentrace bývalé centrálně plánované ekonomiky. Růst podílu dovozu na domácí nabídce zpracovatelských trhů, vznik nových podniků a rozdělení velkých podniků jsou identifikovány jako hlavní zdroje konkukrence. V podmínkách malé české ekonomiky mají však různou váhu v závislosti na jednotlivých trzích.

Srovnání úrovně koncentrace s podobnými odvětvími v Rakousku ukázalo, že tržní struktury českých zpracovatelských odvětví konvergují k normám obvyklým v rozvinutých tržních ekonomikách, nicméně některá zkreslení stále přežívají.

Abstract:

Part of the legacy of a command economy are highly concentrated market structures. The purpose of the study is to analyze the extent to which market structures of manufacturing industries in the Czech economy adjusted during the first three years of transition and to draw conclusions about the efficiency of this process at both industry and firm levels.

Computations of one- and four-firm concentration ratios as well as Herfindahl indexes show that the levels of concentration in most industries changed radically between 1989 and 1992. The development of concentration was significantly different according to the industries. By the end of 1992 about half of the 440 product markets deconcentrated if compared to 1989. On the other hand, about one third of product markets became more concentrated, and the rest remained unchanged.

Between 1989 and 1992, import competition strengthened in most markets. The incorporation of imports and exports into the domestic supply generally leads to a significant decrease in market concentration compared to the concentration computations for which domestic supply is not corrected for exports and imports.

Industry concentration was positively correlated with labor productivity in both 1989 and 1992. This correlation was more significant in 1992 than in 1989. In 1992 a significant positive correlation existed between industry concentration and profit per employee, as well as between industry concentration and both profit-to-cost and average salary. These correlations were weaker or even negative in 1989.

Higher productivity cannot be explained by the mere level of industry concentration, but it can be explained by the size of enterprises. The largest firms had significantly higher outputs per employee than the average for the industry. Nevertheless, the difference decreases as the level of concentration grows. No significant relation between concentration and profit-to-cost or profit-per-employee has been found on the firm level.

The study discusses feasible and effective policy towards deconcentration of former centrally planned economy. Growth of import penetration, new entries in the manufacturing markets, and break-ups of enterprises are identified as the main sources of competition. In a small economy like the Czech Republic, these sources necessarily have different weights according to the particular market.

Comparison of concentration levels with matched industries in Austria led to the conclusion that market structures in the Czech manufacturing industries are converging towards market economy norms, nevertheless some distortions still survive.

This paper is co-sponsored by the Ford Foundation.
The authors are grateful to Jan Svejnar, Aydin Hayri, Gerry McDermott and Mirek Singer for helpful comments.

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1. Introduction

Concentration[1] is at the center of economists' attention because of its effect on costs and profits of the firms and thus on the efficiency of the economy. On the one hand, there exist arguments supporting the positive effects of higher concentration on costs.[2] On the other hand high concentration and thus market power of large enterprises can be associated with consumer welfare losses.[3] That is why the evaluation of the market concentration is often paradoxical.

Numerous empirical studies investigate how market structures change and what the relation between the market concentration and industry average-profitability is in the conditions of stable market economies. [4] In this paper a similar study is carried out with respect to the transitional Czech economy.

In 1989 the Czech Republic possessed one of the most rigid command economies with strongly regulated prices, state monopoly of foreign trade and non-convertible currency. By 1992 most of the prices had been liberalized, state monopoly of foreign trade had been abolished and internal currency convertibility has been achieved. By the end of 1992 almost all manufacturing enterprises had entered the privatization process. Thus the Czech Republic represents a good example for the study of adjustment of market structures to the new institutional framework and policies.

Since 1989 the number of enterprises in manufacturing has radically increased due to numerous break-ups of enterprises and new start-ups. Nevertheless the share of the 100 largest companies in the total output of manufacturing industries did not change markedly over the same period. Moreover, as table 1

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[1] The literature usually refers to the "seller concentration" or "market concentration".

[2] The higher the concentration, the higher the economies of scale and the learning-by-doing effect if producing a single product. The higher the horizontal concentration, the higher the economies of scope if producing multiple products because of economies in research, marketing and advertisement costs, as well financial costs. Nevertheless these economies play role up to a certain scale of the plant or firm (the so called minimum efficient scale) which is changing with time.

[3] Possession of the market power in the short-run allows us to raise prices above the marginal cost. In the long-run market power means pricing above the average cost.

[4] For a good overview see Curry, B. - George, K. (1983)
Most of the studies find weak positive correlation between concentration and industry-average profitability.

indicates, the share of the ten largest producers, as well as the share of twenty largest producers in the total output of manufacturing, increased. [5]

Table 1 **Shares of the largest companies in the total manufacturing output and total employment 1989 and 1992 (in per cent)**

	share in the total output 1989	share in the total output 1992	share in the total empl. 1989	share in the total empl. 1992
10 largest companies	17.8	22.2	13.1	11.2
20 largest companies	26,8	28.8	17.9	15.6
50 largest companies	41.9	40.2	26.3	23.5
100 largest companies	55.2	51.1	38.9	33.2
200 largest company	72.6	64.3	58.0	46.5
Total manuf. output in bn.kr.*	558.35	637.25	-	-
Total number of enterprises**	652	1759	-	-
Total number of employees in manufacturing in thous.	-	-	1659	1213

* in current prices

** enterprises in manufacturing industries with more than 25 employees

In the United Kingdom, the share of the 100 largest companies in total the manufacturing output is over 40 per cent. In the Czech economy, 100 largest enterprises produce about one half of the total output of manufacturing industries (mining and utilities are excluded).

In 1989, the largest 100 companies represented 14% of the total number of companies, while in 1992 largest 100 companies represented mere 4% of the total number of the enterprises operating in the industry.

Along with the growth of selected large enterprises it was the boom of small businesses, which contributed to the increase of inequality of the distribution size of enterprises. Table 2 illustrates this process.

[5] During the same period of the time of transition (1989-1992), total output in manufacturing measured in constant prices decreased by about one third, employment decreased by about one quarter.

Table 2 **Size distribution of manufacturing enterprises, 1989 and 1992***

Size of enterprise by number of employees	1989 I	1992 I	1989 II	1992 II
less than 25	0.8%	58.5%	0.0%	2.5%
25 - 200	3.4%	18.3%	0.1%	6.2%
201 - 500	8.1%	11.2%	1.3%	12.7%
501 - 1000	15.6%	5.5%	6.1%	14.2%
1001 - 2000	28.4%	4.0%	18.9%	19.0%
2001 and more	43.7%	2.5%	18.9%	45.4%
TOTAL	652 enterpr.	4739 enterpr.	610.2bn.kr	638.0bn.kr

I - share on the total number of enterprises
II - share on the total output of manufacturing industries
(Total output in current prices)
* enterprises with less than 25 employees included

Measures of concentration express the number and size of enterprises in terms of a one-parameter index.[6] That is why the above mentioned changes necessarily influenced concentration levels.

The study aims to answer the following questions:

- how did the concentration of the manufacturing industries change during 1989-1992?

- to what extent was domestic supply influenced by import penetration?

- is there a relation between the level of concentration and selected variables at the industry level?

- do the largest enterprises perform differently from the industry average?

[6] compare Scitovsky, T. (1955)

The study is started by an empirical analysis. In chapter two concentration ratios and Herfindahl indexes on two- and three-digit levels are computed for both 1989 and 1992. Analogical computations are repeated in the second part of this chapter but in this time domestic supply was corrected for exports and imports. In such a way international exposure of manufacturing industries is being examined.

In chapter three, correlation analysis is employed in order to attempt to learn more about the relationship of the size of the enterprise with concentration and industry performance.

In chapter four's institutional framework, the conditions and environment for entrepreneurial activities, as well as the background motivating the tendencies to concentration and monopolization in centrally planned economy, are described both on macro- and micro- levels.

Two possible approaches to deconcentration and demonopolization, respectively, during the transitional period are discussed. First is demonopolization "from below", which relies on activities of the state to remove barriers to entry and to facilitate the development of new start-ups and small businesses. Second is demonopolisation "from above", which consists of the initiation of break-ups or the facilitating of large enterprise dissolution through the state agencies and state power.

In chapter four, the role of the small business and anti-trust policies during the transition are described. In order to show the adjustment of market structures of specified industries progressed towards the market economies' norm levels of concentration are compared with Austria.

2. Concentration development 1989 -1992

The empirical analysis focuses on manufacturing industries and attempts to reveal or illustrate general trends in their market structure development. Industries, which are considered to be natural monopolies (water, gas and electricity supply and distribution) as well as mining industries, which are not being privatized, are not involved in the market concentration analysis. Technical details, including the description of data used and their adjustment, are in appendix 1.

The analysis of concentration involves several steps, which differ according to the level of aggregation of the markets and involvement of import into the domestic supply.

Common measures of concentration have been employed and compared. The share of the largest seller in the total supply on the market (CR1), the share of four largest sellers in the total supply on the market (CR4) and Herfindahl index (H index) were calculated for two-digit industries (divisions according to OKEC which corresponds to NACE)) and three-digit industries for 1989 and 1992 (see appendix 1 for details). Each of the measures enables us to reveal or depict a certain aspect of the market structure development.

The share of the largest seller has been used in order to identify the existence of monopoly market situation and the share of the four biggest sellers in the total output of the division has been used for identification of oligopoly situation. The Herfindahl index enables to examine in what measure the inequality of distribution of supply within the whole industry changed.

Such an approach enables us to illustrate to what extent the oligopoly and monopoly market structures established during the period of the command economy, have been maintained during the transition period and, in what measure and industries deconcentration of markets occurred.

Applied measures of concentration are significantly positively correlated with one another, as well as negatively correlated with the number of enterprises, as is illustrated by table 3.

Table 3 **Correlation of Concentration Measures by manufacturing divisions 1992**

	number of enterprises	H index	CR1	CR4
number of enterprises	1.0000	-0.4587	-0.4335	-0.4963
H index	-0.4587	1.0000	0.8693	0.5855
CR1	-0.4335	0.8693	1.0000	0.8632
CR4	-0.4963	0.5855	0.8632	1.0000

2.1. Market concentration without foreign trade incorporation

In this part of the analysis, domestic sales are not corrected for imports and exports. At the first step the changes of concentration according to two-digit manufacturing industries (divisions according to NACE) are analyzed. For detailed results see appendix 2, 4 and 6.

Out of twenty-three divisions in case of nine divisions, the share of the largest producer increased in eleven divisions the share of largest producer decreased, and in a three division share of largest producer remained unchanged or almost unchanged. The most dramatic decreases of the share of the largest supplier were in optical&medical instruments, communication equipment, the leather and shoe industry, communication equipment and the car and trailer industry. The most significant increases were identified in business machines and the PC industry, other transport means and rubber&plastics.

In fifteen manufacturing industries the share of four largest sellers decreased during 1989 -1992, and in seven industries the share of four largest sellers increased. Eleven industries maintained the oligopoly situation. The most dramatic share decrease of the four largest producers occurred in optical and medical equipment, communication equipment, wood-processing and leather products. An increase of CR4 by almost 40% was in business machines and PC.

The dominant position of one seller has been maintained in tobacco, oil&coal processing and car production. Occurrence of the oligopoly situation did not change radically during 1989-1992. An oligopoly situation was maintained in clothing, leather and shoes, paper production, rubber and plastics, metal products, PC and other business machines, cars and trailers, other transport means and recycling. These facts become apparent if concentration is measured on the product level, as illustrated by Tables 4, 5 and 6.

Table 4 **Products by share of four largest producers, 1989 and 1992**

Range of the share of four largest enterprises in the total output of products (CR4 in %)	Number of products 1989	Number of products 1992
0.01 - 30.00	4	6
30.01 - 50.00	11	37
50.01 - 100.00	427	408
Total number of products	442	451

Most of the products are produced in oligopoly markets. The share of four largest producers did not fall below 50% by 427 products in 1989 and this number had not changed markedly by 1992.

The number of products which, in which share of largest producer on the market falls under the 30 % increased from 73 to 118 since 1989, hence almost half of products are produced in markets, on which largest producer has more than 50% of the market.

Table 5 **Products by share of largest producer 1989 and 1992**

Range of the share of largest enterprise in the total output of product (CR1 in %)	Number of products 1989	Number of products 1992
0.01 - 30.00	73	118
30.01 - 50.00	111	118
50.01 - 100.00	258	215
Total number of products	442	451

The most radical changes are indicated by the Herfindahl index computations, which reacts on the changes in the share distribution of all enterprises. More than 10% of all products shifted from the most concentrated markets to the low concentrated markets.

Table 6 **Products by Herfindahl index, 1989 and 1992**

Range of the H index	Number of products 1989	Number of products 1992
0.01 - 0.30	153	204
0.31 - 0.50	106	108
0.51 - 1.00	183	139
Total number of products	442	451

Hence these tables do not depict the reversal changes of the product markets which may cancel each other in these aggregated tables and which are illustrated by appendixes 8-10.
A more careful analysis of changes, which is provided in appendixes 8, 9 and 10 enables us to reveal more about the changes according to the products aggregated by divisions.

In 263 of the 440 products, the share of the four largest producers decreased during 1989-1992, in 99 product groups the share of the four largest producers increased, and the remaining 78 remained unchanged.

The share of the largest producer decreased in 235 groups of products, increased in 193 product groups and stayed unchanged in 12 product groups. These contrasting or reversal changes in the concentration levels for different product groups in a certain extend cancelled each other out at the aggregate level, i.e. at the division level.

While in 1989 the level of monopolization was substantially higher in the case of finished products than is the case with products that are characterized as semi-finished articles (such as parts, accessories, aggregates, components)[7], the industries producing finished products tend more to deconcentration during the period 1989-1992 than the semifinished products.

In 1989 there existed in parallel with oligopolist and monopolists a considerable number of outsiders. This fact is important, especially in view of the number of enterprises in manufacturing. Yet the shares of the majority of these outsiders in the total output of a given product were very low. Such cases most probably reflected evolutionary development of the market structure, which was a reaction to the monopolistic structures of most markets: Enterprises that were unable to obtain needed goods in acceptable structure and time either on the market, or through negotiating with the center, were forced to manufacture a number of machines, equipment, components etc. by themselves, often in a "do-it-yourself" style, regardless of their specialization and of the efficiency of such a type of production.

During the privatization process these production units have to be closed unless they find the management and business plan which would enable them to become independent units, and thus competitors to the incumbent firms.

2.2. Market concentration with foreign trade adjustment.

In this part domestic sales are corrected for imports and export. In order to reveal the impact of foreign trade liberalization on the domestic market structure, the CR1 and CR4 have been computed excluding the exports from the domestic supply and including the imports into the domestic supply. From

[7] see A. Zemplinerova (1989) for more detail

the methodology point of view it was necessary to match the import statistics according to SITC classification on three-digit level to OKEC (Czech analogy for NACE).

Import penetration has been computed according to the following formula:

Import Penetration (IP) = Imports :/ Sales - Exports + Imports/

The exchange rate used for import data available in USD were official exchange rates,i.e. for 1989 1 USD= 15.05 crowns and for 1992 1 USD = 27.80 crowns.

It is not possible to determine to what extent these imports are concentrated while a breakdown of imports according to the shares of importers on the total import is not available. From the same reason it was also not possible to compute H indexes in this part of the analysis.

Inclusion of imports allows us to evaluate the presence and power of foreign competition on the domestic markets, especially important in such a small economy as the Czech, in which the existence of competition in numerous markets depends only on foreign competition.

Except for five divisions (tobacco, oil&coal processing, communication equipment, optical&medical instruments, cars&trailers and furniture&other products) imports increased in all division in 1992, when compared to 1989. The most significant increase of import have been recorded for clothing, paper products, rubber&plastics, machinery, business machines (PC by 90%), other transport means and recycling. On the other hand, imports decreased in oil&coal processing, communication equipment, optical&medical instruments, cars and trailers as well in furniture and other product division.

In 1992 imports represented more than half of the domestic supply in clothing, business machines (mostly PC), communication equipment, optical and medical instruments. More than one third of domestic supply represents imports in chemicals, rubber and plastic, machinery, electrical machines, other transport means and furniture (see table 7).

Table 7 **Import penetration by divisions 1989 -1992**

Industry	IP in % 1989	IP in % 1992	Change 1989-92
Foodstuffs	8.48	14.23	+ 5.75
Tobacco	31.14	31.35	+ 0.21
Textile	5.56	11.98	+ 6.42
Clothing	34.12	51.21	+17.09
Leather and shoes	18.32	20.52	+ 2.20
Wooden products	3.92	11.67	+ 7.75
Paper	12.26	28.12	+15.86
Printing & publishing	8.80	12.86	+ 4.06
Oil & coal processing	39.04	31.35	- 8.22
Chemicals	35.57	44.82	+ 9.25
Rubber & Plastics	14.46	34.03	+19.57
Non-metal	10.45	12.70	+ 2.25
Metal	12.60	15.78	+ 3.18
Metal construct.	18.39	25.56	+ 7.17
Machinery	27.84	43.79	+15.95
Business machines,PC	8.48	98.40	+89.92
Electrical machines	32.67	34.84	+ 2.17
Communication equipment	84.66	73.93	-10.73
Optical, medical	95.71	69.82	-25.89
Cars and trailers	38.36	30.27	- 8.09
Other transport	4.56	47.26	+42.70
Furniture	61.92	42.37	-19.55
Recycling	0.79	12.28	+11.49
TOTAL	19.77	31.52	+11.759

A relatively low level of import penetration (less than 20% of domestic supply) existed in 1992 in foodstuffs ,textile, leather and shoes, wooden products, printing & publishing, non-metal products, metal products. Nevertheless most

of these industries are at the same time important exporters.(see appendix 11 for export performance of the manufacturing divisions).

Computations of CR1 and CR4 with involvement of the imports and exports into the analysis are in appendixes 3 and 5. There exist significant differences between the computations of concentration with and without adjustment for foreign trade. Generally adjustment of domestic supply for exports and imports led to the decrease of the recorded concentration levels.

In comparison to the results of concentration measurement without foreign trade incorporation shares of largest producer decreased to about one half in clothing,oil and coal processing,, chemicals, non - metal products, machinery, optical and medical instruments, , cars and other transport. In the business machines division import implementation led to a decrease of CR1 from 50 to about 1% and CR4 from 100 to 1.6%.

Shares of the largest four producers decreased after the foreign trade adjustment, most significantly in clothing, paper products, chemicals, rubber and plastics, machinery, communication equipment, optical and medical instruments, cars and furniture.

The computation confirmed that imports do not represent significant competition for domestic producers in tobacco, textile, leather, wooden-products and non-metal and metal products.

3. Efficiency of the concentration

In this section an attempt is made to find out, whether

a) there exists a relationship between the concentration level of industry and the selected indexes of efficiency or performance of the industry

b) largest companies perform differently from the average of the industry

c) there exist differences in these relations for 1989 and 1992.

First the pairwise correlations of concentration (using the computations of H index, CR1 and CR4 in appendices 2, 4 and 6) with productivity, profitability and other selected performance variables for the division have been calculated for both years 1989 as well as for 1992. The results are in the table 7. In 1992

levels of industry concentration were significantly positively correlated with the average sales per employee for industry. This correlation was significant in case of CR1 and CR4 in 1985 but was weaker than in 1992.

Table 8 **Correlation between concentration and selected indexes by divisions, 1989 and 1992**

1992 (1989)	H index	CR1	CR4
sales per employee	0.68 (0.17)	0.77 (0.42)	0.73 (0.59)
average salary	0.56 (-0.02)	0.69 (0.25)	0.71 (0.33)
profit per employee	0.84 (-0.22)	0.89 (0.09)	0.69 (0.45)
profit per cost	0.23 (-0.60)	0.57 (-0.40)	0.58 (-0.06)
profit per fonds	0.70 (-0.52)	0.83 (-0.26)	0.65 (0.15)
physical capital per employee	0.20 (0.06)	0.32 (0.24)	0.53 (0.37)
export per sales	-0.41 (-0.23)	-0.35 (-0.09)	-0.23 (-0.10)
import penetration	0.15 (0.61)	-0.23 (-0.12)	-0.45 (-0.44)

By the end of 1992 spontaneous market relations started to come into force in Czech manufacturing - on one side labor intensive industries deconcentrated and capital intensive industries become more concentrated. This can be confirmed by correlation of physical capital per employee to the concentration level: the higher the physical capital per employee, the higher the concentration.

Significant negative correlation of import penetration and four-firm ration may signalize some barriers to import in highly concentrated industries such as tobacco or car production.

While all correlation computations have been carried on to relatively high aggregated level and concentration can be explained as exogenous to the division performance, the results of the analysis are tentative and preliminary.

In order to analyze whether higher productivity can be attributed to industry concentration or to the size of enterprise, the differences between performance of one largest and four largest enterprises in the division and the division average have been computed for 1989 and 1992 (see appendices 12-15). These differences have been than correlated with the concentration levels (four-firm ratios) by of division.

Results of the performance analysis of the largest producers, if compared to the average of the industry, are consistent with the hypothesis that a large size is connected with higher labor productivity. On the other hand no significant relation between size and profit-to-cost or profit per employee ratios had been found on the firm level.

The larger companies paid higher salary than is the average for industry and had higher average output than for the whole industry. The difference is greater for one-firm ratios than for four-firm ratios, which is consistent with the hypothesis that it is the size and not the concentration that matters in relation to the productivity. The difference also grew in 1992 in comparison to 1989. Possible explanation could be also the fact that in 1989 the four largest enterprises were often the only enterprises in the division.

The fact that the largest companies pay a higher salary and reach a higher output per employee cannot be explained by industry concentration. Concentration does not positively influence the productivity; on the contrary, the correlation is negative as the following computations correlation indicates:

corr ’92 (OD,CR4) = -0.52
corr ’89 (OD,CR4) = -0.46

OD.....the difference between output per employee of the four largest enterprises in the division and the division average output per employee.

There existed no significant correlation between the difference of average salary of the four largest companies and the average salary of division and the level of concentration :

corr ’92 (SD,CR4) = -0.25
corr ’89 (SD,CR4) = -0.31

SD.....the difference between the average salary in the four largest enterprises and the average salary for the division

No significant correlation has been found between the difference of the profit per employee in the four largest companies and average profit per employee in the division and the level of concentration:

corr'92 (PD, CR4) = -0.26
corr'89 (PD, CR4) = 0.13

PD.....difference in profit per employee in the four largest enterprises of the division and the average profit per employee for the division

Positive correlation of salary-to-output difference (of the four largest enterprises and division average) and level of concentration has been found:

corr'92 (S/O, CR4) = 0.48
corr'89 (S/O, CR4) = 0.65

S/O.....difference of the salary-to-output ratio of the four largest to the division average salary-to-output ratio

This finding can be consistent with the hypothesis that smaller enterprises are more labor-intensive and thus the difference decreases with the growth of the level of concentration.

4. Government policy and market structures during the transitional period

It was the state that contributed a major share to the establishment and continuous maintenance of highly concentrated industrial structures in centrally planned economies. The institutional framework of the economy functioning and its organizational structure were tuned to the centrally planned model of economic management.

In socialist countries, in compliance with the set of political and economic tasks, and under the impact of existing ideas on management in a socialist economy, a vast integration of small and medium enterprises was carried out. Large state owned enterprises were created from them. These administrative measures were put into practice with a high degree of consistency in Czechoslovakia, in two respects simultaneously.

On one hand, the private sector was completely liquidated and, on the other hand, the total number of enterprises was drastically reduced. Several thousand

enterprises operating in the manufacturing industries prior to the historical accident called "centrally planned economy" were squeezed into 727 state industrial enterprises by 1989.

Adoption of the above mentioned measures led to great distortion of size structures in CPEs and thus market structures as well. They were a direct consequence of market rejection as a means of ensuring economic equilibrium, and of accepting instead a doctrine of direct links along the central planning hierarchy.

Before 1989 supply of most commodities has been controlled by one or a few state enterprises and monopoly was a general phenomenon in the economy.[8] Economic arguments favouring creation of big enterprises were based on a hypothesis of continuously growing concentration of production capacities and on presumed economies of scale. Enterprises were fused by the criterion of product similarity, which resulted necessarily in concentration of organizational structure of industries. [9]

At the same time, a multi-tier system of vertical management was being created. The organizational structure, enabled the central authorities to control, by directives and operative management, the entire national economy. For the same reason, the development of organizational structures in local (the so-called communal or municipal) and cooperative industries developed along analogical patterns. The integration tendencies in local economy were even more pronounced than in the centrally managed industry. Large, territorial monopolized enterprises were created. [10]

Gradually, markets were administratively divided between the enterprises of local industry, cooperative enterprises and centrally managed enterprises (controlled by branch ministries). It was very difficult for the production cooperatives and local industry enterprises to enter industries reserved for centrally managed enterprises.

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[8] Zemplinerova, A. (1986 and 1989)

[9] The average number of plants for an enterprise in 1988 was 10.6 (in local industries average 17 plants). Analogical indicators are 1.25 and 1.38 for Austria and Great Britain respectively.

[10] The structural hierarchy of management was, characterized by an up to 6-tier management, the central body being the Ministry of Interior.

Monopolization of the economy represents an immanent feature of the directive-planned system of management not only due to the fact that the plan provided the basis for the monopoly of an enterprises. The roots of monopoly go much deeper.

The state set up numerous administrative and legal barriers isolating industries (product markets) from outside, which hindered establishment of any real competition, or even a threat of potential competition in the particular markets. Entry into an industry was barred, first of all, by the fact that the founding function was centered in the hands of state. The legal regulation of the founding activity was related directly at the issue of the state exercising the property rights regulatory function and determined the structure of individual markets.

Maintenance of monopolies was also related to the existing measures barring the exit from the branch. In spite of incessant economic arguments pointing out the necessity of structural changes, state authorities refused to accept declaration of bankruptcy as a means of solving the situation of inefficient state enterprises: such a solution would mean endangering the stability of the system.

Monopoly and oligopoly market structures were consolidated also as a result of autarkic policies and isolating domestic markets by means of state protectionism. Orientation towards self-sufficiency was inherent to the command system of management since any link with the world market meant a threat to inner stability. For the relatively small Czechoslovak economy such a policy led straight to a rapidly developing monopolization.

Pressure for the creation of highly concentrated industries was exerted not only "from above" (i.e. from the center) but also "from below", from the enterprise sphere.

The objective followed by enterprises in a centrally planned economy and by those in market economies, particularly the advantages connected with monopolies, may differ in the pattern but in the essence they are the same: a tendency to minimize effort or to maximize gains and to exclude uncertainty and risks which threaten them in the domain of their activities.

In their struggle for acquiring monopoly positions, the enterprises were motivated by an interes7un364(o9eresyoG8terprister6.)]TJ0 -1.14 TD±¼[(moefnter -1.140 -

convertibility, which would allow for increased domestic competition via imports. New starts-up are promoted , establishment of new enterprises stimulated. The expected effect of such a policy is the frequent spontaneous break-up of or liquidation of existing state enterprises and the subsequent emergence of an industrial structure based on market criteria. A constituent component of this approach is the creation of a new legal and institutional framework suitable for a competitive market economy.

Such an approach is naturally a long term process. Society thus bears the costs of monopoly and have to tolerate the monopolistic behaviour for a relatively long time.

The Czech government adopted in its policy towards demonopolisation this approach but only gradually. In some industries, for instance in telecommunications, barriers to entry still survive, while in others they are being removed gradually. Restriction on foreign trade such as import-surcharge has been gradually diminishing and ended by 1992 as well as restrictions on currency convertibility for current account transactions.

Development of the structures of some industries give evidence in favour of this approach. As mentioned above, the number of enterprises grew since 1989 in most of industries but with different intensity across industries. The number of enterprises in optical and medical instruments production increased 53x; in production of communication equipment 22x, in production of cars and trailers 13x,in clothing 12x and in furniture 10x. On the other side, the number of enterprises decreased 5x in production of business machines and PC (from 19 to 4) and oil refinery and coke manufacturing (from 6 to 4 enterprises). The number of enterprises grew only a little in technically highly concentrated industries such as rubber, metal working and chemicals (se appendix 7).

Another important factor influencing the concentration since 1989 is the diversification of size structure. While large enterprises grow as change of one-firm concentration ratios indicate, the number of small enterprises grow as well and their role in some manufacturing industries increased significantly. The result is a more diversified size structure of enterprises with an increase of inequality of size structures.

Table 9 **Role of small enterprises in manufacturing in the Czech Republic, 1992**

Industry	**Number of small enter-prises***	**Share in total employment of division****	**Share in total sales of division*****
Foodstuffs	360	3.6	2.3
Tobacco	--	--	--
Textile	95	0.9	1.4
Clothing	89	4.1	4.7
Leather and shoes	33	1.0	1.9
Wooden products	244	9.6	12.4
Paper	26	1.4	1.1
Printing & publishing	162	8.4	11.1
Oil and coal processing	4	0.2	0.1
Chemicals	64	0.9	0.9
Rubber & Plastics	136	4.9	6.7
Non-metal	146	1.9	2.9
Metal products	20	0.4	0.2
Metal construct.	533	6.2	10.0
Machinery	329	1.5	4.1
Business machines,PC	19	6.6	42.3
Electrical machines	147	2.9	5.1
Communication equipment	119	2.8	14.9
Optical,medical	105	2.7	11.2
Cars and trailers	49	0.6	0.7
Other transport	18	0.8	1.3
Furniture	254	3.9	7.6
Recycling	28	2.7	7.2
TOTAL	**2980**	**2.4**	**3.1**

* only enterprises with less than 25 employees 1992

** total number of employees of division including all employees of enterprises with more than 25 employees

*** total sales of division including the sales of enterprises with more than 25 employees

The development of enterprise size structure indicates positive trends in the concentration structure of the Czech industry in the sense of its adjustment to market economy standards. The main reasons for the radical change in the size structure were new start-ups, especially small and medium enterprises (SMEs), privatization and restitution.

The number of small businesses grew enormously during the last three years. As illustrated by the table 9, small enterprises with less than 25 employees, which are most probably new starts-up, play an important role in business machines & PC production, printing and publishing, rubber and plastics, communication equipment and optical and medical production, in which their share is more than 10 % even for the reduced sample (obtained from the Statistical office). It is estimated, that since the data available are only representative of small businesses, which are 1/3 to 1/10 of the existing enterprises, the share is in fact substantially higher.

The government policy, the legislation and the bank's policy were favourable for SME development after the revolution in 1989. Existing barriers to entry have been gradually removed, the approval process become less bureaucratic and the state provided tax advantages for small businesses with less than 25 people.

It was not difficult to obtain credit during the second half of 1990, 1991 and first half of 1992.[12] The banks did not require collateral other than assets on which the credit was provided, did not ask for credit history; required business plans were simple, often elaborated by bank officials. In addition, the state did not have a strong and sophisticated internal revenue service, which provided the possibility of tax avoidances.

All these together with the large potential of entrepreneurship, led to a boom of small business in the period of 1990 - 1992. In 1991 the number of private entrepreneurs increased from 379 thous. to 1,059 thous. The total underdevelopment of the small business sector grew through new start-ups, restitution, small scale privatization, and the division of big state enterprises into smaller units. Also the monopolistic structure provided numerous niches for SMEs activities, large field of opportunities, empty industries with great potential of growth.

[12]Relatively liberal credit policy was caused by the fact that the Central bank provided large amounts for re-finance credits, and the existing state banks did not consider the risk of providing credits to SMEs.

New starts-up have been attracted by better than "average" conditions (salaries regulation in the state sector allowed to attract labor to private enterprises).

Besides the boom of small businesses there were two waves of break-ups of large state enterprises, which contributed to the size structure diversification. The first wave of break-ups occurred in the early 1990s: in some industries, the number of enterprises doubled or tripled.

Most of the break-ups have been in response to requests from plants and units to become an independent enterprise. The strength for independence was often motivated by the entrepreneur intention and based on good knowledge of the plant or part of the enterprise. Usually only technically well-furnished plants which have a good chance for economic prosperity were requesting independence. More pure and weaker plants and enterprises endeavour to associate with the larger enterprises, relying on power based on size, and the open hand of the state.

These processes of spontaneous break-ups and deconcentration based on economic calculation have been held up by the decision of the government by the end of 1990. There were several reasons for stopping this break-up process. One reason for such a decision was the fear of the total collapse of the functioning of basic supplies for inhabitants. Government intended to quash an uncontrolled elementary process of privatization through the creation of the private joint stock companies or in cooperation with foreign firms. Limited experience and qualifications of existing managers is typical for these transactions. The managers pursued their own aims selling the enterprises at a very low price. It was also argued that from the ethical point of view, it was unfair that the same people who profited from their position in the communist era can again realize their privileges.

The main reason was the program of **large scale privatization**, which at the same time created space for a renewal process of the natural breakup of state enterprises. [13] It should release entrepreneurial activity, this time not only platonic, but also with a clear definition of property rights. It is expected that in this way the spontaneous demonopolization of many industries could be achieved. In addition to the mandatory (basic) privatization projects prepared

[13] Act on Large Scale Privatization, February 1991

by enterprise management, every juridical or physical entity had the legal right to submit competing privatization projects for part or all of any enterprise. There were about 4-5 competitive privatization projects per enterprise on average in the first wave of privatization.

Privatization projects are evaluated and approved by the Ministry of Privatization, which must decide if the enterprise will be privatized as a whole or restructured into several independently privatized units. Thus large scale privatization initiated and enabled the second wave of break-ups, which can be illustrated by the following table:

Table 10 **Number of industrial units before and after privatization project approval (as by February 1994)**

Industry	Number of enterprises prior to approval of privat. projects	Number of enterprises after approval of privat. projects
Ferrous metallurgy	20	51
Non-ferrous metallurgy	16	50
Chemicals and rubber	57	131
Machinery	303	676
Electronics	74	212
Building materials	119	280
Wood-processing industry	81	230
Metal products	18	41
Paper and cellulose	22	84
Glass, china and ceramic	55	159
Textiles	94	409
Apparel	23	72
Leather	19	72
Printing and publishing	31	50
Food-processing	198	683
Others	49	93
TOTAL:	**1179**	**3293**

Source: Ministry of Privatization, February 1994

The biggest problem is the big industrial state enterprises, which often operate in capital intensive industries and are not capable of changing their production in a program flexible manner. It is often asserted, that de-monopolization of these industries is connected with considerable social risks and thus also with political destabilization.

But the contrary is true: the longer the existence and maintenance of monopolies in the economy, the higher the social losses from these monopolies. Social and political commotions will thus be stronger and longer, if the monopolies will be artificially protected and retained by the state for a longer time. The liquidation of the state monopolies by the means of shock therapy is also not acceptable. In the GDR there has been a collapse of a the major part of the economy. The state is for this reason forced for a certain limited time to pursue a protectionist policy towards the domestic resident enterprises [14].

The dismantling of concentrated structures without any state intervention as well as privatization without using the free state property voucher system would probably be a very long-term process.

There is no doubt that deconcentration or breakups of state enterprises through the state authority would increase the number of enterprises in the industries much more quickly. [15] Nevertheless this variant is connected with certain risks as well.

Organizationally concentrated enterprises are composed of factories and plants which differ substantially in their levels of management, efficiency, past investment and future prospects. Cross-subsidization takes place very often between the plants which make up an enterprise.

Liberalization of prices, which was realized in January 1991 enabled to distinguish effective and non-effective enterprises, but the measure of cross-subsidization between the operational units of the enterprise remains hidden.

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[14]There exist for instance an 18 % surcharge on imported goods, import licensing and further limits of the foreign trade liberalization. A rather high devaluation of the czechoslovak currency by the end of 1990 led to protection of domestic producers (1 USD = 30 USD). For instance, in the paper industry the original 12 enterprises have been spontaneously - on their own request - broken up into 23 independent enterprises. A foreign consulting firm in its study suggested creating three big financially powerful enterprises by merging of all existing enterprises. The firm BATA asked in the first proposal for state protection of the shoe market from foreign competition for several years. The attempt to monopolize the whole distribution network of building materials is another example.

[15]The technical obstacles to decomposition are not so unsurmountable, as one often judges. Separate plants or factories are keeping accounting practices parallel with the whole enterprise. Also loans and debts are usually held separately. As further subsidiary criterion could be used local and technological separability of particular factories, plants and other operational units as it is already the case during the small scale privatization.

After the enterprise is broken up, an inefficient factory which had been subsidized by the rest of the enterprise would be apparent and such a factory could not - without other assistance - avoid bankruptcy or the required restructuring. The single radical decomposition of the state enterprises would likely increase the number of enterprises (as was already mentioned, one state industrial enterprise has an average 5-7 plants or local and technological separate units). Many of these new independent enterprises would go bankrupt, but it would be positive that these bankruptcies would concern only inefficient units, while when the big integrated enterprise go bankrupt, many potential effective units would be liquidated at the same time.

The other fear or risk consists in the fact that the government decision about enterprise division could be mistaken as well as the decision about forced mergers of enterprises in the framework of the CPE. Again the trade off between the costs of such a decision and the costs of the survival of the monopolies have to be considered.

Large enterprises often have considerable political power. Deconcentration would no-doubt lead to decreasing of their power in bargaining with the government. An oppressive heritage of a directive system is not only a highly concentrated monopolistic structure of the enterprise sphere, but also the structure of an economic center, created for the needs of the CPE.

The old patterns survive along with newly established institutions which signal gradual adjustment of central bodies to a pattern typical for liberal market economies. In considering this variant, the inertia of the surviving institutions of CPE as well as social values inherited from the command type of economy have to be taken into the account. Adjustment of state bodies to the new style of work and role of the state proceeds slowly. Even new ministries or agencies such as the Ministry of Privatization and the Fund of National Property cannot avoid the hierarchical inflexible structure of decision making, cannot overcome the information monopoly of management and the referent's power in influencing the privatization process.

The other problem for decision-making of governmental bodies is a lack of the clear rules and criteria. For instance, the privatization project selection and approval of privatization projects is based on a multi-criteria system, which is not explicitly defined. This provides space for manipulation based on the monopoly of information.

It is paradoxical that the state on the one hand pursues measures for eliminating monopoly, and on the other hand - often bona fide - creates monopolies. A general feature of creation of monopolies through state intervention is the conviction that in some industries the existence of monopoly will be more effective than laissez-faire and free competition. The state in such industries regulates prices, quality, quantity of output or number of enterprises in the industry.

Monopolies from regulation can be created also through tariffs, import surcharges or other protection policies. It is usual argued by the necessity of the competitiveness of domestic production on the world markets, concentration of capital, necessity in supporting of the selected industries etc.

But experiences from developed countries and the historical experience from CPEs witness against such regulative measures. Such policies lead often to the opposite: backwardness of domestic production, loss of competitiveness, lower industrial concentration and generally to the wasting of resources. Generally, unequal conditions for selected economic actors leads to monopoly from regulation.

One of the most important governmental agencies related to the topic of deconcentration is the Ministry of Economic Competition. In January 1991 parliament passed [16] the Competition Protection Act, which became effective in February 1991 and since then has been twice amended. The law is similar to EC legislation and the German Anti-cartel law. Up to now, the law on competition seems to be a weak vehicle to facilitate de-concentration. Approval of mergers is formal and application of the law bureaucratic: enterprises are frequently "strong enough" to defeat the will of the Ministry.

According to the Law on the protection of the competition "The dominant position in the market is held by an entrepreneur who supplies the relevant market in the course of the calendar year with at least 30% of supply of identical, comparable or mutually commutable goods."[17]

It gives the Ministry responsibility to perform deconcentration already prior to privatization. The Ministry should also approve each privatization project from the point of view of possible deconcentration during the privatization.

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[16] No 63/1991 Coll. of Law

[17] Article 9, Law on the protection of competition

The Ministry for Economic Competition should observe fair conditions for the starting competition (by illicit restriction of competition, controlling the mergers etc), which is the classical function of similar institutions in developed market economies. It should fulfil also the specific - temporal function, which consists of active liquidation of concentrated markets in which enterprises are abusing the monopoly position, i.e. inherited monopolies.

The main dilemma of this office is the choice of one of variants of demonopolization described above choose or prefer.
Antimonopoly committees or offices in market economies usually deal with tens of cases yearly. Some of the cases have to be decided by the court and last years. In the former CPE, there are hundreds of such enterprises, for which the share in the market exceeds 30%. If only from organizational-technical reasons, it is impossible to deal with all these cases in detail and provide sophisticated analysis of abusing the monopoly position. That is why the Ministry should apply the indirect method of demonopolization as well and care about competition by removing existing entry barriers, creating a climate for fair competition, i.e. equal conditions and rule for all enterprises.

Generally, anti-monopoly policy is a delicate issue. On the one hand, it provides a means of threatening enterprises to limit their abuse of monopolistic positions. On the other hand, an overly active anti-monopoly office can repeal foreign investors.

3.1. A comparison of concentration with Austria

The deformation of the particular market structures or their adjustment to the market economy can be proved by the computations of the concentration ratios with similar or same industries in market economies.[18]

[18] Pryor, F.L.(1972)

Table 11 **Concentration Comparison Austrian and Czech two-digit Industries***

	Austria CR4	Czech Republic CR4
mining and iron production	100.0	77.7
oil and refinery	99.0	100.0
glass industry	84.9	56.0
transport means	60.6	60.4
iron foundry (casting)	46.2	44.4
paper production	45.9	60.2
non iron metallurgy	41.3	76.2
leather industry	41.1	50.9
paper processing	37.4	52.6
electrotechnics	33.7	15.0
ceramics	28.8	23.7
clothing industry	26.3	52.4
metalworking	25.9	31.9
chemical industry	19.0	39.4
woodprocessing	16.9	28.0
sawing, timber	13.1	57.1
textile	11.9	16.5
foodprocessing	11.8	16.0
mechanical engineering	11.2	10.5

Source: Czech Statistical Office 1992 own computations, QENB WIFO

* The concentration ratios can be different from the previous tables because of different division's break down (we had to adjust to the available Austrian data) and the number of enterprises involved. For the previous tables the reduced number of enterprises have been used. The reason is that for the correlation computations the detailed information on cost and profit were necessary, which were not available for all enterprises.

The data for the comparison with Austria are for 1988 year and domestic sales are not corrected for imports and exports. Market concentration in stable market

economies does not develop quickly over years and the correction for exports or imports does not greatly change the concentration measures. As for the Czech Republic, the compared measures of concentration are also not corrected for export and imports and correspond with the chapter 2.1.

Although Austria is traditionally an economy with relatively high concentrated industries, the respective concentration ratios are in most industries higher in Czech Republic.

Significantly higher concentration levels can be found in foodprocessing industries such as meat or milk products or timber and sawing products in which the creation of so called local monopolies and monopsonies is threatening. On the other hand, lower levels of concentration in comparison to Austria are in so called Czech traditional industries such as glass, china, ceramics or textile, in which concentration capacities are low and investments were retained during the period of centrally planned economy. These aspects reveal the analysis on the three-digit level.

The leather and shoes and the clothing industry seem to continue to be over-concentrated, thanks to the organizational concentration.

Table 12 **Comparison of the concentration with Austria***, three-digit level

Range of the share of four largest producers in the total output of the group	Austria number of groups	Czech Republic number of groups
00.01 - 30.00	21	2
30.01 - 50.00	15	7
50.01 - 100.00	26	53
Total number of groups	62	62

* Number of groups is lower than in the following tables, because only matched groups of products are included, for which data were available for both countries.

A comparison of concentration levels with matched industries in Austria led to the conclusion that market structures in the Czech manufacturing industries are converging towards market economy norms, nevertheless some distortions still survive.

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APPENDIX 1: **A description of the sources of data and notes on methodology**

The following data sets have been used for the statistical analysis of concentration:

(1) 727 industrial enterprises[19] operating in the Czech Republic in 1989 of which 652 were active in manufacturing[20]

(2) 1909 industrial enterprises with 25 and more employees[21] operating in the Czech Republic. 1759 of these enterprises are active in manufacturing

(3) 3042 small industrial enterprises with less than 25 employees operating in the Czech Republic in 1992 of which 2980 were active in manufacturing [22]. This data set is far from being complete and represents about 10 - 30% of the real number of industrial enterprises with less than 25 employees.[23]

(4) data on 463 products, of which 442 are products of manufacturing industries produced by 690 industrial enterprises in 1989

(5) data on 549 products, of which 451 are products of manufacturing industries produced by 2661 industrial enterprises in 1992

(6) data on import to the Czech Republic by SITC on three-digit level 1989 and 1992

(7) data sets (2), (3) aggregated into the 120 product groups (three-digit level according to NACE or OKEC), of which 92 are in manufacturing for 1992

(8) data sets (1), (2) and (3) aggregated into 30 divisions (two-digit level), of which 23

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[19] This number differs from the number given in the Statistical yearbook (430), in which enterprises creating a trust are not registered as independent economic units.

[20] In 1989 only enterprises controlled by sectoral (line) ministries were included in the analysis. Local enterprises or industrial cooperatives respectively are not included. In view of the relatively low levels of these enterprises' share, the resulting bias is unimportant.

[21] The actual number of all industrial enterprises registered by Czech Statistical Office is 2416. In the study the reduced number of enterprises is being used. The reason is that only in 1909 enterprises detailed data on financial activities such as cost and profits are available. The results of the analysis are not significantly influenced by this reduction because the remaining 507 enterprises represent a mere 5% of output and 5.8% of staff. Of the 1,909 enterprises, 349 are state enterprises, 776 joint stock companies, 462 limited liability companies, 247 cooperatives and 75 have other form of enterprise.

[22] For some computations, data sets (2) and (3) have been. merged

[23] From 3,042 enterprises, 1,764 are limited liability companies, 882 enterprise owned by one person, 91 joint stock companies, 59 cooperatives and 26 state enterprises.

are in manufacturing for 1989 and 1992

(9) groups and divisions matched with the (5) (the import statistics according to SITC classification on three-digit level to OKEC which is Czech analogy for NACE). 23 matched divisions have been obtained

Up to 1991 the Czech economy was classified according to JKONH (Unified Classification of economy by branches). The industrial activities were divided into 19 divisions and 82 subdivisions.

In 1992 a new classification was introduced, namely OKEC (Classification of Economic Activities by Branches) with 30 divisions and 126 product groups. This Classification is derived from NACE classifications.

The enterprises in 1989 were classified according JKONH. Therefore for the purposes of comparison with 1992 the data from 1989 had to be transformed into the OKEC classification. This fact might to some degree influence the comparability of both years.

Beside of these classifications of activities, the Czech industrial statistics uses product classification (about 440 products), more detailed than the product groups. Only limited data are available for this product classification, nevertheless there exist the possibility to measure the concentration.

The usual measures of concentration: number of enterprises, size structure of enterprises as well as Herfindahl index (H index) and concentration ratios (CR),i.e. share of one (CR1), two , three, four (CR4) etc. largest enterprises on the total output of the industry, are employed.

The measures are constructed differently:

Herfindahl index (H index) is a sum of all seller squared market shares. It takes all enterprises into the account:

$$H=\sum_{i=n}^{n} p_i^2 \quad where \quad p_i=\frac{x_i}{\sum_{j=1}^{n} x_j}$$

Four-firm Concentration Ratio (CR4) is the share of output (domestic supply) accounted for by the four largest sellers

$$CR4=\frac{\sum_{i=1}^{4} x_i}{\sum_{i=n}^{n} x_i} \quad where \quad x_i \geq x_{i+1}$$

One-firm Concentration Ratio (CR1) is share of output accounted for by the largest seller

$$CR1 = \frac{\max x_i}{\sum_{i=n}^{n} x_i} = \max p_i$$

Concentration ratios include only **the largest producers/sellers** in the market and thus do not provide the full information about the whole structure of the market but only about the largest enterprises. If, for instance, CR4 is 50%, the remaining 50% of the market can be supplied by 10 or 100 enterprises.

Herfindahl index includes **all enterprises,** but is influenced by large enterprises. H index maximum = 1 (or 100%). H index minimum = 1/n shows the even division of market shares. If the division of shares in the market is equal, H index is the reciprocal value of the number of enterprises.

Herfindahl index and concentration ratios have significantly correlated results. All are negatively correlated to the number of enterprises.

Output or domestic demand can be computed

- without the correction for exports and imports
- with the correction for exports and imports

While imports are computed from SITC statistics, exports are computed from enterprise statistics (1) and (3), which seem to be more reliable.

Correlation analysis uses usual statistical correlation coefficient.

$$r = \frac{n\Sigma x_i y_i - \Sigma x_i \Sigma y_i}{\sqrt{[n\Sigma x_i^2 - (\Sigma x_i)^2][n\Sigma y_i^2 - (\Sigma y_i)^2]}}$$

for i = 1,2,...*n*.

The results of computations were tested on the level of significance 0.05, e.g. critical value of r for 23 divisions is 0.41.

APPENDIX 2: **One-firm concentration ratios by manufacturing divisions 1989 and 1992 (domestic supply not adjusted for exports and imports)**

Industry	CR1 1989	CR1 1992	Change 1989-92
Foodstuffs	5.76	6.04	+0.28
Tobacco	100.00	100.00	0.00
Textile	7.51	4.65	-2.86
Clothing	20.24	24.20	+3.96
Leather and shoes	51.19	26.30	-24.89
Wooden products	18.81	10.05	-8.76
Paper	24.08	21.30	-2.78
Printing & publishing	12.74	12.34	-0.40
Oil & coal processing	56.13	55.21	-0.92
Chemicals	14.29	16.36	+2.07
Rubber & Plastic	15.41	22.85	+7.44
Non-metal	10.15	12.09	+1.94
Metal	20.95	25.08	+4.13
Metal construct.	7.62	9.41	+1.79
Machinery	9.49	4.63	-4.86
Business machines,PC	29.79	49.83	+20.03
Electrical machines	9.85	6.79	-3.06
Communication equipment	58.31	12.62	-45.69
Optical, medical	100.00	9.63	-9O.37
Cars and trailers	75.37	54.12	-21.25
Other transport	19.60	36.39	+16.79
Furniture	13.41	8.81	-4.60
Recycling	32.10	21.79	-10.31

APPENDIX 3: **One-firm concentration ratios by manufacturing divisions 1989 and 1992 (domestic supply adjusted for exports and imports)**

Industry	CR1 1989	CR1 1992	Change 1989-92
Foodstuffs	4.83	4.75	-0.08
Tobacco	68.86	68.65	-0.21
Textile	5.03	4.89	-0.14
Clothing	11.06	9.94	-6.17
Leather and shoes	41.67	20.31	-21.36
Wooden products	17.62	8.98	-8.69
Paper	22.65	14.58	-8.07
Printing & publishing	13.66	9.06	-4.60
Oil & coal processing	32.60	36.44	+3.84
Chemicals	9.55	5.95	-3.60
Rubber & Plastics	12.60	11.53	-1.07
Non-metal	8.10	6.21	-1.89
Metal	17.49	21.46	+3.97
Metal construct.	7.30	7.13	-0.17
Machinery	6.30	2.56	-3.74
Business machines,PC	24.46	0.85	-23.60
Electrical machines	5.00	4.59	-0.41
Communication equipment	9.15	3.03	-6.12
Optical, medical	4.29	4.12	-0.17
Cars and trailers	48.59	29.80	-18.79
Other transport	13.10	17.32	+4.22
Furniture	5.24	5.56	+0.32
Recycling	32.73	17.99	-14.74

APPENDIX 4: **Four-firm concentration ratios by manufacturing divisions 1989 and 1992 (domestic supply not adjusted for exports and imports)**

Industry	CR4 1989	CR4 1992	Change 1989-92
Foodstuffs	19.46	17.55	-1.91
Tobacco	100.00	100.00	0.00
Textile	20.66	17.10	-3.56
Clothing	60.74	52.40	-8.34
Leather and shoes	79.80	52.17	-27.63
Wooden products	56.43	33.68	-22.75
Paper	67.45	60.19	-7.26
Printing & publishing	47.01	36.38	-10.63
Oil and coal processing	98.46	100.00	+1.54
Chemicals	45.71	40.21	-5.50
Rubber & Plastics	48.49	51.79	+3.30
Non-metal	23.07	26.05	+2.98
Metal	61.42	66.61	+5.19
Metal construct.	25.14	26.67	+1.53
Machinery	19.28	14.06	-5.22
Business machines,PC	60.89	100.00	+39.11
Electrical machines	30.43	24.15	-6.28
Communication equipment	100.00	39.55	-60.45
Optical, medical	100.00	31.93	-68.07
Cars and trailers	100.00	75.66	-24.34
Other transport	48.19	61.56	+13.37
Furniture	49.96	26.78	-23.18
Recycling	90.70	64.95	-25.75

APPENDIX 5: **Four-firm concentration ratios by manufacturing divisions 1989 and 1992 (domestic supply adjusted for exports and imports)**

Industry	CR4 1989	CR4 1992	Change 1989-92
Foodstuffs	16.70	12.73	-3.97
Tobacco	68.86	68.65	0.21
Textile	17.90	15.55	-2.35
Clothing	39.14	22.92	-16.22
Leather and shoes	65.45	45.39	-20.06
Wooden products	53.87	28.64	-25.23
Paper	58.58	38.57	-20.01
Printing & publishing	43.98	27.08	-16.90
Oil and coal processing	59.73	68.65	+8.92
Chemicals	30.33	20.08	-10.25
Rubber & Plastics	40.84	33.47	-7.37
Non-metal	21.05	19.07	-1.98
Metal	53.19	55.19	+2.00
Metal construction	22.88	26.86	+3.98
Machinery	12.04	8.32	-3.72
Business machines,PC	56.17	1.60	-54.57
Electrical machines	18.11	15.74	-2.37
Communication equipment	15.34	9.87	-5.47
Optical, medical	4.29	12.76	+8.47
Cars and trailers	61.64	46.74	-14.90
Other transport	38.38	36.61	-0.23
Furniture	19.09	14.76	-4.33
Recycling	90.38	53.32	-37.06

APPENDIX 6: **Herfindahl index by manufacturing divisions, 1989 - 1992 (domestic supply adjusted for exports and imports)**

Industry	H index 1989	H index 1992	Change 1989-1992
Foodstuffs	2.40	1.19	- 1.21
Tobacco	100.00	100.00	- 0.00
Textile	2.98	1.95	- 1.03
Clothing	12.33	8.92	- 3.41
Leather and shoes	30.12	10.20	- 19.92
Wooden products	11.30	4.02	- 7.28
Paper	14.27	9.38	- 4.89
Printing & publishing	8.92	4.49	- 4.43
Oil and coal processing	42.66	42.63	- 0.03
Chemicals	7.55	6.24	- 1.31
Rubber & Plastics	8.54	8.32	- 0.22
Non-metal	3.29	3.10	- 0.19
Metal	11.19	13.69	+ 2.50
Metal construct.	3.41	2.41	- 1.00
Machinery	2.07	1.16	- 0.91
Business machines, PC	13.64	25.74	+ 12.10
Electrical machines	5.24	3.19	- 2.05
Communication equipment	51.38	5.03	- 46.35
Optical, medical	100.00	4.18	- 95.82
Cars and trailers	60.05	31.10	- 28.95
Other transport	7.80	14.98	+ 7.18
Furniture	9.08	2.42	- 6.66
Recycling	23.57	13.50	- 10.07

APPENDIX 7: **Number of industrial enterprises by manufacturing industries, 1989 and 1992***

Industry	**1989**	**1992**	**Change**
Foodstuffs	89	277	+188
Tobacco	1	1	-
Textile	48	115	+67
Clothing	11	59	+48
Leather and shoes	10	53	+43
Wooden products	13	59	+46
Paper	10	39	+29
Printing & publ.	15	65	+50
Oil & coke manuf.	6	4	- 2
Chemicals	30	54	+24
Rubber & Plastics	19	48	+29
Non-metal products	53	135	+82
Metals	31	44	+13
Metal constructions	50	157	+107
Machinery	144	280	+136
Business machines (PC)	19	4	- 15
Electrical machines	25	59	+34
Communication equipment	2	34	+32
Optical,medical instr.	1	45	+44
Cars and trailers	3	33	+30
Other transport	47	39	- 8
Furniture	19	141	+122
Recycling	6	14	+8
Total Manufact.	652	1759	+1107

* only enterprises with 25 and more employees

APPENDIX 8: **Change of one-firm concentration ratios by products, 1992 versus 1989***

	I.	II.	III.
Foodstuffs	14	16	0
Tobacco	0	0	1
Textile	18	17	0
Clothing	3	3	0
Leather and shoes	1	10	0
Wooden products	2	8	0
Paper	4	5	0
Printing & publishing	1	2	1
Oil and coal processing	3	0	0
Chemicals	21	13	2
Rubber and Plastics	7	6	0
Non-metal	10	20	0
Metal	37	12	2
Metal construct.	11	20	4
Machinery	31	47	0
Business machines,PC	3	0	0
Electrical machines	10	8	2
Communication equip.	1	8	0
Optical, medical	3	11	0
Cars and trailers	1	9	0
Other transport	5	5	0
Furniture	4	13	0
Recycling	3	2	0
Total number of products	193	235	12

* domestic supply not adjusted for exports and imports

I ..... number of products, in case of which share of largest producer increased in 1992 compared to 1989

II..... number of products, in case of which share of largest producer decreased in 1992 compared to 1989

III.... number of products, in case of which share of largest producer remained unchanged

APPENDIX 9 **Change of four-firm concentration ratios by products 1992 vs.1989***

	I.	II.	III.
Foodstuffs	5	22	3
Tobacco	0	0	1
Textile	8	25	2
Clothing	0	5	1
Leather and shoes	0	10	1
Wooden products	1	7	2
Paper	0	8	1
Printing & Publishing	0	2	2
Oil and coal processing	2	0	1
Chemicals	14	14	8
Rubber and plastics	3	8	2
Non-metal	4	18	8
Metal	13	13	25
Metal construct.	6	23	6
Machinery	27	45	6
Business machines,PC	1	1	1
Electrical machines	4	12	4
Communication equip.	1	8	0
Optical, medical	2	11	1
Cars and trailers	1	6	3
Other transport	4	6	0
Furniture	2	15	0
Recycling	1	4	0
Total	99	263	7

* (domestic supply not adjusted for exports and imports)

I ..... number of products, in case of which share of four largest producer increased in 1992 compared to 1989

II..... number of products, in case of which share of four largest producer decreased in 1992 compared to 1989

III.... number of products, in case of which share of four largest producer remained unchanged

APPENDIX 10: **Change of Herfindahl index in 1992 versus 1989 by products***

	I.	II.	III.
Foodstuffs	12	18	--
Tobacco	--	--	1
Textile	10	25	--
Clothing	2	4	--
Leather and shoes	1	10	--
Wooden products	2	8	--
Paper	3	6	--
Printing & publishing	1	2	1
Oil and coal processing	2	1	--
Chemicals	20	14	2
Rubber and plastic	5	8	--
Non-metal	8	22	--
Metal	35	14	2
Metal construct.	10	21	4
Machinery	30	48	--
Business machines ,PC	3	--	--
Electrical machines	10	8	2
Communication equip.	2	7	--
Optical, medical	3	11	--
Cars and trailers	3	7	--
Other transport	6	4	--
Furniture	4	13	--
Recycling	1	4	--
Total	163	225	12

* (domestic supply not adjusted for exports and imports)

I ..... number of products, in case of which H index increased in 1992 compared to 1989

II..... number of products, in case of which H index decreased in 1992 compared to 1989

III.... number of products, in case of which H index remained unchanged

APPENDIX 11: **Share of exports on the total sales by manufacturing divisions 1989 and 1992 (in per cent)**

Industry	1989	1992	Change 1989 - 1992
Foodstuffs	5.51	8.15	+ 2.64
Tobacco	0.88	2.00	+ 1.12
Textile	24.34	35.28	+10.94
Clothing	37.58	47.50	+ 9.92
Leather and shoes	30.56	30.08	-0.48
Wooden products	19.74	30.58	+10.84
Paper	15.17	26.75	+11.58
Printing & publishing	6.95	7.14	+0.19
Oil & coal processing	25.73	16.30	-9.43
Chemicals	17.36	27.72	+10.36
Rubber & Plastics	10.96	24.86	+13.90
Non-metal	22.18	35.26	+13.08
Metal	15.96	31.74	+15.78
Metal construct.	14.71	19.41	+4.70
Machinery	27.78	21.21	-6.57
Business machines,PC	27.49	28.21	+0.72
Electrical machines	18.34	19.68	+1.34
Communication equip.	11.91	28.61	+16.70
Optical, medical	12.03	16.88	+4.85
Cars and trailers	33.66	36.74	+3.08
Other transport	23.70	24.41	+0.71
Furniture and other products	30.95	42.82	+11.87
Recycling	2.44	22.69	+20.25
TOTAL	18.32	23.91	+5.59

APPENDIX 12: **Average salary, output per employee and profit per employee in the largest enterprise compared to the division average, 1992**

Industry	I.	II.	III.
Foodstuffs	105	77	61048
Tobacco	100	100	0
Textile	102	102	-12455
Clothing	117	115	7782
Leather and shoes	111	105	-7559
Wooden products	104	87	-3073
Paper	116	166	-86954
Printing & publishing	132	201	80970
Oil and coal processing	102	77	-166738
Chemicals	127	170	-61131
Rubber & Plastics	126	143	70628
Non-metal	131	262	28916
Metal	117	144	63545
Metal construct.	132	1559	257806
Machinery	90	132	-101850
Business machines,PC	108	122	64939
Electrical machines	101	111	-5124
Communication equip.	101	232	-140687
Optical, medical	118	155	-44554
Cars and trailers	124	208	169944
Other transport	101	98	19306
Furniture	106	168	9832
Recycling	114	124	-94703

I..... average salary in largest enterprise to the average salary for division in per cent

II..... output per employee in largest enterprise to the average output per empl. in the division in per cent

III.... profit per employee in largest enterprise minus the average profit per employee in the division in krowns

APPENDIX 13 **Average salary, output per employee and profit per employee in the largest enterprise compared to the division average, 1989**

Division	I	II	III
Foodstuffs	97	213	-1153
Tobacco	100	100	0
Textile	105	141	12948
Clothing	107	102	4023
Leather and shoes	110	113	1393
Wooden products	101	104	6434
Paper	102	120	20377
Printing & publishing	120	134	-25097
Oil and coal processing	102	84	22084
Chemicals	110	137	-18214
Rubber & Plastics	117	133	6562
Non-metal	110	114	-37263
Metal	104	132	35956
Metal construct.	107	101	7665
Machinery	102	92	-7666
Business machines,PC	107	135	1571
Electrical machines	97	89	-8992
Communication equip.	101	93	-5420
Optical, medical	100	100	0
Cars and trailers	101	112	-18349
Other transport	108	92	4855
Furniture	99	120	-4436
Recycling	100	132	68687

I..... average salary in largest enterprise to the average salary for division in per cent

II.... output per employee in largest enterprise to the average output per empl. in the division in per cent

III.... profit per employee in largest enterprise minus the average profit per employee in the division in crowns

APPENDIX 14 **Average salary, output per employee and profit per employee in the four largest enterprises compared to the division average, 1992**

Division	I	II	III
Foodstuffs	103	125	31643
Tobacco	100	100	0
Textile	112	157	-2556
Clothing	109	113	4840
Leather and shoes	113	123	-2967
Wooden products	100	100	5359
Paper	113	147	-7580
Printing & publishing	105	149	-15955
Oil and coal processing	100	100	0
Chemicals	106	107	8627
Rubber & Plastics	115	143	57460
Non-metal	120	213	77242
Metal	106	107	23350
Metal construct.	124	144	26545
Machinery	98	138	-11475
Business machines,PC	100	100	0
Electrical machines	105	209	64723
Communication equip.	102	104	-17126
Optical, medical	98	115	4147
Cars and trailers	106	129	21566
Other transport	100	111	23716
Furniture	114	99	23261
Recycling	118	141	8946

I... average salary in the four largest enterprises to the average salary for division in per cent

II... output per employee in the four largest enterprises to the average output per empl. in the division in per cent

III... profit per employee in the four largest enterprises minus the average profit per employee in the division in crowns

APPENDIX 15 **Average salary, output per employee and profit per employee in the four largest enterprises compared to the division average, 1989**

Division	I	II	III
Foodstuffs	101	199	3038
Tobacco	100	100	0
Textile	103	117	3531
Clothing	102	102	1289
Leather and shoes	104	109	46
Wooden products	100	107	2450
Paper	104	121	25854
Printing & publishing	104	124	-845
Oil and coal processing	100	104	4010
Chemicals	103	104	-8671
Rubber & Plastics	106	139	8610
Non-metal	109	137	7920
Metal	101	90	-4537
Metal construct.	108	118	2768
Machinery	100	108	-9757
Business machines,PC	101	106	-898
Electrical machines	95	104	-6292
Communication equip.	100	100	0
Optical, medical	100	100	0
Cars and trailers	100	100	0
Other transport	103	115	6140
Furniture	100	124	457
Recycling	102	107	10152

I.... average salary in the four largest enterprises to the average salary for division in per cent

II... output per employee in the four largest enterprises to the average output per empl. in the division in per cent

III... profit per employee in the four largest enterprises minus the average profit per employee in the division in crowns

APPENDIX 16 **Comparison of Concentration in selected Austrian and Czech Industries***

	Austria H index in %	Czech Republic H index in%
Oil and refinery	73.8	30.6
Glass industry	32.4	12.9
Transport means	21.4	17.4
Iron foundry (casting)	0.04	7.7
Paper production	8.0	17.1
Non iron metallurgy	5.5	18.9
Leather industry	6.5	10.2
Paper processing	5.9	10.3
Electrotechnics	4.2	1.7
Ceramics	2.9	2.5
Clothing industry	2.7	8.9
Metalworking	3.9	4.8
Chemical industry	1.3	6.2
Woodprocessing	1.1	3.3
Sawing, timber	0.6	10.1
Textile	0.9	2.0
Foodprocessing	0.7	1.2
Mechanical engineering	0.6	0.9

Source: Czech Statistical Office 1992 own computations, QENB WIFO

* Concentration level can be different from the previous tables because of different division's break down (we had to adjust to the available Austrian data) and number of enterprises involved. For the previous tables reduced number of enterprises have been used. The reason is than for the correlation computations the detailed information on cost and profit were necessary, which were not available for all enterprises.