RESTRUCTURING AND MEASUREMENT OF EFFICIENCY IN FIRMS IN TRANSITION

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A B S T R A C T

In this paper we try to explain some restructuring patterns of Czech textile and clothing industries from a microeconomic point of view. We introduce two measures of production efficiency (technical and allocative efficiency) and look at changes in the behaviour of enterprises. In 1994, after the chaos during the culmination of transition (1991-92), firms' profits showed the first signs of dependency on efficiency. This fact can be taken as evidence of the creation of a competitive environment and a signal that long-term restructuring has led to economic patterns characteristic for standard market economies.

Keywords: transition, efficiency, production function, capital hoarding, Czech Republic.

A B S T R A K T

V článku se usiluje o vysvětlení chování výrobců v podmínkách poklesu efektivnosti při restrukturalizaci výroby v českém textilním a oděvním průmyslu. Rozlišují se dva druhy efektivnosti výroby (tzv. technická a alokativní) a měří se jejich úroveň v období 1991-94. V roce 1994, kdy už podniky měly za sebou období chaosu a nejhlubšího poklesu poptávky (1991-92), se poprvé objevily známky hromadné závislosti výše zisků na efektivnosti výroby. Tento fakt je interpretován jako důkaz tendence, že po předchozím tříletém období transformace došlo ve většině případů k prosazení konkurenčního tržního prostředí alespoň na takové úrovni, která by už umožňovala přejít na kvalitativně vyšší stupeň restrukturalizace, jaký je znám ze standardních tržních ekonomik.

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1. Introduction

It has become routine that praise for the Czech macroeconomic results is accompanied with a disclaimer that microeconomic adjustment has not proceeded at the same rate, and that especially in large firms (e.g., former state-owned enterprises undergoing privatisation under the voucher scheme), the process of restructuring is still in the beginning stages. [3] In this paper we consider the process of restructuring in Czech textile and clothing firms, i.e., in two industries most harshly hit by the liberalisation of the economy. We try to show that the tendency to create competitive market-oriented firms was already apparent in 1994.

Let us first provide a short introduction to the situation in the Czech industrial sector before 1995. According to official data, the real output (GDP) in the Czech Republic declined 26 per cent between 1990 and 1993, followed by a growth of 2 per cent in 1994. From 1990 to 1993, labour was cut by 19 per cent and the output in manufacturing by 24 per cent. The fundamental argument for such a decline is the loss of artificially contrived demand.

However, the aggregate state of the economy cannot be considered separately from developments within firms. We analyse the efficiency of production (Y) in a competitive industrial framework and assume that each firm (i = 1, 2, ..., N) has constant returns to scale technology:

$$\mathbf{Y}_i = \mathbf{A}_i * \mathbf{f}(\mathbf{K}_i, \mathbf{L}_i)$$

We also assume that the function **f** is industry specific, coming from the fundamental properties of the technological process and reflecting the degree of capital (K) and labour (L) intensity of the production in industry. Thus, all firms in a given industry are described by the same function **f**, while the parameter $\mathbf{A}_i$ is specific for every particular firm *i* of the industry and

[3] This general approach was best summarised in the Financial Times (19 December 19, 1994, “FT Survey on the Czech Republic,” pp. i-viii) in which "macro" praises are accompanied with cautious "micro" reserves. For example: "[In the Czech Republic] the most painful part of microeconomic adjustment at the enterprise level is probably to begin" (p. i). "Czechs ... have hardly started the painful micro-economic surgery on former state-owned enterprises" (p. iii).

reflects its technical abilities. Therefore, every firm is fully described from a technological point of view by the set {$\mathbf{A}_i$, **f**}.

The suggested path of a firm during transition is shown in Figure 1.[4] The original technological and economic situation in production of this firm is depicted by unit-value isoquant Y_1 and its tangent unit-value isocost line based on given level of wages {w} and capital rental rates {r}. The demand shock occurred in 1991-93 when production was falling. At the beginning of transition (in 1991), the demand shock caused a sharp fall in production, and coefficient **A** in the production function of our firm decreased proportionally. This means that in 1991 its labour and capital were fully retained, and the unit-value factor inputs rose proportionally. Then firms started laying off labour (1992-3) but at a less intensive rate than the rate at which production had been falling. At the end of 1993 the firm reached the trough on its path of contraction when production fell by 50% relative to 1990. The amount of the sunk physical capital per unit of output was at its peak. In fact, the immobility of physical capital was the main cause of inefficiency. While in 1993, relative to 1990, output in our firm declined to half of the volume in 1990, and labour was cut by a third, yet capital was still kept in full.

In 1994, the decline in production ended and output slowly started to grow. However, the shedding of labour continued while the sunk physical capital decreased by only the rate of depreciation (or by natural wear and tear).[5] In 1995 production began to rise more significantly, and the coefficient **A** began a rising trend, shifting the unit-value isoquant back towards its original position of 1990. However, the sunk capital costs prevented **K/Y** from a faster decrease, compared to the more flexible rate of decrease in **L/Y.** Thus physical capital was significantly slowing the process of restructuring and the return of coefficient **A** to its

[4] The years shown in Figure 1 are hypothetical and may differ from firm to firm.

[5] This means that our enterprise in transition decided to retain its sunk capital, instead of scrapping and replacing it with new capital which is more productive. There are many reasons for such behaviour (see Benáček (1997)); the lack of financial resources (including the lack of credit) is one of the most important determining factors showing that, in its perverse logic, this behaviour is rational.

original value. In fact, it was this coefficient which was causing the drift of the points of factor allocation in Fig. 1 along their path of inefficiency in 1991-95.

Figure 1: Expected path of a firm with the problem of sunk costs during transition

Producers in large manufacturing firms under transition may often find themselves trapped in a situation in which the complete specificity of their capital makes them stay with the given capital endowment, which thus becomes a barrier to their exit from the market. In an extreme case of completely sunk capital costs, all parts of the firm's capital can be completely immobile for any economically productive alternative uses. This is one explanation of the capital "hoarding" tendencies in firms most severely hit by loss of demand due to transition.

The hypothesis of a return to the original level of efficiency assumes that the sunk capital is slowly recouped until the use of factors per unit of output gets again close to the starting point of 1990. At that point the process of transition and restructuring can be assumed closed, even though the old technology has still been retained. At the same time the total number of workers and the total capital have both been reduced proportionally by the level of cuts in production.

In our hypothesis neither innovation nor a change in prices was assumed. The process of transition has been marked by changing relative factor prices - namely the low value of the old capital. The general tendency to substitute relatively more expensive labour by cheaper old capital is depicted by a shift of the tangent unit-value isocost line to points $1/r_2$ and $1/w_2$. This has moved the optimal point of factor allocation on the original unit-value isoquant Y_1 slightly to the north-west, to the new intersection of the unit-value isoquant with a higher K/L ray.

2. Definition and measurement of production efficiency

From a microeconomic point of view, perfectly efficient firms minimise unit costs and lie on the same ray, which we call the optimal factor input mix **Φ**. This parameter, given by the slope of **Φ**, is common for all firms in the given industry. [6] We regard inefficiency in its dual meaning both as a deviation from the optimal input mix and as a deviation from the most cost-effective point on the ray of optimal input mix **Φ**. [7] Figure 2 presents both a perfectly efficient firm (at point X_e) and inefficient ones (at points X_a, X_b and X_c). The fact that the more efficient firm has a higher parameter **A**, e.g., firm X_b vs. X_a, means that this firm is located on a lower unit-value isoquant (labelled YY_1), and cost minimisation requires the choice of inputs at the tangency point between the unit-value isocost line and the unit-value isoquant (point X_e).

We use two types of efficiencies, which are similar to those used in the approach of Kopp and Diewert (1982). The first one, **technical efficiency (E_T)**, relates to the technological constant **A**. E_T measures how far the **unit-value** isoquant is from the origin. A more technically efficient firm with a **higher** parameter **A** has a smaller E_T "gap" relative to the ideal (i.e., the technologically most advanced) firm.

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[6] We assume the existence of common technologies for all firms in the given industry, resulting in characteristic factor intensities for an optimal (efficient) production of given industrial output.

[7] Farrell (1957) saw inefficiency as a realised deviation from an idealised isoquant of production under full

The second type of efficiency is **allocative efficiency (E_A)**. An allocatively inefficient firm deviates from the optimal (cost minimising) mix of inputs (deviations from the efficient ray OX_e, in Figure 2). This inefficiency can be caused by managerial failures when, at the given state of technology in the firm, there is a shortage in the use of one factor at the expense of more intensive use of the other factor which has lower marginal productivity. A reasonable assumption we make here is that the managers are not systematically wrong in choosing an input mix. Thus, the **average K/L** ratio over all firms in the industry can be taken as a rough approximation of the optimal factor mix. Our estimate of this average will define angle (γ), which will serve as a benchmark for the measurement of allocative efficiency.

Figure 2: The relationship between technical and allocative efficiencies

In Figure 3, the technical efficiency of firm F is represented by vector OD (measured along the optimal ray) while the optimal input mix is given by angle γ. The deviation from the optimal ray can be measured as the length of segment DF. Vector DF has a very easy interpretation: it shows the amount of inputs per unit of output that should be added or dropped by firm F in order to achieve the efficient input structure. We consider the linear distance DF as a measure of allocative efficiency of this firm.

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capacity and Pareto-optimal use of resources.

Figure 3: An alternative way of presenting technical and allocative efficiencies

Now, imagine that the firm described by point F in Figure 3 is faced with an adverse external shock. There can be a fall in its output prices, a fall in demand or social turmoil resulting in a decreased productivity of labour. Its parameter **A** is thus decreasing. In order to assess the effect of this shock, we assume that the firm still continues to use the same volume and the same proportion of inputs. That means that point F moves north-east along the same ray with angle β to point F'. Therefore, point D also moves along the same optimal ray (because of the homotheticity of the isoquants), to point D'. Thus, technical efficiency decreases (OD growing to OD'). Because angle β is supposed to remain unchanged, the length of FD increases to F'D'.

Finally, the technical efficiency of firm *i* is estimated by $(OD)_i$[8] and the allocative efficiency by $(FD)_i$. The algebraic expressions for these efficiencies are as follows:

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[8] Note that the right measure of technical efficiency should be segment OC. However, for relatively small values of angle b, segment CD is very small relative to OD and can be neglected.

$$E^i_T = \sqrt{l_i^2 + k_i^2}\cos(arctg\,(\frac{k_i}{l_i}) - arctg\,(\overline{\frac{k}{l}})) \qquad \mathbf{1}$$

$$E^i_A = \sqrt{k_i^2 + l_i^2}\sin(arctg\,(\frac{k_i}{l_i}) - arctg\,(\overline{\frac{k}{l}})) \qquad \mathbf{2}$$

where $\boldsymbol{k_i}$ is capital per unit-value of output, $\boldsymbol{l_i}$ is labour per unit-value of output, *i* is index of the given firm i, and the expression under the bar indicates the statistical mean of all k/l values in the given industrial statistical sample for all observations i.

Now we are ready to calculate the allocative and technical efficiency of individual firms. Taking the weighted average of the technical and allocative efficiencies, we can assess efficiencies (technical and allocative) for an industry of N firms:

$$E^{WHOLE}_{INDUSTRY} = \frac{\sum_{i=1}^{N} OUTPUT_i * \left|E_i\right|}{\sum_{i=1}^{N} OUTPUT_i} \qquad \mathbf{3}$$

Given the way we have constructed our measure of allocative efficiency, its average should be close to 0. Therefore, we estimate the allocative efficiency of an industry as a weighted average of the absolute values of individual efficiencies.

3. Empirical testing of efficiency [9]

The main source of data we used for the empirical testing is a database of approximately 2000 large Czech firms originally designed for the voucher privatisation scheme. The second resource are the official Czech industrial statistics compiled at the Czech Statistical Office (this also included a sample of small firms). It must be admitted that as the Czech economy underwent transformation, problems with the accuracy of statistics grew. This precluded us from using panel data for individual firms even for 1990–92. For a discussion of data and problems of restructuring former state-owned enterprises, see Boná□ek, Mejst□ík (1995), Corado, Boná□ek, Caban (1995) and Boná□ek (1997).

Our enterprise data cover the years 1990–1994. It should be noted that the figures for 1990 can be taken as a starting point for transition. With the exception of the first export losses on the East European markets and the devaluation of the Czech crown by 18 per cent, there were few fundamental changes in the functioning of the former centralised economy prior to 1990. 1991 was a year of dramatic breakthrough with price liberalisation, free trade, and a tight monetary and fiscal policy. 1992 with massive privatisation affecting approximately a third of production capacities was a year of relative stability. The following year, was marked mainly by the crucial restructuring of the whole fiscal system, and to a lesser extent, by the separation of Czechoslovakia.

In this paper we consider only large firms which, as we supposed, had similar basic technology. A typical pattern of a unit capital-labour scatter chart is shown in Figure 4. We can see that in 1992 many firms were very inefficient, with excessive capital and labour expenditure, and the enormous dispersion of observations was beyond anything expected in a functioning market economy. The dependence between capital-labour ratio and capital is given

[9] Our computations are based on comparing local efficiencies and their relative ranking within the given industry. We are circumventing the problem of comparing efficiency between the East and the West [see Bergson (1987), (1992)]. We are not attempting to make a comparison with other estimates of East European efficiency [see

in Figure 5. We discarded all firms which had capital less than the minimal capital among all firms in 1990 (the starting year of transition), because these firms were supposed to be new companies with different technology created after the year 1990. In the remaining sample, the dependence of capital labour ratio on the volume of physical capital (i.e. a size effect) was statistically insignificant.

In order to proceed with the efficiency analysis, we first need to estimate the capital-labour ratio pertinent to each particular industry. We have analysed three sorts of capital-labour ratios:

- average K/L ratio for the whole industry, $(K/L)_A$;

- average K/L ratio over firms with higher profitability than the average profitability of the industry, $(K/L)_H$;

- average K/L ratio over firms with lower profitability than the average profitability of the industry $(K/L)_L$.

Danilin et al. (1985)], which would require using the same methodology, for example, stochastic frontier production functions.

Figure 4: Unit capital-labour scatter plot for the textile industry in the Czech Republic, 1992

Figure 5: Dependence of the capital-labour ratio on physical capital

Table 3.1 presents the K/L ratios estimated from our sample of the textile and clothing firms and their percentage changes for 1990, 1991, 1992 and 1994. We used a total wage bill as a measure of labour in money, taking advantage of low wage differential among firms in this period.

Not surprisingly, the textile industry is more capital-intensive than clothing. More interesting is a different evolution of the ratios over time. In both industries the K/L ratio grew, but before 1994, the growth of the K/L ratio in the textile industry was more rapid than in clothing. Some minor investment did take place in the industries considered, but it cannot explain such a large increase in the K/L ratio. While in both industries a lot of workers were fired and their real wages decreased, the capital has remained nearly unchanged. This was the main pressure on the K/L ratio to increase. [10] However, these adverse developments were reversed after 1993. We can observe a stabilisation of the K/L ratio in the textile industry, while in the clothing industry this happened only in 1995.

[10] The firms were short of financial capital and credits for purchasing new equipment. Therefore, upgrading their old technology was not an alternative. Selling the surplus of old machinery was practically impossible in a time of general demand shock and scrapping it would have incurred an additional cost. Sunk labour is shown to be a lesser problem than sunk capital.

Table 3.1 : Capital-labour ratio estimates for the textile and clothing industries

Industry	Capital-Labour Ratios	1990	1991	1992	1994
Textile	Average of the whole industry	0.923 (0.292)	1.715 (0.569)	1.939 (1.079)	1.787 (1.141)
		100%	186%	210%	194%
	Average of more profitable firms	0.990 (0.307)	1.634 (0.530)	1.959 (1.142)	1.729 (1.161)
		100%	165%	198%	175%
	Average of less profitable firms	0.862 (0.267)	1.820 (0.607)	1.905 (0.978)	1.949 (1.083)
		100%	211%	221%	226%
Clothing	Average of the whole industry	0.356 (0.110)	0.557 (0.235)	0.561 (0.276)	0.968 (0.645)
		100%	156%	158%	272%
	Average of more profitable firms	0.352 (0.091)	0.547 (0.247)	0.526 (0.216)	0.838 (0.543)
		100%	155%	149%	238%
	Average of less profitable firms	0.363 (0.157)	0.566 (0.238)	0.600 (0.332)	1.249 (0.767)
		100%	156%	166%	345%

Note: variance in parentheses.

We also tested our sample for the presence of sunk costs by comparing how labour and capital responded to changes in real sales. Our test reveals the clear presence of sunk costs in both the clothing and textile industries in the years 1992–94. Both labour and capital responded to the loss of sales with a lag. If we analysed the trends in 1991-94, then the lag in labour shedding was nearly 2 years while the lag in the disposal of capital would hypothetically be up to 12 years.

We compared the development of K/L average ratios in the more profitable firms with those firms whose profits were below the industrial average. Thus, we tested the hypothesis that the more profitable firms were hit less severely by the problem of sunk capital. This means the less profitable firms were expected to show K/L ratios rising at a faster speed than the more profitable firms. This was particularly evident in the case of the clothing industry where the rising K/L ratios always proceeded faster than in the textile industry. This can also be taken as evidence that labour shedding and restructuring in the clothing industry proceeded faster than in the textile industry.

We use the average K/L over the whole industry as an estimate of the optimal input mix for a given industry. With that we can estimate the efficiencies by using the technique designed in Chapter 2 for the estimate of allocative and technical inefficiency: [11]

Table 3.2 : Technical and allocative inefficiency in the clothing industry

Year	Technical Inefficiency	Allocative Inefficiency	N
1990	4.52	0.25	12
1991	6.65	0.65	19
1992	5.63	0.58	38
1994	6.95	1.48	60

Table 3.3 : Technical and allocative inefficiency in the textile industry

Year	Technical Inefficiency	Allocative Inefficiency	N
1990	5.25	0.53	58
1991	7.89	0.78	81
1992	10.45	1.14	97
1994	9.56	1.33	132

Remark: N is the number of observations.

Since, by our definition, allocative efficiency is the deviation from the industrial

[11] For convenience, we use the terms *inefficiency* and *efficiency* interchangeably. Larger values of E_T and E_A imply greater **in**efficiency.

optimal K/L line Φ, its mean should be close to zero. (We assume that allocative inefficiency is distributed normally). The absolute value of allocative inefficiency gives us the most important information: it shows how large the dispersion in the inefficient use of resources is. The increase in both technical and allocative inefficiencies may indicate a widening gap in the quality of management or a widening span in the factor prices used in different firms.

A comparison of efficiencies over time can provide us only with a general assessment of industrial performance. We can see that there was an increase in technical and allocative inefficiency in both the textile and clothing industries. This is quite natural, given the enormous problems which challenged these industries during the early years of transition. Our argumentation regarding behaviour of producers in transition (see Figure 1) is thus, in general, consistent with these findings. Technical inefficiency increased at first, reflecting a decrease of parameter **A** in the production function, but stabilised afterwards. The increase in allocative inefficiency was almost the same for both industries at the beginning. However, by 1994 the allocative inefficiency in the clothing industry rose sharply. This increase can be partially explained by its faster rate of labour shedding (accompanied most probably by greater problems with sunk capital) and by more intensive break-ups of the large enterprises during privatisation. It should be also noted that if new smaller enterprises have different K/L ratios, the industrial allocative inefficiency may have increased more over time than the inefficiency of the original firms would have increased.

4. Does efficiency really relate to firms' profits?

The relationship between a firm's profitability and efficiency is of particular interest because it enables us to test the hypothesis that the market environment influences a firm's performance. Since an increase in inefficiency (i.e., a rise in our estimates of E - see Tables 3.2 and 3.3) is supposed to have a negative effect on profit per unit of output, our basic indicator of a firm's market performance, a significant relationship between inefficiency and profit would support the idea that the "invisible hand" was at work.

To test this we use the following specification:

$$\pi_i = Const + \alpha E_{T,i} + \beta \left| E_{A,i} \right| + \gamma\, Sign + \varepsilon_i \qquad \mathbf{4}$$

where π_i is the profit of firm *i* per unit of output,

$E_{T,i}$ is the technical inefficiency of firm *i*,

$|E_{A,i}|$ is the absolute value of allocative inefficiency of firm *i*,

"Sign" is a dummy variable representing the sign of allocative inefficiency. (Sign = 1 if k_i/l_i is greater than or equal to the industrial optimum, and sign = 0, otherwise.)

Before running this regression, we normalised unit capital **k** and unit labour **l** across the industry by dividing them by their maximal values, in order to determine their relative ranking. After that, we recalculated the optimal input mix and technical and allocative inefficiencies from this data which should not bias our estimates.

One can expect negative signs of α and β coefficients, since technical inefficiency reflects the use of inputs per unit of production, and allocative inefficiency reflects the divergence of the input mixed from the optimum.

Table 4 shows the results of the regression (4). It is apparent that the clothing industry behaved differently than the textile industry. Its smaller firms, divisibility of enterprises to smaller plants, easier privatisation, and closer access to the market for final consumption made efficiency in the clothing industry relevant from the very start of the transition. On the other hand, the textile industry with its huge plants, technologically dependent specialisation, problems with sunk capital costs, limitations regarding product innovation without investment, and nearly exclusive privatisation by vouchers resulted in behaviour beyond standard market oriented profit maximisation.

Table 4 : Estimates of coefficients for model (4)

Industry	Year	Const	E_T	E_A	Sign	R^2_{adj}	Meth.	N
Clothing	1990	0.348 (5.8)*	-0.072 (-1.24)	-0.465 (-2.4)+	-0.009 (-0.25)	0.42	OLS	12
	1991	0.873 (8.4)*	-0.916 (-8.4)*	0.30 (1.30)	-0.049 (-1.00)	0.79	OLS	19
	1992	0.786 (9.9)*	-1.10 (-8.5)*	0.044 (0.19)	-0.037 (-0.93)	0.73	RR	38
	1994	1.325 (10.5)*	-1.453 (-7.9)*	-1.766 (-4.4)*	-0.069 (-0.85)	0.71	RR	60
Textile	1990	0.312 (8.9)*	-0.035 (-0.6)	0.170 (0.8)	-0.047 (-1.77)	0.01	RR	58
	1991	0.509 (9.4)*	-0.448 (-3.8)*	0.378 (1.0)	-0.025 (-0.59)	0.15	RR	81
	1992	0.538 (11.2)*	-0.710 (-7.4)*	-0.406 (-1.6)	-0.033 (-0.92)	0.50	RR	97
	1994	1.112 (14.2)*	-2.460 (-2.5)+	-1.445 (-2.9)+	0.053 (0.88)	0.66	RR	132

RR = robust regression estimate
OLS = ordinary least square estimate
* = significance at 1 percent level
\+ = significance at 5 percent level
t-statistics in parentheses.

Based on the fact that in the textile industry our estimates for 1990 and 1991 are clearly weaker than those for 1992 and 1994, we conclude that during the early stage of transition the market economy could not have been functioning well. Profits were dissociated from allocative efficiency and their association with technical efficiency was weak. We can say that at that time profits in the majority of textile firms did not serve as an objective criterion for the allocation of resources. Profits could be endogenously manipulated inside the post-planning system of incomplete corporate governance and earned on the grounds of random or administrative decisions, e.g., manipulations by prices, taxes or subsidies, cheap acquisition of material input stocks, sales of assets, moral hazard, fraud, [12] etc.

The increase in the statistical significance of both coefficients in the textile industry for 1994 can be interpreted as a signal that the market economy had begun to operate. Before 1994 changes in profits might be explained by the changes in technical, but not in allocative efficiency. However, since 1994 trends in both efficiencies have been responsible for changes in profits. The low statistical significance of the dummy "sign" means that the allocative inefficiency, with its bias to an excessive use of labour or capital, was not an important factor for explaining its impact on profits.

The last test we did here concerns the interdependence between technical and allocative inefficiencies. Correlation between technical inefficiency and the absolute value of allocative inefficiency appeared to be weak and thus we could exclude the presence of multicolinearity in our model.

Now let us look at Table 5. It suggests that the years after 1992–93 might have been the turning point during which the J-curve of the Czech transformation reached its lowest point. Developments in 1994 and 1995 led to a break-even point and stabilisation. Given the strong negative correlation between profits and technical inefficiency, we can suppose from the rising profits in 1994 that the most painful part of the economic transformation in textile and clothing manufacturing was over, and that since 1994 those industries have been on an upward sloping growth trajectory, approaching conditions for standard patterns of market behaviour and

[12] Stripping an enterprise of its assets by non-owners and the channelling of these assets into private/personal/ use as a result of the chaos in ownership and the dominant position of agents over principals has produced the term "tunnelling" in the Czech Lands. Tunnelling became a national sport in large-scale entrepreneurship during the days of mass privatisation in practically all post-Communist countries. It is needless to say that its impact on efficiency in respective firms was disastrous.

development.

Table 5 : Profits in the textile and clothing industries, 1990–1994
(in mil. K□s, nominal prices)

Sector	1990	1991	1992	1993	1994
Textile	3960	4502	1396	-388	1779
Knitting	948	1184	446	-34	590
Clothing	615	443	324	473	620

Source: Statistics of the Ministry of Industry, Annual Report of ATOK (1994).

We can see from Tables 3.2 and 3.3 that the growth in technical inefficiency was not sharp for the clothing industry, while in the textile industry its initial dramatic rise was later stabilised. This is in accordance with the results of our regression (4). Note that we used profits per unit of output in regression (4), while Table 5 contains data on total profits. Evidence that total profits in both industries were closely related to the developments in technical efficiency and that the tendency toward falling profits was reversed indicates that restructuring in both industries was intensive and fruitful. The technical and institutional conditions for recovery were better in the clothing industry. The textile industry continued to have problems with corporate governance which the voucher privatisation method could not solve. Nevertheless, it was evident already in 1994 that both industries were far from calling off the restructuring. Stabilisation of the adverse trends has not been followed by a convergence back at least to the original level of technical efficiency. On top of that, in 1994 both industries were standing before the task of halting and reverting the divergence in their allocative inefficiency.

To summarise our results of the previous two empirical sections:

1. Dynamics of the K/L ratio show a rising pattern for both the textile and the clothing industries while their output was falling. In the period 1990–1994, this ratio in the clothing industry increased more than in the textile industry, reflecting the presence of sunk costs and more intensive labour shedding.
2. There was a growth in both technical and allocative inefficiencies in both textile and clothing industries. The stabilisation in technical inefficiency was achieved sooner than in allocative efficiency. The sharp growth in the allocative inefficiency did not show a pattern of attenuation. The sharp increase in allocative inefficiency in the clothing industry in 1994, accompanied by a minor increase in technical efficiency, could have been a result of break-ups of enterprises into smaller private units, where the more efficient smaller units escaped from our statistical sample.
3. Real profit per unit of output decreased with an increase in technical inefficiency. Starting from 1994, it also began to depend on allocative inefficiency, which could indicate the presence of the "invisible hand".

5. Conclusions

In this paper an attempt has been made to address the problem of falling production efficiency by applying a standard methodology aimed at quantifying the underlying processes.

The research was done on the Czech textile and clothing industries, which were among those most severely hit by the transition. The adjustment undertaken by the majority of these firms seemed paradoxical and was not marked by strategies widely used in the developed market economies under recession. For example, the behaviour of physical capital hoarding may be, at least partially, justified by the presence of sunk capital costs.

A microeconomic model explaining the behaviour of the textile and clothing firms in transition was introduced. A simplified technique of statistical estimate of technical and allocative inefficiencies was adopted and applied to data of the former state-owned enterprises in the textile and clothing industries. Empirical tests showed that efficiency in both studied industries revealed a sharply falling trend during 1991-94, while the capital-labour ratio was rising and the production was falling.

The test of the relationship between efficiency and profits of individual firms in 1990–1994 confirms that at the end of this period these two indicators were more strongly correlated than in 1990, the beginning of the transformation period. This signals that after the period of distorted profit maximisation behaviour, the market mechanism has begun to influence decisions about the optimal allocation of resources and thereby has set sound conditions for long-term economic progress in the economy as a whole.

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