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ABSTRACT

Efficiency and Market Share in the Hungarian Corporate Sector*

One of the major tasks facing a transition economy is to create the competitive environment of a properly functioning market economy. It is widely believed that competition has a positive effect on efficiency, but the theoretical and empirical support is quite scarce. The objective of this Paper is to investigate the link between competition and efficiency for the Hungarian corporate sector during various phases of the transition process. We employ frontier production functions for exploring differences among groups of firms and for identifying the typical adjustment process of each group separately throughout the transition period until 1997. Groups are defined according to industries, size and ownership.

The estimated production functions indicate a gradual improvement in efficiency and a shift from decreasing to increasing returns to scale due to a growing share of small firms entering the higher returns regime. Market shares can be explained by the degree of internal and external competition and by the efficiency of the firm.

The transitional recession in 1990–1 was followed by a fast consolidation period, with rapidly increasing firm level efficiency and improving returns to scale. This consolidation period ended in 1994–5 and afterwards mean firm level efficiency only changed slowly. Massive investments largely increased the market share of the better performing firms and sectors, resulting in rapid economic growth. However, this economic growth may become vulnerable if productive efficiency fails to improve faster.

JEL Classification: C23, D21 and D24
Keywords: efficiency, firm in transition economy and production functions

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NON-TECHNICAL SUMMARY

Hungarian firms have gone through different periods of economic transformation since the liberalization of prices and imports in 1988–9. Initially, most firms just waited and did not adjust their capacities to the fall in internal and external demand. Although many (usually small) private firms were established in the period 1988–91, the privatization of state-owned enterprises just started. The increased competition from both newly-emerging firms and from liberalized imports and, more importantly, the loss of the former CMEA markets, led to a severe recession and to a deep crisis of the banking sector in 1992–3. The adoption of new accounting standards and a tough bankruptcy law in 1992 contributed to the acceleration of restructuring, which was further enhanced by substantial foreign investment and the emergence of private firms. The March 1995 stabilization measures intended to re-establish the macroeconomic equilibrium in current accounts and in the general government budget and also to shift revenues to the corporate sector. As the privatization, accompanied by a substantial inflow of foreign capital, progressed, it created a favourable environment for better corporate performance.

This study tries to assess the development of corporate performance between 1990 and 1997 on a large, rather comprehensive sample. Dynamic Cobb-Douglas frontier production functions were estimated. Frontier production functions can directly measure productive efficiency and assess the speed of the adjustment process to the new, changed environment of the firms. The estimated efficiency was subsequently used to explain the firms' market share, together with import penetration and concentration.

The time path of the efficiency of various sectors is quite similar to the overall picture: Substantial drop in 1991, rapid growth until 1994 and a mild decline afterwards. Substantial deterioration of firm level efficiency in 1991 basically reflected the enormous capacity under-utilization of most firms, due to the sudden loss of important markets. First, firms had to adjust their capacities to the realities of the new market conditions, probably cutting excess capacities. They could efficiently use the productive inputs only afterwards. While practically all main sectors move to the same direction, important sectoral differences can be observed. Agriculture is usually the least efficient sector and it is clearly left behind by other sectors at the end of the sample period. Services and Manufacturing are the most efficient sectors in the second half of the sample.

There is a clear ranking in efficiency according to ownership: 1) foreign 2) important foreign 3) domestic private 4,5) other and state. The difference between the efficiency among firms in foreign and domestic private ownership is remarkable. It certainly reflects differences in market access. It may also

indicate that domestic private owners are very much constrained by the financial markets. It is curious that state-owned enterprises are not much less efficient than domestic privately owned firms, although most theoretical works would suggest that. However, fluctuations and the gap between the most and least efficient groups diminished, especially after 1994, indicating a move towards homogeneity and competition.

The ability to achieve the highest returns to scale in the relevant market can also be defined as efficiency in the use of productive inputs, in cost control. Smaller firms tend to have higher returns to scale than larger ones. Large firms are in the decreasing return to scale region for the entire sample, which may indicate still existing inefficiencies.

Market characteristics play a changing role during transition. Import competition, sectoral concentration and efficiency are important explanatory factors for the development of market share of a firm. Heterogeneity can be observed across sectors, according to ownership and to size. The differences, however, are not that large and were diminishing, which makes the hypothesis of the importance of market environment in the determination of corporate performance plausible.

Efficiency was usually significant in market share equation indicating that efficient firms gain market shares. The correlation between efficiency and profitability is usually significant, but between efficiency and investment it is not.

The 1990–7 period can be divided into three distinct sub-periods. Transition started by a sudden collapse of corporate efficiency, as one important element of the transitional recession. It was followed by a fast consolidation period, with rapidly increasing efficiency and improving returns to scale. During this period performance was frequently improved by downsizing, thus fast improving corporate performance could not be translated into economic growth. This consolidation period ended in 1994–5, after that mean firm level efficiency only changed slowly. However, the 1995 stabilization package created a favourable environment for substantial investments into the Hungarian corporate sector. These investments largely increased the market share of the better performing firms and sectors and the massive investments, together with substantial structural improvements, brought about rapid economic growth. However, this economic growth may become vulnerable if productive efficiency fails to improve faster.

1. Introduction

Hungarian firms have gone through different periods of economic transformation since the liberalization of prices and imports in 1988-9. Initially, most firms just waited and did not adjust their capacities to the fall in internal and external demand. Although many (usually small) private firms were established in the period 1988-91, the privatisation of state-owned enterprises (SOE's) just started. The increased competition from both newly emerging firms and from liberalized imports, and more importantly, the loss of the former CMEA markets led to a severe recession and to a deep crisis of the banking sector in 1992-3. The adoption of new accounting standards and a tough bankruptcy law in 1992 contributed to the acceleration of restructuring, which was further enhanced by substantial foreign investment and the emergence of private firms. The March 1995 stabilization measures intended to re-establish the macroeconomic equilibrium in current accounts and in the general government budget and also to shift revenues to the corporate sector. As the privatisation, helped by the inflow of foreign capital, progressed, it created a favourable environment for better corporate performance.

Figure 1 clearly reflects the macroeconomic consequences of this process: The crisis in 1990-1 was followed by a gradual recovery, first in productivity[1], from 1994 also in GDP growth. In this paper we are mostly concerned with developments in Hungarian corporate sector, underlying this gradual improvement.

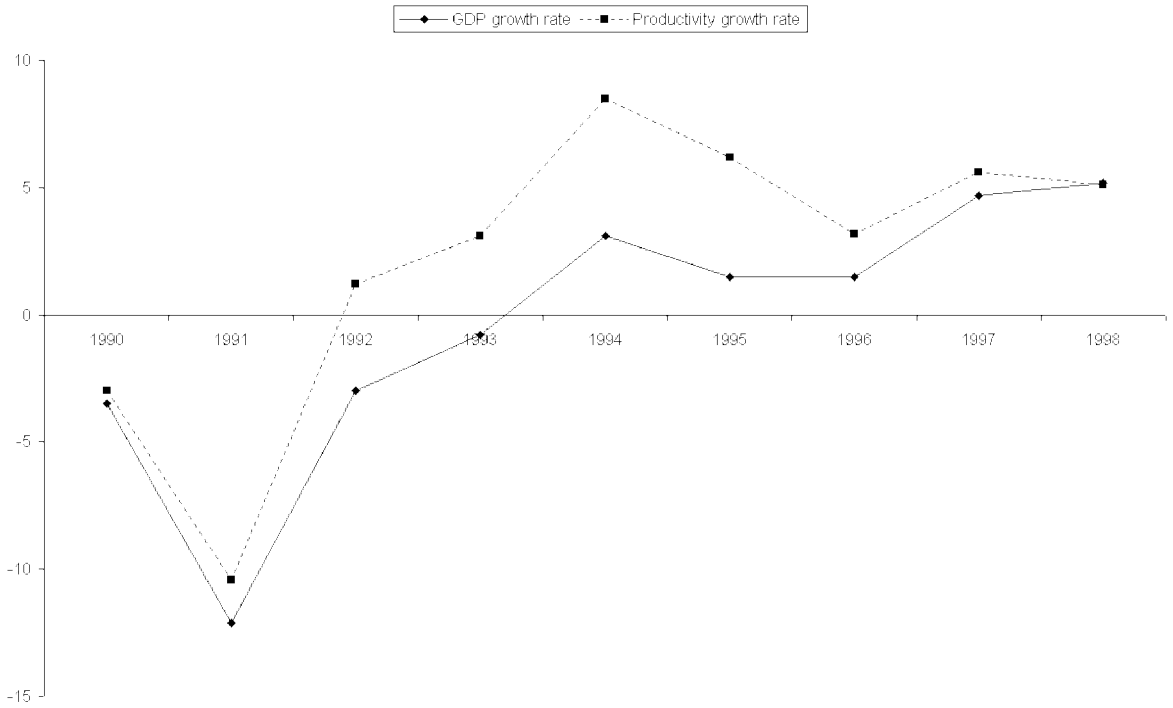

Figure 1. GDP and productivity, annual change in percentages

[1] Productivity is measured here as GDP over employment.

This work was largely motivated by our earlier study of the performance of large Hungarian exporters (Halpern and Kőrösi (1998b)), where we basically analysed the factors determining the profitability of these firms, but we also estimated production functions. The results from the estimated production functions were very difficult to reconcile with other findings. Those estimates were average production functions, thus, we implicitly assumed that firms used the factor inputs efficiently, which is an unlikely proposition for firms undergoing serious restructuring. Our maintained hypothesis in this study is that most firms operate far away from the efficiency frontier during transition: partly because they underutilize existing capacities due to the lack of demand, and partly because many firms operate rather inefficiently during the reorganization period. Our former estimates may have been severely biased due to these circumstances. Halpern and Kőrösi (1998c) was our first attempt to overcome these problems; this paper revises and extends the analysis therein.

This study tries to assess the development of corporate performance between 1990 and 1997 on a larger, more comprehensive sample. Dynamic Cobb-Douglas frontier production functions were estimated. Frontier production functions can directly take into account the above inefficiencies. Dynamic functions provide estimates to assess the speed of the adjustment process to the new, changed environment of the firms. The estimated inefficiencies were subsequently used to explain the development of market share, together with import penetration and concentration. For this purpose balance sheet and profit and loss account data of a sample of several thousands of firms were used. Different subsamples were defined and analysed along sectors, size, and ownership.

The remainder of the paper is organized as follows. Section 2 provides some background on former studies of corporate performance. Section 3 discusses data issues. The framework of our empirical analysis is set out in Section 4. Empirical findings are analysed in Section 5. Finally, conclusions are drawn.

2. Corporate performance

The analytical framework of this study was largely set out in papers by Nickell (1996), Nickell et al. (1997), and Hay and Liu (1997). It is assumed that corporate efficiency is closely related to the structure of the market, prices, and firms' costs, hence profits may depend on the degree of competition. In this respect one can distinguish two approaches. In the first one, corporate cost level is outside the control of the firm. Their survival depends on the degree of competition and on the cost level of the rivals. According to the second interpretation cost level is a negative function of efforts, managerial and investment activities. Adopting the second approach the results of the effort of each firm can be compared with that of the best- practice firm and the relative efficiency can be assessed. According to the assumptions this (in)efficiency affects the market share and can be related to other performance indicators. It is, however, obvious that the relation between these categories may be simultaneous. The relation between efficiency and profitability, or investment activity may also be simultaneous, and only an empirical investigation may shed light on its nature.

In principle one can distinguish between short- and long-run changes in efficiencies. Long-run efficiency can be influenced by the adoption of new technologies, by investment, while short-run efficiency depends on the ability of the management to allocate the existing capacities optimally according to market conditions. If the dynamics of these efficiencies can be assessed, then the time profile of performance indicators can be separated.

It is important to incorporate the basic market characteristics into the model. The more competitive the market, the stronger the link between efficiency and market share, *i.e.,* in a very competitive market only the efficient firms have a good chance for survival. In a less competitive environment less efficient firms can also survive, and the relationship between efficiency and market shares will be weaker.

The speed and degree of price and foreign trade liberalization, the rules and costs of entry and exit for domestic and foreign participants, influence the development of markets in transition economies. They are quite different across countries. However, low capacity utilization, the increasingly large number of market participants, the lack of legal, behavioural and institutional stability and of transparency are common characteristics of transition economies, distinguishing them from mature market economies.

Hungarian corporate sector attracted substantial foreign direct investment compared to other transition economies. Large number of new firms was created, partly as spin-offs of liquidated firms. New domestic and foreign firms are assumed to be leaders of the competition, to be more efficient than the others. These assumptions will be investigated.

Similar investigations were made by Brada et al. (1997) for Hungary for 1991 and for Czechoslovakia for 1990, and by Konings and Repkin (1998) for Bulgaria for 1993-5 and Romania for 1994-5 and recently by Brown and Earle (2000) for Russia. Our results are not, however, directly comparable to these studies. There are major differences in the model specification, and also in the sample period. Nevertheless, the main direction of these studies is similar to ours as the estimation of frontier production function is concerned. This paper goes beyond the scope of these studies as the aim of this paper is the investigation of the relationship between efficiency and market share. The behaviour of Hungarian firms, the link between performance and ownership have been analysed by other studies (*c.f.,* Major (1999) and Tóth (1999)), but none of them aim at assessing the link between performance and market power.

3. Data

The database for this empirical study consists of the profit and loss account and balance sheet data of the main Hungarian firms between 1989 and 1996.[2] This dataset is linked to another database: a labour market survey database, although the latter is not used in the present study.[3]

[2] We would like to express our gratitude to Mr. József Becsei and his collaborators for their help in compiling the data base.

[3] We plan to extend the analysis by resolving the labour homogeneity assumption. In the labour market survey employment is differentiated by occupational categories and educational attainment.

The corporate dataset covers those firms which were present in the labour survey. The survey theoretically covers all firms with at least 20 employees, but the actual compliance is far from complete, especially among smaller firms. On the other hand, some smaller firms, employing fewer people, also are in the sample.[4] However, the corporate dataset also includes data in the 'neighbouring' years, if the firm could be identified for those years. That is, if a firm only participated in the labour survey in 1993, our dataset should include the balance sheet of the firm in years 1992-94, provided that the firm existed and following up the firm was possible.

Firms are identified by their tax-file number in the dataset. If a firm was reorganized: broken up, merged with another firm, or, sometimes, it simply changed name, relocated headquarters, etc., it got a new tax-file number. As our sample covers the period, when former SOE's were corporatised, frequently reorganized, and later privatised, there were many such changes, when a new tax-file number had to be assigned to the firm. Thus, in some cases, existing firms disappear from our sample, because their tax-file number was changed for some reason, and 'new' firms enter the dataset where the tax-file number is the only novelty. Unfortunately, we cannot distinguish de novo firms from the reorganized ones, or those split off from existing firms. Both groups are rather large: Since the mid-1980's many small private firms were started. Many grew to considerable size, and they represent an important fraction of new firms in our sample, although they frequently enter this sample after several years of operation. On the other hand, there are many new firms created from existing former SOE's: Voszka (1997) reports that from remnants of 49 well-known former socialist SOE's which in 1989 produced approximately 30% of Hungarian GDP and 50% of the exports at least 690 firms were created by 1996, most of them privately owned by then.

Our classification is further hampered by the fact that existing firms did not always participate in the labour survey for the entire sample period, thus, the firm may have been incorrectly classified as new or disappearing. Firm creation and destruction is over-reported in our database, and thus in our analysis for all these reasons.

As the corporate dataset is a mirror image of the labour survey, sample selection is biased towards large firms. Only those firms are covered which have to comply with double-entry accounting rules, thus family firms and individual entrepreneurs are excluded, unless their equity or turnover exceeds a rather high limit. The dataset covers approximately 10-13% of the incorporated firms in each year. The sample included 2682 firms out of 23314 in 1990 and 11172 firms out of 120423 in 1997. The coverage varied a lot over sectors: while only 5-7% of trading firms are included, coverage is over 50% in mining in all years. The sample almost always covers at least 20% of the firms in all broad industrial sectors.

The coverage is, however, much higher with respect to sales volume. It is more than 50% even in the trade sector. In other sectors, including services and agriculture, at least 70% of the sales were at firms included in our sample. There are sectors, like mining, or electricity generation, where the coverage is well over 90%.

Many observations, however, had to be excluded due to data problems, *e.g.,* missing observations, so the actual sample size of the estimations is smaller, but the coverage,

[4] Before 1992 agriculture and some service sectors were excluded from the survey.

measured by sales, is still high in all years. There was one important characteristic feature of the sample, which has a strong systematic influence on our results: There are many firms with negative (or zero) value added. As the dependent variable of the reported production functions is the logarithm of the value added, these firms had to be excluded from estimation. These firms represented more than 5% of our sample in all years, peaking with 20% of the covered firms in 1991. These firms are the heavy loss makers, frequently bankrupt or at least approaching insolvency. Some resurface in later years, but most of them were closed down. This characteristically different group of firms was excluded from the current analysis, although we plan to study them later.[5]

Capital is a key variable of production functions. It is always difficult to measure capital stock appropriately. It is a probably even more problematic task in a transition economy. The assets of practically all pre-existing firms were revalued at least once (frequently for several times) during the process of commercialisation and privatisation. The asset value could change substantially without any change in the physical composition of the capital, and the timing of the revaluation(s) is unknown. For example, in the 1992 sample some firms will have capital stock recently revalued, and it is supposed to reflect the actual market value of the assets. Other firms, where no reorganization occurred, reported assets calculated from past investments flows. That certainly influences our results, however, we cannot assess its importance.

Definitional changes also caused some problems. Some definitions changed with the introduction of new accounting standards in 1992, but those changes could be followed through. Sectoral classification also changed in 1992. We aggregated the sectoral classification to a level where it is reasonably homogeneous for the sectoral subsamples, but some inconsistencies are inevitable. The four digit sectors, used for the determination of the market size, substantially changed from 1991 to 1992.

4. Estimated Models

The starting point of our analysis is the traditional Cobb-Douglas production function in its linearized form. We assume that the production function describes the potential production of the firm, thus, we use frontier production functions. We follow the traditional approach first suggested by Aigner et al. (1977):

$$\log(Y_{t,i}) = c + \alpha \log(L_{t,i}) + \beta \log(K_{t,i}) + \gamma \log(Y_{t-1,i}) + v_{t,i} - u_{t,i} \ ,$$

where v is the usual disturbance term (assumed to be $v \sim \mathcal{N}(0, \sigma_v)$), while u is assumed to have truncated normal distribution (for $u > 0$), representing firm specific inefficiencies, compared to the 'best-practice' firm in the sample. As the returns to scale may also be interpreted as a measure of allocative efficiency of input use, or of market imperfection, we did not impose constant returns to scale (CRS).

[5] We experimented with production functions, where the dependent variable was sales. These estimates were severely influenced by the observations corresponding to firms with negative value added: The overall performance of the production functions, estimated for the entire sample was worse than those estimated for firms with positive value added only, and the likelihood function was also much worse conditioned.

The lagged dependent variable captures the fact that with substantial changes in factor input or in circumstances adjustment to the new long-run production level may take a relatively long time. Fixed time effect is also included in all panel estimates, which in this case represents the change of the mean (in)efficiency for that year compared to the (first) base year.

The difference with respect to the best-practice firm is defined as inefficiency.[6] There are at least two possible problems with this interpretation. First, this measure is a general capacity disutilization. In both market and emerging economies capacity (dis)utilization can be different across factors which is not allowed in our specification. The other possibility is that labour and/or capital are not homogenous, labour skills and capital might be different across firms or sectors. Our present approach is not appropriate for choosing between these interpretations. Otto (1999) attempts to separate them at the aggregate level.

Frontier functions were estimated in two forms. First, the functions were augmented by variables reflecting the competition firms have to face. Three variables are used to describe this pressure: import penetration, concentration and market share. We expect positive coefficient for import penetration, market share and negative for concentration. The rationale behind is that stronger competition may force the company to become more efficient. Market share is lagged in order to avoid possible simultaneity: More efficient firms may increase their market share, thus leading to a possible reverse causality. On the other hand increasing market share may be associated with weakening competition. Second, a 'simple' production function was coupled with a dynamic second equation, describing the market share of the firm which included the same indicators of competitive pressure (concentration and import penetration) and also the residual $\widehat{u}$ of the production equation, representing the efficiency of the productive process.[7] The market share equation:

$$share_{t,i} = \gamma_0 + \gamma_1 share_{t-1,i} + \gamma_2 \widehat{u}_{t,i} + \gamma_3 conc_{t,i} + \gamma_4 impp_{t,i} + \epsilon$$

The underlying assumption is that efficient firms will gain market share. We expect that efficiency has a positive and growing effect on market share as long as market institutions evolve and competition increases. We also assume that concentration has a positive effect on market share, as higher concentration is associated with a less competitive market making it easier to increase market share. Finally, the import penetration is expected to enter the equation with negative sign, since higher import penetration increases domestic competition and reduces market share for domestic firm.

We also check the hypothesis that profitability may be related to efficiency and that investments may influence efficiency. Simple linear correlation is used for this purpose.

The models used throughout this paper are best applied for manufacturing. One important feature of the Hungarian corporate sector is that the sectoral classification

[6] Due to the features of the data set it was impossible to estimate a panel model with fixed firm effect to separate short and long term inefficiencies.

[7] Hay and Liu (1997) found for UK data that efficiency is exogenous to the market share. The reverse causation was also examined, long run efficiency was regressed on investment, short run efficiency was explained by lagged market share, lagged gross profit and by rival firms efficiency. Due to data constraint we were unable to explore all these issues.

may be biased, the principal activity of the time of registration may be totally different of the actual one and firms are following quite distant and heterogeneous activities. That is why results for non-manufacturing sectors were also analysed.

5. Estimation results

We estimated the outlined models for the entire sample, and also for various subsamples. The equations were estimated for sectors; for small, medium-sized, and large firms; and for five ownership categories. The sectoral classification of this study is: Agriculture, Manufacturing, Construction, Trade, and Services. Within manufacturing Engineering, Chemical industry, Food industry, Light industry,[8] and Other industries were distinguished. Observations were grouped for state-owned, domestic private, foreign, important foreign minority and other ownership categories.[9] We do not report estimation results for all subsamples. However, for most subsamples for most years we got significantly different coefficient vectors than for the entire sample. Thus, the behaviour of firms is not homogeneous. These structural differences necessitate the analysis of characteristic differences over the various groups of firms.

The frontier production function is relevant only if the second component of the disturbance term, representing (in)efficiency, is different from 0. This is indicated by the ratio of the two standard errors (σ_v/σ_u). There is a small number of cases, when the estimation of this ratio converges to extremely low (or large) values. This obviously indicates severe specification error in those cases involved, however, we were unable to find a consistently better specification.[10] In most cases the ratio of the two standard errors in the equation was above unity. These estimates are significantly larger than the usual estimates for developed countries. It may reflect higher inefficiency of firms in Hungary, compared to developed market economies, although direct comparison is strongly influenced by the actual model specification, the characteristics of the sample information, and also by the variance of the traditional disturbance term. Anyway, the overwhelmingly significant estimate for this coefficient clearly indicates that the use of frontier production functions was justified.

Tables 1-3 present results of panel estimates for the single equation model, while Tables 4-6 the same for the two-equation one. The same models are estimated for the entire period, for two sub-periods (1990-3 and 1994-7) and for biannual panels. Parameter estimates in different time periods are significantly different from each other according to the structural break tests, 1996-7 excepted. The two four-yearly panels have very different estimated properties. The four-yearly and the biannual panel estimates suggest very

[8] Light industry consists of textile, clothing, leather, footwear, wood, paper and printing industries.

[9] The definitions of size and ownership categories are given in Appendix A, while estimation results in Appendix B.

[10] Other distributions were also tried (*c.f.,* Greene (1993) for further details), however, the attempted other distributions usually also led to very questionable estimates. The convergence problems usually emerge when the sample size becomes relatively small. As ill-conditioned likelihood function can just be the consequence of small sample size, we did not want to present estimation results from a different specification for these cases.

different time paths for the change in mean inefficiency for 1990-3. These discrepancies are much smaller for the second half of the sample period, but these panel estimates may still be biased.

Even though coefficient vectors, estimated for the later years, are not far from each other, the significant structural breaks for most of the sample period suggest that sample information should be treated as a series of repeated cross-sections instead of a single panel. Thus, we continued our analysis by departing from the panel framework. Sample information is as repeated cross sections of a large and growing number of heterogeneous firms. Tables 7-10 B summarize estimation results for each year,[11] while Tables 11-27 present estimates for relevant groups of firms: classified according to sectors, ownership and size.

There are two models for each sample: production function augmented with market variables, and a two equation model consisting of the production and the market share equations. Both models have high explanatory power, but the market share equation of the second model is usually far from being satisfactory: residuals are heteroscedastic, and the reset test indicates incomplete specification. Estimated coefficients are in line with the expectations with some exceptions: The sign of import penetration is uncertain, and concentration is usually insignificant in the single equation model. These variables perform better in the two-equation model.

The overall picture on the corporate performance is, that the 1990-1 transitional crisis was characterized by huge inefficiencies and decreasing returns. Corporate efficiency improved rapidly from 1992, also accompanied by higher (close to constant) returns to scale, or, from 1994 even slightly above that. However, firm level efficiency improvement was substantially slower from 1995. It was no longer uniform: the heterogeneity of the firms increased with respect to efficiency, but this increase cannot be attributed to any specific group of firms.

There are, however, interesting differences behind the general tendencies, which will be analysed in the following sections. First, the analysis of the efficiency of the production process is presented. Second, the market share equations and the role of the variables representing competitive pressure are discussed. Third, the link between efficiency and profit and investment is shown. Fourth, returns to scale estimations according to industries and size are presented.

5.1. Efficiency

One can look at the mean (in)efficiency of the production process within a group of firms in two alternative ways. On the one hand, when the production function is estimated for the entire sample of all firms, groups of firms (say sectors) can be ranked according to differences in the mean efficiency. This is the traditional interpretation, and in this paper we mostly deal with this efficiency measure. On the other hand, when the production function is estimated for the individual groups of firms, mean inefficiency of the group

[11] The B tables consist of mean inefficiencies of various group of firms. While ranking firm level inefficiency would be a futile effort, these means have relatively small variances, thus their comparison is meaningful.

reflects the heterogeneity of firms with respect to efficiency. Theoretically, the two measures may develop very differently: It may happen that a sector is rather homogeneous, all firms are close to the most efficient one within the sector, thus the mean inefficiency of the sectoral production function is small. But that does not tell anything about the efficiency of the sector, compared to other sectors: It may happen, that the overall efficiency of the production process is (uniformly) much lower in this sector than in others. It is interesting to note that these two sorts of efficiency measures developed rather similarly over time and over the relevant groups of firms in the Hungarian corporate sector. It indicates that specific groups usually had lower or higher overall mean efficiency because firms were more or less heterogeneous within the group. We look at the overall efficiency of firms from three different aspects in the following subsections: Sectoral differences, and variations according to the size and ownership of the firms.

Fixed time effects of the panel estimates reflect year to year changes of the mean inefficiency, compared to the base year. Although conflicts emerge between estimates for panels covering different time periods, their overall pattern is similar to the time path emerging from cross-section estimates. This clearly indicates that very powerful forces shaped the productive efficiency of Hungarian firms during the transition period; no matter how we look at it: in panel models, at aggregate level, or for various groups of firms, we get similar results. Thus we do not analyse these panel estimates separately.

5.1.1. Sectors

The time path of the efficiency of various sectors is quite similar to the overall picture obtained from the panel estimates: Substantial drop in 1991, rapid growth until 1994 and a mild decline afterwards. (See Figures 1 and 2.) There is a curious discrepancy between this assessment of the developments in corporate efficiency and the aggregate (macroeconomic) development: Economic growth was rather sluggish after the 1991-2 recession, and it speeded up after 1996, by which time the productive efficiency of the corporate sector did not improve. It indicates that the substantial deterioration of firm level efficiency in 1991 basically reflected the enormous capacity underutilization of most firms, due to the sudden loss of important markets. First, firms had to adjust their capacities to the realities of the new market conditions, probably cutting excess capacities, and they could efficiently use the productive inputs only afterwards.

While practically all major sectors move to the same direction, important sectoral differences can be observed. Agriculture is usually the least efficient sector, and it is clearly left behind by other sectors at the end of the sample period. Services and Manufacturing are the most efficient sectors in the second half of the sample, although these differences are only noticeable in the dynamic specifications.

The picture is somewhat different within Manufacturing; there is no decline after 1994 for Engineering and Light industry. The 1991 crisis hit Engineering the hardest, but it recovered within two years, and it became the most efficient industry. Pharmaceuticals, the traditional standard bearer in the Hungarian corporate sector, on the other hand, suffered a major efficiency loss in 1993, and it no longer stands out.

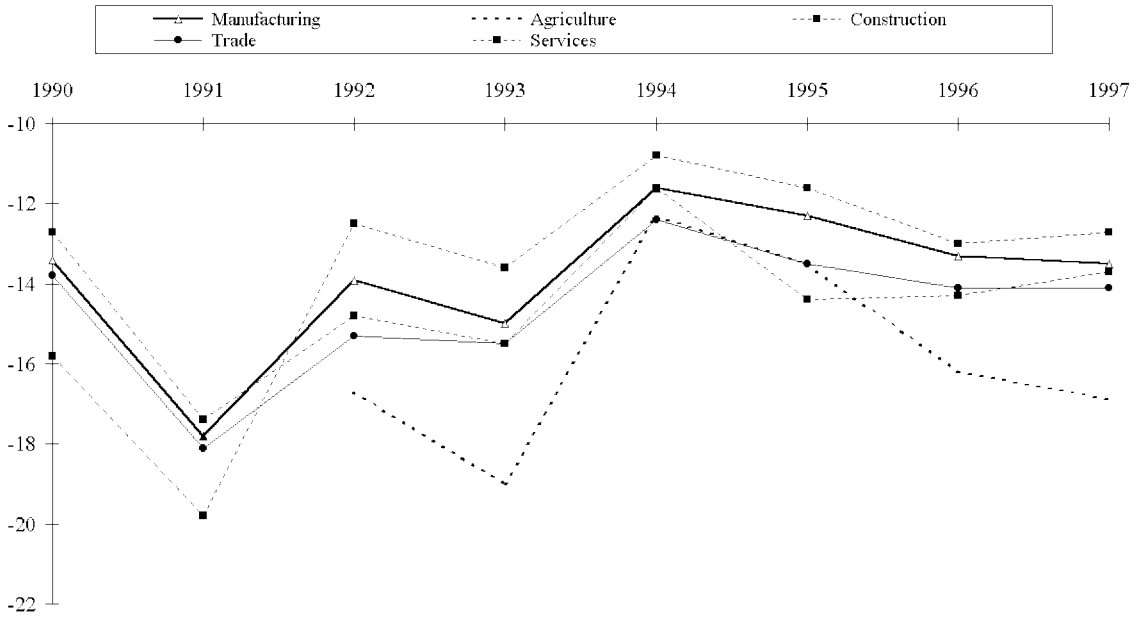

Figure 2. Sectoral mean inefficiencies

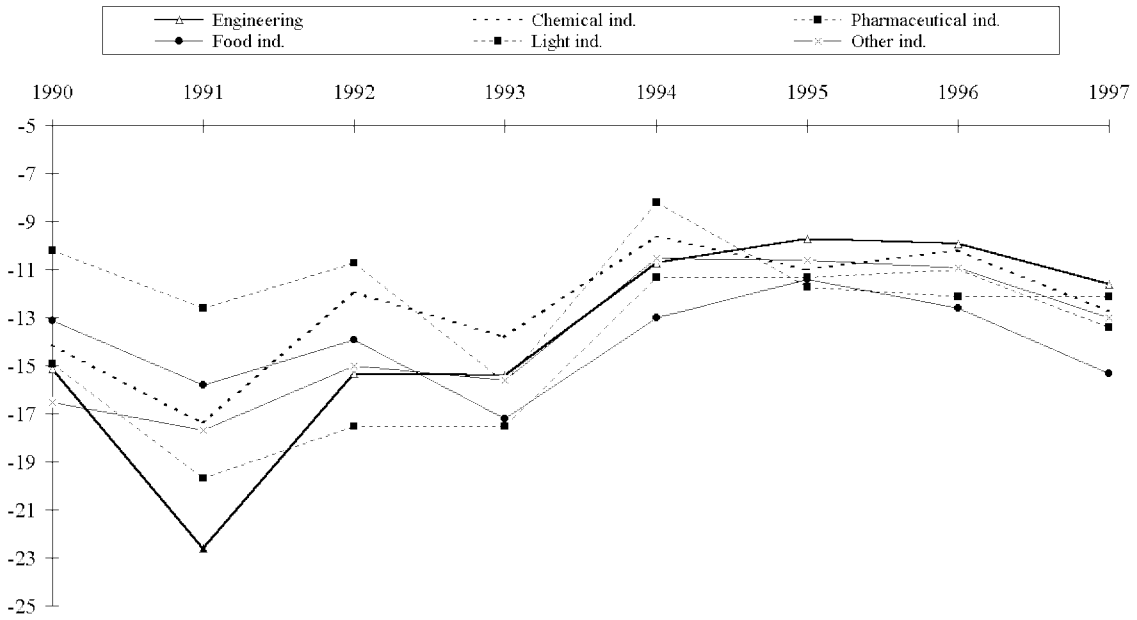

Figure 3. Mean inefficiencies in the manufacturing sectors

5.1.2. Size

Three size groups were defined: small, medium and large. (See definitions in the Appendix). Results derived from the estimation on the entire sample reveal that large firms were consistently the most efficient group. (See Figure 3.) The difference between the other two groups was negligible. This ranking is also supported by the individual estimation results for these groups, and the heterogeneity decreases with size. There are curious discrepancies between these efficiency estimates and the returns to scales, to be analysed later.

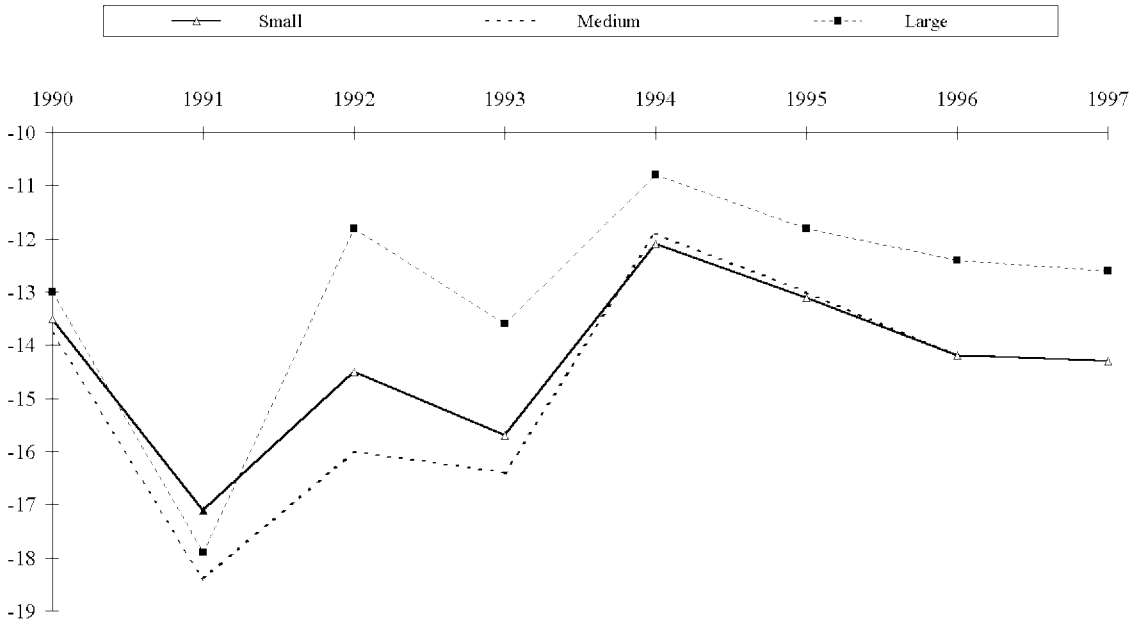

Figure 4. Mean inefficiency by size

5.1.3. Ownership

There is a clear ranking in efficiency according to ownership: 1) foreign 2) important foreign 3) domestic private 4),5) other and state. It is true for the entire sample and even more pronounced for Manufacturing. (See Figure 4.) This persistence in ranking can be a result of selection bias in privatisation; it goes beyond the scope of this paper to address the endogeneity issue between privatisation and efficiency. However, we believe that sample selection bias may only be substantial in the initial years: Foreign and domestic private ownership became so widespread after 1993 that persistent substantial differences in the preconditions are unlikely. The more plausible explanation is that these differences are caused by differences in corporate governance, the quality of management, access to markets and resources, etc. The difference between the efficiency among firms in foreign

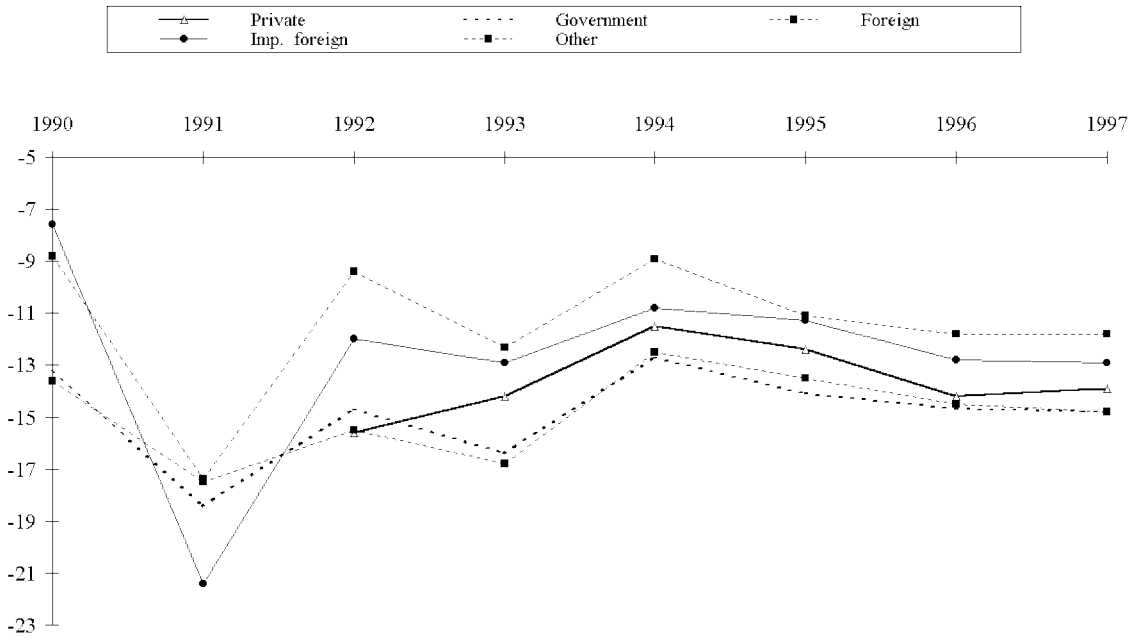

Figure 5. Mean inefficiency by ownership categories

and domestic private ownership is remarkable. It certainly reflects differences in market access. It may also indicate that domestic private owners are very much constrained at the financial markets. It is curious that state owned enterprises are not much less efficient than domestic private owned firms, although most theoretical works would suggest that. This is especially true for the other ownership group, which largely consists of private firms after 1994.[12] This group of firms includes many medium sized former SOE's, frequently bought up by the (former) management through limited liability companies. They are clearly less efficient than the majority of the corporate sector. The efficiency gap between the firms privatised to foreign and domestic owners clearly indicate a curious failure of the privatisation in creating a group of domestic owners who can operate efficiently and compete internationally. However, fluctuations and the gap between the most and least efficient groups diminished, especially after 1994, indicating a move towards homogeneity and competition. The efficiency gap between firms owned by foreign and domestic investors is, however, persistent, and almost uniform over various groups of firms by size or sector.

[12] The other group includes firms with no dominant owner, or firms which have a dominant corporate owner. This second type is much more numerous. Initially the corporate owners usually were state owned holding companies, but as privatisation progressed, the overwhelming majority of these indirectly owned firms were in fact (domestic) private. However, we have no exact information on the ownership structure of the parent company.

5.2. Market share

As indicated earlier, we had little success with the attempt to augment the production functions with variables indicating market conditions and competitive pressure. Coefficients are frequently insignificant or they change sign from one year to the other, and the joint effect of the three variables, describing market structure, is usually negligible. Especially, concentration was hardly ever significant in the single equation model.

In the alternative two-equation model we estimated an autoregressive equation for the market share explained by the productive efficiency (measured as $\widehat{u}$), import penetration and concentration. These regressions fit reasonably, but diagnostic tests indicate significant specification problems. These variables most probably are insufficient to explain why firms gain or lose market share.[13] Thus we have to interpret these results with due caution.

Efficiency usually was significant with the expected positive sign, indicating that efficient firms gain market share. With respect to the other two variables results are rather mixed: They do not play important role in explaining market share, and they rarely enter the equation with correct sign significantly. For example, import played a substitution role in the more intense phase of restructuring in manufacturing; while a complementary role has developed and became general in the second half of 1990s.

5.3. Efficiency vs. profitability and investment

As sample information did not facilitate the separation of short and long-term efficiencies, our efficiency measure incorporates both. Efficiency should somehow be correlated to the profitability of the firm and to its investment activity. Simple correlation coefficients show that there was a semi-strong positive link between efficiency and profit margin and only a very weak positive relationship between efficiency and investment. The profit relationship has weakened in 1997, while the investment relation became more common.

5.4. Returns to scale

The null of CRS was rejected in almost all cases. In the early years of transition all groups of firms faced decreasing returns to scale, indicating substantial mismatch of input use under the new market conditions. Later returns to scale increased, and the long-run returns to scale actually exceeded unity after 1994. This tendency could suggest another interpretation of efficiency: The larger the firm, the better the output to input ratio. One could also interpret this general tendency as the consequence of institutional and behavioural changes: The hardening of the budget constraint has brought about substantial

[13] Our concentration indicator is an unfortunately poor measure to assess characteristics of a sector. We did not have information on all the firms of a sector to compute better indicators.

improvements in the resource allocation, hence in efficiency. Another important possibility is related to the market structure and entry conditions: The larger the firm, the wider the possibility to have access to monopoly rents.[14]

Market structure can be very different across sectors, resulting in a varying potential for increasing return to scale. However, the sectoral differences were rather small. All sectors started with decreasing returns to scale in 1990-1, and most, except Agriculture and Services, entered the increasing return to scale region by 1997. It is also important to note that the sectoral variation declined a lot.

We also estimated separate models for samples defined by ownership.[15] The above tendency is true for the ownership classification with two exceptions: SOE's were always in a regime with increasing return to scale, starting from 1992, while firms classified as Other ownership left that regime in 1996 and 1997.

It would be easy to jump to apparently obvious conclusions at this stage, *e.g.,* saying that two major factors contribute to the increasing returns to scale: (i) The sample includes large number of SMEs. The underreporting of output can be much larger than for the inputs for SMEs; (ii) Some industries are rather concentrated, and very small firms are disadvantaged by oligopolistic competition. These general assumptions, however, are rejected by the analysis of the results when splitting the sample by size.

Classification by size revealed substantial and persistent differences. (See Figure 5.) Results for the entire sample seem to be strongly influenced by the change in composition: by the growing share of small firms (from 1/4 to 2/3), and by the increase of their returns to scale. Medium-sized firms were practically in CRS after 1991. Large firms, curiously enough, always stayed in decreasing returns to scale with substantial fluctuations.

We also looked at the interaction of size and ownership, using two ownership categories in this case: foreign and domestic.[16] The tendency of returns to scale becoming gradually larger was practically the same for all small firms, although foreign owned ones tended to have slightly higher returns to scale. However, for medium-sized, and large firms we found that domestic companies had higher return to scale in almost all years than foreign ones.

This result is rather surprising and casts some doubt on the validity of our data. One could think that large firms have decreasing returns to scale because they are too large for the market, and operate at the increasing part of the U shaped cost curve. However, the large foreign owned firms are typically local subsidiaries of multinational companies. It is an unlikely proposition for them. This is a curious finding for which we do not have acceptable interpretation which can also be substantiated from the available sample information.[17]

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[14] In our previous works (Halpern and Kőrösi (1998a, b)) we studied monopoly rent: It had disappeared around 1989–90, during the period of large scale price and import liberalization, and reappeared afterwards.

[15] This analysis could only be started with 1992, as the number of privately and foreign owned firms was far too small before that.

[16] The owner is domestic, if the share of foreign ownership is less than 50%.

[17] Large multinationals may initially start their activity with low value added, because of the high start-up costs, and investing into gaining a large share of the newly entered market. But for many of these firms the target is not the Hungarian market; their production is largely exported. And most of them

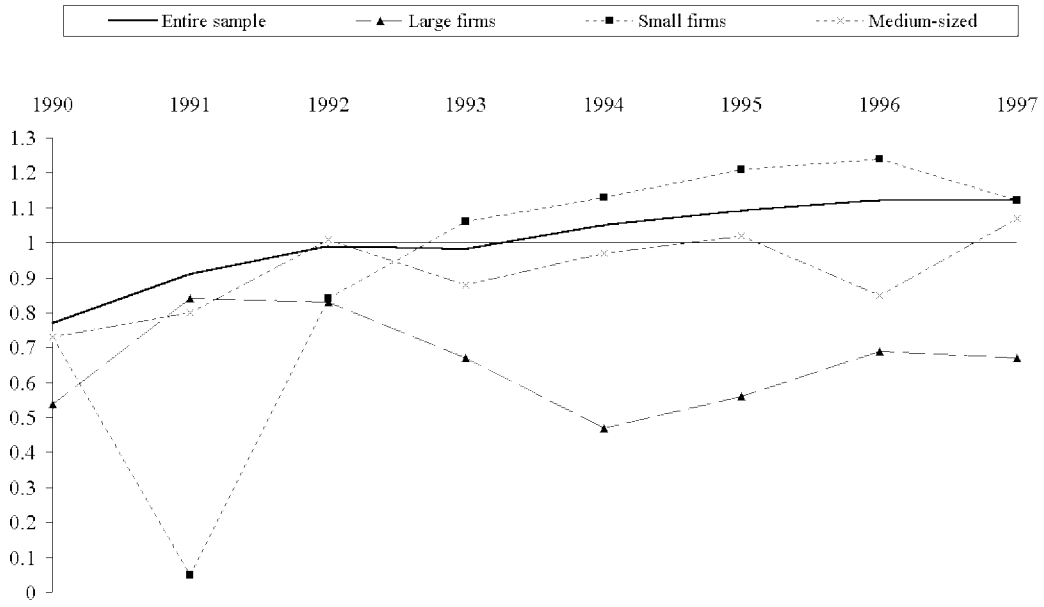

Figure 6. Long-run returns to scale by size categories

Based on these results the market structure explanation of the increasing returns for the entire Hungarian corporate sector should be rejected. The large number of small firms with increasing returns to scale may be interpreted as a positive sign of efficiency and a prospect for further competition. However, it may lead to further differentiation, namely, that very small firms are strongly disadvantaged by their meagre resources and insufficient access to important markets. This possibility requires further investigation.

Given that the returns to scale is smaller for large foreign firms than for any other group, or that one estimated for all firms, the estimated efficiency for this group must substantially understate their efficiency advantage; firms in this group are even more efficient than indicated earlier.

6. Conclusions

Our results do strongly qualify the findings of Brada et al. (1997) and of Konings and Repkin (1998), referring to a hypothesis in Ickes and Ryterman (1992), that the larger the firm the higher the allocative efficiency prior to transition. Our results show that there was a substantial difference in efficiency according to size, fluctuations were rather dominated by macroeconomic developments, like the fall in external and/or internal demand, what

entered the Hungarian market rather early, what makes this explanation quite unappealing by the end of our sample period. We do not have data to test a possible explanation: the transfer pricing hypothesis.

happened in Hungary in 1991 or by a wave of bankruptcies and liquidation in 1993. Microeconomic restructuring had a positive effect and it can be seen that after 1993 efficiency in different disaggregation became more homogeneous and higher as compared with previous years.

Capacity underutilization is very large in the early years of transition, mainly because of the fall of overall demand and the high cost of supply reaction to the changing pattern of demand. The results for the Hungarian corporate sector between 1990 and 1997 confirm the positive development of the performance after a painful and deep microeconomic restructuring and macroeconomic adjustment. However, the speed and scope of recovery varied substantially over different groups of firms.

State-owned firms were among the least efficient, while foreign-owned firms were clearly the most efficient ones throughout the transition period. This is an important difference to our earlier findings (Halpern and Kőrösi, 1998a, b) on the performance of firms: The link between profitability and foreign ownership was less obvious, and less persistent, than between efficiency and ownership.

The ability to achieve the highest returns to scale in the relevant market can also be defined as efficiency. Smaller firms seem to perform better than larger ones, what offer two possible explanations: Small firms have used their opportunities better, while large firms, especially foreign ones, either have not been able to perform better what contradicts to previous results on higher efficiency, or did not show up in their data for different reasons. This calls for further investigations.

Market characteristics play a changing role during transition. Import competition, sectoral concentration and efficiency are important explanatory factors for the development of market share of a firm. Heterogeneity can be observed across sectors, according to ownership and to size. The differences, however, are not that large and were diminishing, what makes the hypothesis of the importance of market environment in the determination of corporate performance plausible.

When looking at corporate performance, the 1990-7 period can be divided into three distinct subperiods. Transition started by a sudden collapse of corporate efficiency, as one important element of the transitional recession. It was followed by a fast consolidation period, with rapidly increasing efficiency and improving returns to scale. During this period performance was frequently improved by downsizing, thus fast improving corporate performance could not be translated into economic growth. This consolidation period ended in 1994-5, after that mean firm level efficiency only changed slowly. However, the 1995 stabilization package created a favourable environment for substantial investments into the Hungarian corporate sector. These investments largely increased the market share of the better performing firms and sectors, and the massive investments, together with substantial structural improvements brought about rapid economic growth. However, this economic growth may become vulnerable if productive efficiency fails to improve faster.

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Appendix A: Definitions

All variables (except employment) were deflated, usually with four digit sectoral producer price indices. There were some—usually small—sectors, where the price index was only available at a higher level of aggregation (2 or 3 digit sectors). Variables are measured in million Forints at 1991 prices. The variables are:

Valued added: Sales less broadly defined material costs. Its logarithm is the dependent variable of all production functions.

Labour (L): Annual average employment at the firm.

Capital (K): Fixed assets. See data section for qualifications.

Market share: Sales of the firm divided by the market size, where market size is the sectoral production plus competing imports less exports, all measured at the four digit sectoral level. The sectoral classification of imports is based on the four-digit product classification.

Import penetration: The ratio of the sectoral imports to the above defined market size.

Concentration: The reciprocal of the number of firms in the four digit sector.

Efficiency: The error term u of the frontier production function.

Profit margin: Pre-tax profits relative to sales.

Investment ratio: Change of capital value plus depreciation over the current capital value.

Large firm: A firm where the number of employees is greater than 500, or the value of fixed assets is greater than 1bn. 1991 forints or sales volume is greater than 1.5bn. 1991 forints.

Small firm: A firm where the number of employees is less than 50, or the value of fixed assets is less than 20m. 1991 forints or sales volume is less than 25m. 1991 forints.

New firm: A firm with an identifier (tax-file number) which was not in the sample in an earlier year.

Disappearing firm: A firm with an identifier (tax-file number) which was not in the sample in a later year.

Private firm: A firm where named persons (investors, employees and managers) owned more than 50% of the equity capital. Firms owned indirectly (by domestic firms) are excluded, as the parent company can be a SOE.

State owned firm: A firm where the central and local governments together owned more than 50% of the equity capital.

Foreign owned firm: Foreign investors owned more than 50% of the equity capital.

Important foreign ownership: Foreign investors owned 25-50% of the equity capital. This category may include firms which are present at other ownership categories.

Legend to the tables: Production functions were estimated by maximum likelihood. Asterisks after the coefficients and test statistics indicate that the test is significant at 0.05 level ($*$) or at 0.01 level ($**$). The null for returns to scale (ν) is that $\nu = 1$. σ denotes the standard error of the compound disturbance term ($\sigma^2 = \sigma_u^2 + \sigma_v^2$), while σ_u/σ_v stands for the ratio of the two standard errors (often denoted by λ). Mean inefficiency is normalized by the mean of the dependent variable. Abbreviations: Nob: number of observations; SEE: standard error of the estimation; Reset y^2: Ramsey's Reset test using the squared fitted values; Reset y^2, y^3 the same using both the squares and the cubes of the fitted values. Chow test is for structural break between the two consecutive years; for production functions it is the LR-test, while for share equations the Wald-test. All share equations were estimated by OLS using White heteroscedasticity consistent standard errors.

Appendix B: Selected estimation results

Table 1: **Single equation models: panel estimates**

	All firms			Manufacturing		
Variable	1990–97	1990–93	1994–97	1990–97	1990–93	1994–97
Constant	-0.10 **	0.09 **	0.17 **	0.00	0.29 **	0.20 **
y_{t-1}	0.63 **	0.45 **	0.72 **	0.60 **	0.46 **	0.68 **
log(L)	0.28 **	0.40 **	0.22 **	0.26 **	0.31 **	0.22 **
log(K)	0.10 **	0.10 **	0.09 **	0.13 **	0.16 **	0.11 **
import penetration	0.02 **	0.00	0.02 **	0.00	-0.03 **	0.01 *
market share$_{t-1}$	0.23 **	0.49 **	0.16 **	0.23 **	0.44 **	0.17 **
concentration	0.51 **	0.83 **	0.23	0.78 **	1.36 **	0.48 **
Dummy for 1991	-0.25 **	-0.27 **		-0.23 **	-0.24 **	
Dummy for 1992	0.46 **	0.33 **		0.59 **	0.51 **	
Dummy for 1993	0.31 **	0.26 **		0.35 **	0.32 **	
Dummy for 1994	0.31 **			0.31 **		
Dummy for 1995	0.26 **		-0.05 **	0.31 **		0.00
Dummy for 1996	0.27 **		-0.05 **	0.31 **		-0.01
Dummy for 1997	0.28 **		-0.03 **	0.31 **		0.00
σ	0.78 **	0.90 **	0.70 **	0.75 **	0.91 **	0.66 **
σ_u/σ_v	1.40 **	1.49 **	1.35 **	1.58 **	1.93 **	1.38 **
short-run ret. to scale	0.38 **	0.50 **	0.30 **	0.40 **	0.47 **	0.34 **
long-run ret. to scale	1.02 **	0.92 **	1.08 **	0.99	0.88 **	1.05 **
Nob	45777	13345	32432	17292	5320	11972
Mean of dep.var	3.38	3.64	3.27	3.63	3.75	3.58
S.dev of dep.var	1.47	1.36	1.49	1.54	1.43	1.59
R^2	0.83	0.75	0.87	0.86	0.79	0.90
Mean inefficiency (%)	-14.63	-16.07	-13.46	-13.65	-16.75	-11.66

Table 2: **Single equation models: bi-annual panels, all firms**

Variable	1990-1	1991-2	1992-3	1993-4	1994-5	1995-6	1996-7
Constant	0.45 **	-0.28 **	0.22 **	0.23 **	0.18 **	0.12 **	0.13 **
y_{t-1}	0.67 **	0.30 **	0.39 **	0.60 **	0.69 **	0.72 **	0.74 **
log(L)	0.17 **	0.54 **	0.48 **	0.31 **	0.24 **	0.22 **	0.20 **
log(K)	0.10 **	0.11 **	0.10 **	0.08 **	0.09 **	0.09 **	0.08 **
import penetration	-0.07	0.02	0.00	0.00	0.03 **	0.04 **	0.01 *
market share$_{t-1}$	-0.13	0.76 **	0.79 **	0.29 **	0.23 **	0.21 **	0.13 **
concentration	1.78 **	0.93 *	0.33	0.37	-0.01	0.26	0.41 *
year$_2$	-0.23 **	0.53 **	-0.03 *	0.01	-0.05 **	0.01	0.02 **
σ	0.89 **	0.92 **	0.88 **	0.78 **	0.69 **	0.71 **	0.70 **
σ_u/σ_v	1.96 **	1.64 **	1.37 **	1.37 **	1.35 **	1.33 **	1.36 **
short-run ret. to scale	0.27 **	0.65 **	0.58 **	0.39 **	0.33 **	0.31 **	0.29 **
long-run ret. to scale	0.81 **	0.93 **	0.95 **	0.99	1.05 **	1.07 **	1.10 **
Nob	3552	4870	9793	12040	13814	16881	18618
Mean of dep.var	4.08	3.68	3.49	3.52	3.46	3.27	3.12
S.dev of dep.var	1.33	1.31	1.34	1.37	1.43	1.48	1.52
R^2	0.76	0.73	0.74	0.81	0.86	0.86	0.87
Mean inefficiency (%)	-15.05	-16.84	-16.09	-13.99	-12.59	-13.59	-14.18
Chow test (χ^2)	22.19 **	353.28 **	518.09 **	149.54 **	28.13 **	36.17 **	5.89

Table 3: **Single equation models: bi-annual panels, manufacturing**

Variable	1990-1	1991-2	1992-3	1993-4	1994-5	1995-6	1996-7
Constant	0.47 **	-0.24 **	0.60 **	0.49 **	0.28 **	0.16 **	0.16 **
y_{t-1}	0.64 **	0.29 **	0.39 **	0.55 **	0.64 **	0.67 **	0.71 **
log(L)	0.17 **	0.51 **	0.40 **	0.27 **	0.23 **	0.23 **	0.21 **
log(K)	0.13 **	0.16 **	0.16 **	0.15 **	0.13 **	0.12 **	0.11 **
import penetration	1.07	-0.03	-0.03 **	-0.02 **	0.01 *	0.02 **	0.01
market share$_{t-1}$	-0.29 *	0.60 **	0.87 **	0.43 **	0.41 **	0.29 **	0.13 **
concentration	2.88 **	1.25 *	0.74	0.93 *	0.16	0.50 *	0.60 **
year$_2$	-0.19 **	0.68 **	-0.13 **	-0.03	0.00	-0.01	0.01
σ	0.93 **	0.96 **	0.88 **	0.78 **	0.67 **	0.65 **	0.66 **
σ_u/σ_v	2.24 **	2.30 **	1.85 **	1.77 **	1.33 **	1.17 **	1.44 **
short-run ret. to scale	0.30 **	0.67 **	0.56 **	0.41 **	0.35 **	0.34 **	0.32 **
long-run ret. to scale	0.83 **	0.94 **	0.91 **	0.92 **	0.97	1.04 *	1.09 **
Nob	1850	1894	3470	4355	5102	6232	6870
Mean of dep.var	3.94	3.75	3.66	3.76	3.74	3.58	3.46
S.dev of dep.var	1.37	1.42	1.45	1.48	1.53	1.57	1.62
R^2	0.76	0.78	0.81	0.85	0.88	0.89	0.90
Mean inefficiency (%)	-16.61	-18.33	-16.54	-13.99	-11.17	-10.85	-12.12
Chow test (χ^2)	54.48 **	92.90 **	165.52 **	48.61 **	13.91 *	22.44 **	16.25 **

Table 4: **Two-equation models: panel estimates**

	All firms			Manufacturing		
Variable	1990–97	1990–93	1994–97	1990–97	1990–93	1994–97
Production function						
Constant	-0.13 **	0.02	0.16 **	-0.04	0.21 **	0.19 **
y_{t-1}	0.63 **	0.46 **	0.72 **	0.60 **	0.47 **	0.69 **
log(L)	0.29 **	0.41 **	0.22 **	0.27 **	0.32 **	0.22 **
log(K)	0.10 **	0.10 **	0.09 **	0.14 **	0.16 **	0.12 **
Dummy for 1991	-0.25 **	-0.27 **		-0.24 **	-0.25 **	
Dummy for 1992	0.46 **	0.34 **		0.60 **	0.51 **	
Dummy for 1993	0.31 **	0.27 **		0.35 **	0.32 **	
Dummy for 1994	0.32 **			0.32 **		
Dummy for 1995	0.27 **		-0.05 **	0.32 **		0.00
Dummy for 1996	0.28 **		-0.05 **	0.31 **		-0.01
Dummy for 1997	0.30 **		-0.02 *	0.32 **		0.00
σ	0.77 **	0.90 **	0.70 **	0.75 **	0.91 **	0.66 **
σ_u/σ_v	1.39 **	1.45 **	1.35 **	1.54 **	1.86 **	1.35 **
short-run ret. to scale	0.39 **	0.51 **	0.31 **	0.40 **	0.49 **	0.34 **
long-run ret. to scale	1.05 **	0.95 **	1.10 **	1.02	0.92 **	1.07 **
Nob	45777	13345	32432	17292	5320	11972
Mean of dep.var	3.38	3.64	3.27	3.63	3.75	3.58
S.dev of dep.var	1.47	1.36	1.49	1.54	1.43	1.59
R^2	0.83	0.75	0.87	0.86	0.79	0.90
Mean inefficiency (%)	-14.57	-15.88	-13.43	-13.52	-16.53	-11.57
Market share equation						
Constant	0.01 **	0.01 **	0.01 **	0.02 **	0.01 **	0.02 **
market share$_{t-1}$	0.63 **	0.81 **	0.59 **	0.50 **	0.82 **	0.44 **
efficiency	1.18 **	0.82 **	1.42 **	1.52 **	0.88 **	2.17 **
import penetration	-0.01 **	-0.01 **	-0.01 **	-0.01 **	-0.01 **	-0.01 **
concentration	0.73 **	0.61 **	0.70 **	0.77 **	0.45 **	0.77 **
Mean of dep.var	0.02	0.03	0.02	0.03	0.03	0.03
S.dev of dep.var	0.10	0.10	0.10	0.10	0.10	0.10
SEE	0.06	0.05	0.06	0.07	0.04	0.07
R^2	0.69	0.77	0.66	0.57	0.80	0.52
White-hetero	28072 **	397 **	20513 **	16488 **	2895 **	10882 **
Reset y^2, y^3	13924 **	12 **	16764 **	14316 **	7**	14017 **
Corr of rel. efficiency						
profit margin	0.17	0.17	0.17	0.40	0.37	0.42
investment rate						

Table 5: **Two-equation models: bi-annual panels, all firms**

Variable	1990-1	1991-2	1992-3	1993-4	1994-5	1995-6	1996-7
Production function							
Constant	0.44 **	-0.41 **	0.13 **	0.19 **	0.15 **	0.10 **	0.11 **
y_{t-1}	0.67 **	0.30 **	0.40 **	0.61 **	0.69 **	0.72 **	0.74 **
log(L)	0.17 **	0.56 **	0.49 **	0.32 **	0.24 **	0.22 **	0.21 **
log(K)	0.11 **	0.11 **	0.10 **	0.08 **	0.09 **	0.09 **	0.08 **
$year_2$	-0.24 **	0.54 **	-0.02	0.01	-0.05 **	0.01	0.02 **
σ	0.90 **	0.92 **	0.88 **	0.78 **	0.69 **	0.71 **	0.70 **
σ_u/σ_v	1.94 **	1.55 **	1.33 **	1.36 **	1.34 **	1.32 **	1.35 **
short-run ret. to scale	0.27 **	0.67 **	0.59 **	0.40 **	0.33 **	0.31 **	0.29 **
long-run ret. to scale	0.83 **	0.97 *	0.99	1.01	1.08 **	1.11 **	1.12 **
Nob	3552	4870	9793	12040	13814	16881	18618
Mean of dep.var	4.08	3.68	3.49	3.52	3.46	3.27	3.12
S.dev of dep.var	1.33	1.31	1.34	1.37	1.43	1.48	1.52
R^2	0.76	0.73	0.74	0.81	0.86	0.86	0.87
Mean inefficiency (%)	-15.05	-16.44	-15.86	-13.92	-12.54	-13.57	-14.15
Chow test (χ^2)	15.39 **	289.37 **	500.50 **	140.34 **	15.59 **	31.97 **	3.15
Market share equation							
Constant	0.00	0.01 **	0.01 **	0.01 **	0.01 **	0.01 **	0.01 **
market $share_{t-1}$	0.92 **	0.72 **	0.75 **	0.81 **	0.87 **	0.87 **	0.48 **
efficiency	0.87 **	1.03 **	1.05 **	1.25 **	1.46 **	1.17 **	1.35 **
import penetration	0.00	-0.02 **	-0.01 **	0.00 *	0.00 *	0.00 **	-0.01 **
concentration	0.15 *	0.94 **	0.94 **	0.46 *	0.07	0.21	0.93 **
$year_2$	0.00 **	0.01 **	0.00 **	0.00	0.00 **	0.00	0.00
Mean of dep.var	0.03	0.03	0.02	0.02	0.02	0.02	0.02
S.dev of dep.var	0.11	0.09	0.10	0.11	0.11	0.10	0.09
SEE	0.03	0.05	0.05	0.05	0.05	0.05	0.06
R^2	0.92	0.66	0.72	0.81	0.80	0.80	0.62
White-hetero	1503 **	1949 **	690 **	942 **	379 **	543 **	17333 **
Reset y^2	285.52 **	64.91 **	5.96 *	38.91 **	385.89 **	405.29 **	29036.10 **
Reset y^2, y^3	187.73 **	38.96 **	12.39 **	142.93 **	266.72 **	298.46 **	18400.48 **
Chow test (F)	6.48	21.76 **	17.90 **	9.55 *	7.38	9.80 *	8.88

Table 6: **Two-equation models: bi-annual panels, manufacturing**

Variable	1990-1	1991-2	1992-3	1993-4	1994-5	1995-6	1996-7
Production function							
Constant	0.51 **	-0.36 **	0.48 **	0.43 **	0.24 **	0.14 **	0.14 **
y_{t-1}	0.64 **	0.30 **	0.40 **	0.56 **	0.65 **	0.68 **	0.71 **
log(L)	0.16 **	0.53 **	0.41 **	0.27 **	0.23 **	0.23 **	0.21 **
log(K)	0.14 **	0.16 **	0.17 **	0.15 **	0.13 **	0.12 **	0.11 **
$year_2$	-0.21 **	0.70 **	-0.13 **	-0.03	0.00	-0.01	0.01
σ	0.93 **	0.95 **	0.87 **	0.78 **	0.67 **	0.65 **	0.65 **
σ_u/σ_v	2.18 **	2.15 **	1.77 **	1.73 **	1.30 **	1.15 **	1.42 **
short-run ret. to scale	0.30 **	0.69 **	0.58 **	0.42 **	0.36 **	0.35 **	0.32 **
long-run ret. to scale	0.83 **	0.98	0.96 *	0.96 *	1.01	1.07 **	1.11 **
Nob	1850	1894	3470	4355	5102	6232	6870
Mean of dep.var	3.94	3.75	3.66	3.76	3.74	3.58	3.46
S.dev of dep.var	1.37	1.42	1.45	1.48	1.53	1.57	1.62
R^2	0.76	0.78	0.81	0.85	0.88	0.89	0.90
Mean inefficiency (%)	-16.56	-17.96	-16.31	-13.88	-11.04	-10.75	-12.04
Chow test (χ^2)	38.65 **	60.12 **	166.16 **	47.76 **	6.67 *	16.92 **	5.28
Market share equation							
Constant	0.00	0.01 *	0.02 **	0.01 **	0.01 **	0.01 **	0.02 **
market $share_{t-1}$	0.95 **	0.67 **	0.75 **	0.98 **	1.01 **	0.93 **	0.32 **
efficiency	0.83	0.87 *	1.28 **	1.33 **	1.68 **	1.76 **	1.99 **
import penetration	0.01	-0.02 **	-0.01 **	0.00 *	0.00	0.00 **	-0.01 **
concentration	0.02	1.07 **	0.69 **	0.03	-0.03	0.21 *	0.93 **
$year_2$	0.00 *	0.01	-0.01 *	0.00	0.00 **	0.00	0.00
Mean of dep.var	0.04	0.03	0.03	0.03	0.03	0.03	0.03
S.dev of dep.var	0.11	0.10	0.09	0.10	0.10	0.10	0.10
SEE	0.03	0.06	0.05	0.03	0.03	0.04	0.07
R^2	0.91	0.65	0.73	0.89	0.90	0.85	0.46
White-hetero	798 **	1267 **	2285 **	735 **	974 **	599 **	5013 **
Reset y^2	230.25 **	11.09 **	14.78 **	384.67 **	228.61 **	0.70	15634.67 **
Reset y^2, y^3	152.44 **	50.82 **	7.53 **	205.92 **	129.49 **	76.23 **	7818.86 **
Chow test (F)	7.80	27.63 **	59.32 **	2.15	3.25	17.61 **	46.59 **

Table 7–A: **Single equation models: all firms**

Variable	1990	1991	1992	1993	1994	1995	1996	1997
Constant	0.55 **	0.04	0.10	0.28 **	0.21 **	0.11 **	0.14 **	0.14 **
y_{t-1}	0.68 **	0.63 **	0.23 **	0.54 **	0.69 **	0.69 **	0.74 **	0.73 **
log(L)	0.13 **	0.24 **	0.62 **	0.35 **	0.24 **	0.24 **	0.20 **	0.21 **
log(K)	0.10 **	0.10 **	0.10 **	0.08 **	0.08 **	0.09 **	0.08 **	0.09 **
import penetration	0.54	-0.08	0.00	-0.01	0.01	0.05 **	0.02 *	0.01
market share$_{t-1}$	0.03	-0.34 **	1.65 **	0.38 **	0.23 **	0.25 **	0.18 *	0.12 **
concentration	1.66 **	1.62	0.64	0.71	-0.21	0.08	0.44	0.33
σ	0.85 **	0.97 **	0.87 **	0.86 **	0.67 **	0.71 **	0.71 **	0.70 **
σ_u/σ_v	1.85 **	2.22 **	1.50 **	1.34 **	1.49 **	1.28 **	1.39 **	1.33 **
short-run ret. to scale	0.23 **	0.34 **	0.72 **	0.44 **	0.32 **	0.33 **	0.28 **	0.30 **
long-run ret. to scale	0.73 **	0.92	0.93 **	0.95 **	1.02	1.06 **	1.09 **	1.10 **
Nob	2156	1396	3474	6319	5721	8093	8788	9830
Mean of dep.var	4.22	3.85	3.62	3.42	3.64	3.34	3.20	3.06
S.dev of dep.var	1.31	1.34	1.29	1.35	1.38	1.45	1.50	1.54
R^2	0.77	0.74	0.75	0.76	0.86	0.85	0.86	0.87
Mean inefficiency (%)	-13.55	-17.71	-15.72	-15.86	-11.97	-13.06	-14.10	-14.24

Table 7–B: **Mean relative inefficiency for subsets of observations**

Variable	1990	1991	1992	1993	1994	1995	1996	1997
Manufacturing	-13.6	-17.6	-14.7	-15.1	-11.7	-12.5	-13.4	-13.6
Engineering	-13.7	-20.1	-14.3	-14.4	-11.4	-11.5	-12.4	-12.6
Chemical ind.	-12.6	-15.5	-11.9	-12.7	-9.9	-13.0	-12.7	-13.4
Pharmaceutical ind.	-9.0	-10.9	-10.6	-14.1	-8.7	-13.6	-15.0	-12.7
Food ind.	-11.9	-14.5	-12.6	-15.5	-13.4	-12.9	-15.4	-15.5
Light ind.	-13.7	-17.5	-16.3	-16.2	-11.9	-13.3	-13.7	-14.0
Other ind.	-14.9	-15.9	-14.3	-13.8	-10.6	-12.0	-13.3	-13.3
Agriculture			-17.2	-18.9	-12.3	-13.4	-16.2	-16.9
Construction	-12.7	-17.2	-15.6	-15.5	-11.7	-14.3	-14.2	-13.7
Trade	-13.7	-17.9	-16.0	-15.6	-12.5	-13.4	-14.0	-14.2
Services	-17.6	-20.2	-13.9	-14.1	-11.0	-11.6	-13.1	-12.8
Owner: Private			-16.4	-14.3	-11.6	-12.5	-14.2	-13.9
Government	-13.3	-18.2	-15.7	-16.5	-12.7	-14.1	-14.7	-14.8
Foreign	-9.2	-17.9	-9.7	-12.3	-9.0	-11.2	-11.9	-11.9
Imp. foreign	-7.5	-20.7	-12.6	-13.1	-11.0	-11.4	-12.9	-13.0
Other	-13.7	-17.3	-16.3	-16.8	-12.5	-13.5	-14.5	-14.9
Size: Small	-13.8	-17.0	-15.5	-15.8	-12.2	-13.2	-14.2	-14.3
Medium	-13.8	-18.2	-16.6	-16.4	-11.9	-13.0	-14.1	-14.3
Large	-13.0	-17.6	-12.7	-13.8	-10.9	-11.9	-12.6	-12.8

Table 8–A: **Two-equation models: all firms**

Variable	1990	1991	1992	1993	1994	1995	1996	1997
Production function								
Constant	0.51 **	0.08	-0.10	0.24 **	0.18 **	0.09 **	0.13 **	0.13 **
y_{t-1}	0.69 **	0.62 **	0.24 **	0.55 **	0.69 **	0.69 **	0.75 **	0.73 **
log(L)	0.13 **	0.24 **	0.65 **	0.36 **	0.25 **	0.24 **	0.20 **	0.21 **
log(K)	0.11 **	0.10 **	0.10 **	0.08 **	0.08 **	0.10 **	0.08 **	0.09 **
σ	0.84 **	0.98 **	0.85 **	0.86 **	0.67 **	0.71 **	0.71 **	0.70 **
σ_u/σ_v	1.80 **	2.27 **	1.35 **	1.33 **	1.48 **	1.26 **	1.38 **	1.32 **
short-run ret. to scale	0.24 **	0.34 **	0.75 **	0.44 **	0.32 **	0.34 **	0.28 **	0.30 **
long-run ret. to scale	0.77 **	0.91 *	0.99	0.98	1.05 *	1.09 **	1.12 **	1.12 **
Nob	2156	1396	3474	6319	5721	8093	8788	9830
Mean of dep.var	4.22	3.85	3.62	3.42	3.64	3.34	3.20	3.06
S.dev of dep.var	1.31	1.34	1.29	1.35	1.38	1.45	1.50	1.54
R^2	0.77	0.73	0.74	0.76	0.86	0.85	0.86	0.87
Mean inefficiency (%)	-13.46	-17.91	-14.97	-15.81	-11.91	-13.00	-14.10	-14.18
Market share equation								
Constant	0.00	0.01	0.02 **	0.00 **	0.01 **	0.01 **	0.01 **	0.01 **
market share$_{t-1}$	0.89 **	0.97 **	0.54 **	0.83 **	0.79 **	0.97 **	0.81 **	0.36 **
efficiency	0.50 **	1.30 *	1.75 **	0.86 **	1.65 **	1.26 **	1.09 **	1.32 **
import penetration	-0.02	0.00	-0.02 **	-0.01	0.00 **	0.00	0.00 **	-0.01 **
concentration	0.17 *	0.15	1.27 **	0.68	0.21	-0.07	0.43 *	1.10 **
Mean of dep.var	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02
S.dev of dep.var	0.10	0.11	0.08	0.11	0.11	0.11	0.09	0.09
SEE	0.03	0.04	0.05	0.05	0.04	0.05	0.04	0.06
R^2	0.94	0.89	0.55	0.78	0.87	0.76	0.85	0.54
White-hetero	343 **	879 **	950 **	465 **	3689 **	281 **	3344 **	8575 **
Reset y^2	114.12 **	186.79 **	109.63 **	0.35	227.61 **	89.57 **	225.25 **	22005.68 **
Reset y^2, y^3	57.62 **	173.21 **	54.84 **	0.57	322.26 **	55.98 **	381.02 **	14929.58 **
Corr of rel. efficiency								
profit margin	0.32	0.48	0.33	0.18	0.24	0.16	0.17	
investment rate								

Table 8–B: **Mean relative inefficiency for subsets of observations**

Variable	1990	1991	1992	1993	1994	1995	1996	1997
Manufacturing	-13.4	-17.8	-13.9	-15.0	-11.6	-12.3	-13.3	-13.5
Engineering	-13.6	-20.4	-13.6	-14.4	-11.2	-11.2	-12.2	-12.4
Chemical ind.	-12.5	-16.0	-10.7	-12.7	-9.9	-12.6	-12.5	-13.3
Pharmaceutical ind.	-9.0	-11.7	-9.6	-14.1	-8.7	-13.5	-15.0	-12.7
Food ind.	-11.8	-14.5	-12.4	-15.5	-13.4	-12.9	-15.5	-15.5
Light ind.	-13.6	-17.7	-15.4	-16.2	-11.8	-13.0	-13.6	-13.9
Other ind.	-14.1	-16.0	-13.0	-13.6	-10.6	-11.9	-13.2	-13.2
Agriculture			-16.7	-19.0	-12.3	-13.5	-16.2	-16.9
Construction	-12.7	-17.4	-14.8	-15.5	-11.6	-14.4	-14.3	-13.7
Trade	-13.8	-18.1	-15.3	-15.5	-12.4	-13.5	-14.1	-14.1
Services	-15.8	-19.8	-12.5	-13.6	-10.8	-11.6	-13.0	-12.7
Owner: Private			-15.6	-14.2	-11.5	-12.4	-14.2	-13.9
Government	-13.2	-18.4	-14.7	-16.4	-12.7	-14.1	-14.7	-14.8
Foreign	-8.8	-17.4	-9.4	-12.3	-8.9	-11.1	-11.8	-11.8
Imp. foreign	-7.6	-21.4	-12.0	-12.9	-10.8	-11.3	-12.8	-12.9
Other	-13.6	-17.5	-15.5	-16.8	-12.5	-13.5	-14.5	-14.8
Size: Small	-13.5	-17.1	-14.5	-15.7	-12.1	-13.1	-14.2	-14.3
Medium	-13.8	-18.4	-16.0	-16.4	-11.9	-13.0	-14.2	-14.3
Large	-13.0	-17.9	-11.8	-13.6	-10.8	-11.8	-12.4	-12.6

Table 9–A: **Single equation models: manufacturing**

Variable	1990	1991	1992	1993	1994	1995	1996	1997
Constant	0.54 **	-0.09	0.33 **	0.54 **	0.39 **	0.20 **	0.12 **	0.20 **
y_{t-1}	0.69 **	0.49 **	0.23 **	0.50 **	0.64 **	0.64 **	0.70 **	0.71 **
log(L)	0.11 **	0.36 **	0.56 **	0.30 **	0.21 **	0.23 **	0.22 **	0.21 **
log(K)	0.11 **	0.14 **	0.15 **	0.16 **	0.12 **	0.13 **	0.10 **	0.11 **
import penetration	1.87 *	-0.42	-0.04 *	-0.03 *	-0.01	0.03 **	0.01	0.00
market share$_{t-1}$	-0.16	-0.64 **	1.28 **	0.32	0.51 **	0.33 **	0.25 **	0.12 **
concentration	3.41 **	1.27	0.93	1.05	0.71	-0.11	1.20 **	-0.02
σ	0.87 **	1.03 **	0.86 **	0.87 **	0.67 **	0.66 **	0.64 **	0.67 **
σ_u/σ_v	2.13 **	2.70 **	1.94 **	1.89 **	1.61 **	1.15 **	1.20 **	1.68 **
short-run ret. to scale	0.23 **	0.50 **	0.71 **	0.46 **	0.33 **	0.37 **	0.32 **	0.31 **
long-run ret. to scale	0.74 **	0.98	0.93 **	0.91 **	0.92 **	1.01	1.07 **	1.09 **
Nob	1182	668	1226	2244	2111	2991	3241	3629
Mean of dep.var	4.01	3.80	3.72	3.63	3.90	3.63	3.52	3.39
S.dev of dep.var	1.32	1.46	1.40	1.48	1.48	1.55	1.59	1.64
R^2	0.77	0.76	0.81	0.82	0.88	0.88	0.90	0.91
Mean inefficiency (%)	-14.99	-19.48	-16.28	-16.38	-11.28	-10.86	-10.89	-13.06

Table 9–B: **Mean relative inefficiency for subsets of observations**

Variable	1990	1991	1992	1993	1994	1995	1996	1997
Engineering	-15.2	-22.3	-15.6	-15.4	-10.9	-9.9	-10.0	-11.7
Chemical ind.	-14.2	-16.5	-12.8	-13.8	-9.7	-11.2	-10.4	-12.8
Pharmaceutical ind.	-10.0	-11.2	-11.4	-15.7	-8.0	-11.7	-12.1	-12.1
Food ind.	-13.3	-15.9	-14.1	-17.5	-13.2	-11.4	-12.6	-15.4
Light ind.	-14.9	-19.5	-18.1	-17.5	-11.4	-11.5	-11.1	-13.5
Other ind.	-17.3	-17.6	-15.9	-15.9	-10.6	-10.6	-11.0	-13.1
Owner: Private			-15.1	-15.4	-11.1	-10.4	-11.3	-13.2
Government	-14.4	-20.4	-16.6	-18.5	-13.2	-12.1	-11.9	-15.5
Foreign	-13.8	-18.9	-9.9	-13.0	-8.7	-9.9	-9.4	-11.4
Imp. foreign	-7.9	-16.0	-12.5	-13.7	-10.8	-10.0	-10.6	-11.9
Other	-15.5	-18.8	-17.4	-17.4	-12.0	-11.4	-11.2	-13.6
Size: Small	-15.0	-19.7	-16.1	-16.9	-11.4	-11.0	-11.0	-13.2
Medium	-14.8	-19.5	-17.2	-16.0	-11.2	-10.8	-10.7	-13.0
Large	-15.3	-19.1	-14.2	-15.3	-11.0	-10.5	-10.5	-12.2

Table 10–A: **Two-equation models: manufacturing**

Variable	1990	1991	1992	1993	1994	1995	1996	1997
Production function								
Constant	0.56 **	0.02	0.13	0.49 **	0.32 **	0.18 **	0.10 **	0.19 **
y_{t-1}	0.70 **	0.49 **	0.24 **	0.51 **	0.65 **	0.64 **	0.71 **	0.72 **
log(L)	0.10 **	0.33 **	0.59 **	0.30 **	0.22 **	0.24 **	0.22 **	0.20 **
log(K)	0.13 **	0.15 **	0.15 **	0.17 **	0.12 **	0.13 **	0.10 **	0.11 **
σ	0.87 **	1.04 **	0.85 **	0.86 **	0.67 **	0.66 **	0.64 **	0.67 **
σ_u/σ_v	2.02 **	2.78 **	1.75 **	1.86 **	1.56 **	1.13 **	1.17 **	1.65 **
short-run ret. to scale	0.23 **	0.48 **	0.75 **	0.47 **	0.34 **	0.37 **	0.32 **	0.31 **
long-run ret. to scale	0.77 **	0.94	0.99	0.94 **	0.98	1.04	1.11 **	1.11 **
Nob	1182	668	1226	2244	2111	2991	3241	3629
Mean of dep.var	4.01	3.80	3.72	3.63	3.90	3.63	3.52	3.39
S.dev of dep.var	1.32	1.46	1.40	1.48	1.48	1.55	1.59	1.64
R^2	0.77	0.75	0.80	0.82	0.88	0.88	0.90	0.91
Mean inefficiency (%)	-14.88	-19.75	-15.73	-16.31	-11.15	-10.72	-10.78	-12.96
Market share equation								
Constant	0.00	0.01	0.02 **	0.01 **	0.01 **	0.01 **	0.01 **	0.02 **
market share$_{t-1}$	0.89 **	1.06 **	0.43 **	0.95 **	1.00 **	1.02 **	0.85 **	0.24 **
efficiency	0.44 **	1.32	1.94 **	1.12 **	1.75 **	1.62 **	1.84 **	1.61 **
import penetration	0.00	0.02	-0.02 **	0.00 *	0.00	0.00	-0.01 **	-0.01 **
concentration	0.08	-0.03	1.31 **	0.09	-0.03	-0.03	0.42	1.00 **
Mean of dep.var	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03
S.dev of dep.var	0.11	0.12	0.08	0.10	0.11	0.10	0.10	0.10
SEE	0.03	0.04	0.05	0.03	0.04	0.03	0.04	0.07
R^2	0.94	0.90	0.53	0.91	0.88	0.93	0.79	0.44
White-hetero	167 **	583 **	313 **	819 **	286 **	1452 **	359 **	2182 **
Reset y^2	84.73 **	175.41 **	4.29 *	125.00 **	232.53 **	44.00 **	10.65 **	10655.00 **
Reset y^2, y^3	50.47 **	115.75 **	6.55 **	98.91 **	117.01 **	125.42 **	100.64 **	5452.52 **
Corr of rel. efficiency								
profit margin	0.34	0.56	0.37	0.46	0.47	0.41	0.44	0.40
investment rate					0.19			0.21

Table 10–B: **Mean relative inefficiency for subsets of observations**

Variable	1990	1991	1992	1993	1994	1995	1996	1997
Engineering	-15.1	-22.6	-15.3	-15.4	-10.7	-9.7	-9.9	-11.6
Chemical ind.	-14.1	-17.4	-11.9	-13.8	-9.6	-11.0	-10.2	-12.7
Pharmaceutical ind.	-10.2	-12.6	-10.7	-15.7	-8.2	-11.7	-12.1	-12.1
Food ind.	-13.1	-15.8	-13.9	-17.2	-13.0	-11.4	-12.6	-15.3
Light ind.	-14.9	-19.7	-17.5	-17.5	-11.3	-11.3	-11.0	-13.4
Other ind.	-16.5	-17.7	-15.0	-15.6	-10.5	-10.6	-10.9	-13.0
Owner: Private			-15.0	-15.3	-11.0	-10.3	-11.2	-13.2
Government	-14.3	-20.7	-16.0	-18.4	-13.1	-12.0	-11.8	-15.4
Foreign	-11.8	-19.4	-9.9	-12.9	-8.7	-9.7	-9.3	-11.3
Imp. foreign	-8.4	-16.1	-12.3	-13.7	-10.7	-9.9	-10.4	-11.9
Other	-15.4	-19.1	-16.8	-17.3	-11.8	-11.2	-11.1	-13.5
Size: Small	-14.7	-20.1	-15.4	-16.7	-11.2	-10.8	-10.9	-13.1
Medium	-14.7	-19.7	-17.0	-16.1	-11.2	-10.7	-10.7	-13.0
Large	-15.4	-19.4	-13.5	-15.0	-10.7	-10.4	-10.3	-12.1

Table 11: **Two-equation models: engineering**

Variable	1990	1991	1992	1993	1994	1995	1996	1997
Production function								
Constant	0.85 **	0.18	0.16	0.30 **	0.36 **	0.14	0.10	0.08
y_{t-1}	0.65 **	0.42 **	0.23 **	0.50 **	0.55 **	0.56 **	0.67 **	0.67 **
log(L)	0.17 **	0.37 **	0.68 **	0.42 **	0.31 **	0.33 **	0.26 **	0.31 **
log(K)	0.04	0.14 **	0.05	0.09 **	0.13 **	0.14 **	0.13 **	0.08 **
σ	0.97 **	1.26 **	0.88 **	0.90 **	0.75 **	0.66 **	0.64 **	0.64 **
σ_u/σ_v	2.51 **	3.03 **	1.76 **	1.98 **	1.50 **	0.77 **	0.99 **	1.53 **
short-run ret. to scale	0.21 **	0.51 **	0.72 **	0.52 **	0.44 **	0.47 **	0.39 **	0.40 **
long-run ret. to scale	0.60 **	0.88	0.94	1.04	0.98	1.06	1.16 **	1.19 **
Nob	392	179	425	753	662	985	1076	1258
Mean of dep.var	4.02	3.50	3.39	3.46	3.75	3.61	3.57	3.48
S.dev of dep.var	1.10	1.41	1.17	1.33	1.36	1.45	1.52	1.55
R^2	0.61	0.62	0.70	0.76	0.83	0.84	0.88	0.90
Mean inefficiency (%)	-16.98	-26.25	-17.79	-17.99	-12.90	-8.84	-9.93	-11.97
Market share equation								
Constant	0.00	0.00	0.02 **	0.01 **	0.01	0.02 **	0.05	0.02 **
market $share_{t-1}$	0.86 **	0.87 **	1.09 *	1.01 **	1.05 **	1.06 **	0.83 **	0.18 **
efficiency	0.35 **	0.17	2.39 **	1.34 **	2.31 **	3.57 **	11.05	1.91 **
import penetration	0.02	-0.04	-0.01 *	0.00 *	0.00	0.00	-0.02 *	-0.01 **
concentration	0.01	-0.06	1.00 **	0.06	-0.11	-0.26	1.57	1.69 **
Mean of dep.var	0.01	0.02	0.03	0.03	0.04	0.03	0.04	0.03
S.dev of dep.var	0.04	0.05	0.07	0.12	0.14	0.13	0.27	0.11
SEE	0.01	0.01	0.05	0.03	0.04	0.04	0.25	0.09
R^2	0.97	0.95	0.43	0.92	0.91	0.92	0.16	0.41
White-hetero	231 **	112 **	339 **	293 **	323 **	689 **	55 **	836 **
Reset y^2	34.90 **	0.70	3.81	82.95 **	221.29 **	9.99 **	0.61	3559.50 **
Reset y^2, y^3	17.48 **	2.31	24.98 **	45.77 **	192.22 **	58.93 **	0.33	1947.48 **
Corr of rel. efficiency								
profit margin	0.41	0.66	0.35	0.46	0.56	0.50	0.45	0.41
investment rate			0.15		0.23	0.25		0.19

Table 12: **Two-equation models: chemical industry**

Variable	1990	1991	1992	1993	1994	1995	1996	1997
Production function								
Constant	0.68	0.48 **	-0.09	0.54 *	0.40 **	0.22	0.12	0.23 *
y_{t-1}	0.69 **	0.63 **	0.21 **	0.43 **	0.79 **	0.67 **	0.69 **	0.76 **
log(L)	0.14	-0.01	0.65 **	0.29 **	0.10 *	0.15 **	0.17 **	0.13 **
log(K)	0.12	0.30 **	0.22 **	0.25 **	0.10 **	0.19 **	0.16 **	0.14 **
σ	1.00 **	0.85 **	0.74 **	0.77 **	0.53 **	0.70 **	0.52 **	0.63 **
σ_u/σ_v	2.07 *	246.63	1.41	1.57 **	1.19 **	1.41 **	0.86 *	2.43 **
short-run ret. to scale	0.26 **	0.29 **	0.87 *	0.54 **	0.20 **	0.34 **	0.33 **	0.27 **
long-run ret. to scale	0.83	0.77 **	1.10	0.96	0.95	1.05	1.06	1.14
Nob	72	43	88	174	173	243	263	283
Mean of dep.var	4.97	4.31	4.28	4.18	4.47	4.09	3.92	3.80
S.dev of dep.var	1.70	1.35	1.70	1.65	1.63	1.71	1.70	1.81
R^2	0.83	0.85	0.89	0.88	0.93	0.90	0.93	0.94
Mean inefficiency (%)	-14.24	-14.31	-11.31	-12.31	-7.10	-10.87	-6.82	-11.49
Market share equation								
Constant	0.01	-0.02	0.01	0.00	0.01	0.01 *	0.00	0.00
market $share_{t-1}$	0.90 **	1.30 **	0.43 **	0.86 **	0.92 **	1.03 **	0.93 **	0.98 **
efficiency	0.71	-0.60	4.69 *	0.49 *	1.70 *	2.07 *	1.40	0.42 *
import penetration		0.00	-0.01 **	0.00	0.00	0.00	0.00	0.00
concentration	-0.01	0.11	2.50 **	0.39	-0.08	-0.02	0.03 *	0.17 **
Mean of dep.var	0.11	0.12	0.05	0.04	0.04	0.04	0.03	0.03
S.dev of dep.var	0.25	0.36	0.16	0.12	0.13	0.12	0.11	0.11
SEE	0.08	0.05	0.04	0.03	0.02	0.03	0.01	0.01
R^2	0.91	0.99	0.92	0.95	0.98	0.92	0.98	0.99
White-hetero	16	38 **	76 **	73 **	132 **	39 **	173 **	152 **
Reset y^2	12.94 **	6.93 *	11.09 **	3.95 *	4.79 *	0.26	3.55	0.09
Reset y^2, y^3	7.04 **	132.34 **	8.70 **	2.42	5.17 **	6.78 **	11.84 **	0.38
Corr of rel. efficiency								
profit margin	0.26	0.38	0.68	0.43		0.44	0.52	0.44
investment rate			0.20				0.25	0.34

Table 13: **Two-equation models: food industry**

Variable	1990	1991	1992	1993	1994	1995	1996	1997
Production function								
Constant	-0.28	-0.03	0.11	0.41 *	0.06	0.21 *	-0.05	0.17
y_{t-1}	0.44 **	0.49 **	0.18 **	0.33 **	0.51 **	0.59 **	0.70 **	0.55 **
log(L)	0.64 **	0.66 *	0.63 **	0.42 **	0.36 **	0.24 **	0.20 **	0.26 **
log(K)	-0.06	-0.20	0.20 **	0.21 **	0.16 **	0.16 **	0.14 **	0.22 **
σ	0.84 **	0.92 **	0.78 **	0.91 **	0.82 **	0.68 **	0.66 **	0.85 **
σ_u/σ_v	4.49	3.49	2.35 **	2.64 **	2.62 **	1.68 **	1.68 **	2.28 **
short-run ret. to scale	0.58 **	0.46 **	0.83 **	0.63 **	0.52 **	0.40 **	0.34 **	0.47 **
long-run ret. to scale	1.03	0.90	1.00	0.94	1.06	0.99	1.15 *	1.05
Nob	97	65	129	274	304	460	487	531
Mean of dep.var	5.08	4.87	4.56	4.09	4.19	3.70	3.46	3.18
S.dev of dep.var	1.05	1.09	1.48	1.59	1.60	1.68	1.76	1.81
R^2	0.69	0.66	0.87	0.84	0.87	0.91	0.92	0.89
Mean inefficiency (%)	-11.85	-13.22	-12.33	-15.74	-13.82	-12.17	-12.85	-18.46
Market share equation								
Constant	-0.01	0.00	0.01	0.00	0.00	0.00 **	0.00 *	0.00 *
market $share_{t-1}$	0.79 **	1.00 **	0.88 **	0.84 **	0.98 **	1.02 **	0.99 **	0.95 **
efficiency	0.00	0.10	0.86 *	1.23 **	0.70 **	0.58 **	0.54 **	0.70 *
import penetration		0.00	0.16 *	0.13	-0.01	0.00	-0.02	0.03
concentration	0.48 *	0.27	0.18	0.04	0.04	0.10	0.12	-0.09
Mean of dep.var	0.07	0.05	0.03	0.04	0.04	0.03	0.03	0.03
S.dev of dep.var	0.15	0.06	0.05	0.10	0.10	0.09	0.09	0.08
SEE	0.03	0.01	0.04	0.03	0.02	0.01	0.02	0.02
R^2	0.96	0.97	0.53	0.91	0.97	0.98	0.97	0.95
White-hetero	68 **	27 **	16	189 **	127 **	155 **	105 **	277 **
Reset y^2	36.26 **	17.21 **	0.07	0.56	8.81 **	0.26	6.53 *	1.66
Reset y^2, y^3	36.34 **	13.69 **	0.58	3.22 *	8.47 **	0.22	11.12 **	10.14 **
Corr of rel. efficiency								
profit margin	0.33	0.38	0.64	0.32	0.43	0.41	0.30	0.43
investment rate		-0.16	0.15	0.55	0.27			0.30

Table 14: **Two-equation models: light industry**

Variable	1990	1991	1992	1993	1994	1995	1996	1997
Production function								
Constant	0.37 **	-0.06	0.05	0.35 **	0.28 **	0.09	0.09	0.25 **
y_{t-1}	0.69 **	0.53 **	0.22 **	0.61 **	0.77 **	0.66 **	0.69 **	0.75 **
log(L)	0.10 **	0.33 **	0.57 **	0.23 **	0.12 **	0.24 **	0.24 **	0.15 **
log(K)	0.15 **	0.12 **	0.20 **	0.16 **	0.10 **	0.12 **	0.09 **	0.11 **
σ	0.68 **	0.97 **	0.83 **	0.80 **	0.53 **	0.64 **	0.62 **	0.63 **
σ_u/σ_v	1.57 **	2.74 **	2.03 **	1.72 **	1.51 **	1.54 **	1.35 **	1.94 **
short-run ret. to scale	0.25 **	0.45 **	0.77 **	0.39 **	0.23 **	0.36 **	0.32 **	0.26 **
long-run ret. to scale	0.80 **	0.95	0.98	0.99	0.98	1.06	1.06	1.06
Nob	537	309	483	843	764	988	1065	1173
Mean of dep.var	3.51	3.29	3.43	3.29	3.54	3.27	3.18	3.06
S.dev of dep.var	1.07	1.14	1.19	1.29	1.26	1.36	1.37	1.43
R^2	0.77	0.65	0.76	0.79	0.90	0.87	0.88	0.90
Mean inefficiency (%)	-12.71	-21.23	-17.08	-16.31	-9.72	-12.73	-12.18	-14.05
Market share equation								
Constant	0.00 **	0.01	0.02 **	0.01 **	0.01 *	0.00 **	0.01 **	0.01 **
market $share_{t-1}$	0.84 **	0.49 **	0.50 **	0.95 **	0.82 **	1.00 **	0.65 **	0.93 **
efficiency	0.38	0.92 *	0.95 *	0.84 **	1.32 *	0.87 **	2.22 **	1.05 **
import penetration		-0.05	-0.03 **	0.00	0.00	0.00	-0.02 **	0.00 *
concentration	-0.06	1.67 *	2.01 **	0.21	0.42	0.03	2.89 **	0.27 *
Mean of dep.var	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
S.dev of dep.var	0.05	0.04	0.07	0.04	0.06	0.05	0.08	0.07
SEE	0.01	0.03	0.05	0.02	0.04	0.02	0.05	0.01
R^2	0.94	0.58	0.51	0.81	0.60	0.92	0.62	0.96
White-hetero	178 **	222 **	135 **	104 **	179 **	339 **	399 **	507 **
Reset y^2	17.15 **	306.88 **	26.34 **	2.53	60.80 **	33.29 **	96.22 **	103.45 **
Reset y^2, y^3	12.41 **	247.00 **	18.72 **	1.27	81.69 **	19.92 **	78.29 **	111.32 **
Corr of rel. efficiency								
profit margin	0.31	0.48	0.50	0.54	0.43	0.41	0.48	0.48
investment rate			0.17				0.19	0.19

Table 15: **Two-equation models: other industries**

Variable	1990	1991	1992	1993	1994	1995	1996	1997
Production function								
Constant	0.58	0.24	0.22	0.66 **	0.28 *	0.24 **	0.13	0.05
y_{t-1}	0.73 **	0.37 **	0.21 **	0.37 **	0.56 **	0.65 **	0.64 **	0.68 **
log(L)	0.03	0.33	0.63 **	0.39 **	0.34 **	0.24 **	0.28 **	0.22 **
log(K)	0.20 *	0.21 *	0.13 **	0.17 **	0.10 **	0.12 **	0.09 **	0.13 **
σ	1.14 **	0.88 **	0.83 **	0.84 **	0.59 **	0.65 **	0.61 **	0.52 **
σ_u/σ_v	2.06 **	2.01	2.13 **	2.41 **	1.86 **	1.88 **	1.60 **	1.08 **
short-run ret. to scale	0.23 **	0.54 **	0.76 **	0.56 **	0.43 **	0.36 **	0.37 **	0.35 **
long-run ret. to scale	0.86	0.86	0.97	0.89 *	0.99	1.03	1.05	1.09
Nob	98	78	114	238	251	369	412	449
Mean of dep.var	5.44	5.50	4.90	4.51	4.71	4.39	4.20	4.10
S.dev of dep.var	1.78	1.40	1.66	1.72	1.64	1.71	1.74	1.79
R^2	0.79	0.80	0.87	0.88	0.93	0.92	0.93	0.94
Mean inefficiency (%)	-14.45	-11.11	-12.04	-13.20	-8.64	-9.98	-9.47	-7.27
Market share equation								
Constant	0.00	0.01	0.04 **	0.01	0.01 *	0.02 *	0.02 *	0.01
market share$_{t-1}$	0.98 **	1.01 **	0.39 **	1.02 **	1.00 **	0.85 **	0.65 **	1.08 **
efficiency	0.81	2.42 *	2.18	1.98 *	2.83 *	1.93 *	2.51	2.51 *
import penetration	-0.02	0.00	-0.01 **	0.00	0.00	0.00	0.00 *	0.00
concentration	0.15	0.03	0.66 **	0.03	0.04	-0.08	0.27	-0.01
Mean of dep.var	0.12	0.09	0.08	0.06	0.07	0.05	0.04	0.04
S.dev of dep.var	0.19	0.18	0.12	0.13	0.14	0.11	0.09	0.11
SEE	0.05	0.04	0.08	0.04	0.05	0.04	0.04	0.03
R^2	0.93	0.96	0.58	0.90	0.87	0.87	0.81	0.95
White-hetero	60 **	54 **	17	146 **	43 **	336 **	379 **	378 **
Reset y^2	12.33 **	16.49 **	1.22	29.89 **	3.50	43.01 **	329.47 **	95.45 **
Reset y^2, y^3	6.12 **	13.97 **	1.31	21.23 **	3.18 *	21.48 **	292.55 **	87.23 **
Corr of rel. efficiency								
profit margin	0.36	0.62	0.37	0.62	0.45	0.37	0.48	0.35
investment rate				0.17		0.21		0.23

Table 16: **Two-equation models: agriculture**

Variable	1992	1993	1994	1995	1996	1997
Production function						
Constant	-0.08	0.03	-0.16 *	0.04	0.16 *	0.00
y_{t-1}	0.19 **	0.32 **	0.43 **	0.57 **	0.66 **	0.58 **
log(L)	0.67 **	0.56 **	0.55 **	0.37 **	0.21 **	0.33 **
log(K)	0.08 **	0.05 **	0.03 **	0.04 **	0.11 **	0.08 **
σ	0.81 **	0.88 **	0.62 **	0.63 **	0.75 **	0.75 **
σ_u/σ_v	2.60 **	2.39 **	1.86 **	1.64 **	2.31 **	1.97 **
short-run ret. to scale	0.75 **	0.62 **	0.58 **	0.41 **	0.33 **	0.41 **
long-run ret. to scale	0.93 **	0.91 **	1.03	0.96	0.96	0.99
Nob	799	1072	1107	1396	1459	1509
Mean of dep.var	3.74	3.27	3.45	3.23	3.01	2.85
S.dev of dep.var	0.95	1.04	1.04	1.10	1.20	1.21
R^2	0.66	0.64	0.81	0.82	0.80	0.80
Mean inefficiency (%)	-15.69	-19.30	-12.38	-12.91	-17.57	-18.21
Market share equation						
Constant	0.00	0.00 *	0.00	0.00	0.00	0.00 **
market share$_{t-1}$	0.58 **	0.81 **	0.86 **	1.08 **	0.32	0.82 **
efficiency	0.16 **	0.09 **	0.21 **	0.05 *	0.19 **	0.09 **
import penetration	0.01	0.00 **	0.00	0.00 *	-0.01	0.00 *
concentration	3.15 *	0.38 *	1.65	0.48 *	2.52	-0.26
Mean of dep.var	0.00	0.00	0.00	0.00	0.00	0.00
S.dev of dep.var	0.01	0.01	0.01	0.01	0.01	0.01
SEE	0.01	0.00	0.01	0.00	0.01	0.00
R^2	0.65	0.92	0.76	0.95	0.53	0.94
White-hetero	372 **	480 **	353 **	865 **	1405 **	462 **
Reset y^2	79.19 **	35.61 **	23.64 **	615.46 **	974.40 **	515.25 **
Reset y^2, y^3	39.61 **	21.27 **	28.31 **	445.36 **	1538.57 **	272.75 **
Corr of rel. efficiency						
profit margin	0.47	0.35	0.33		0.16	
investment rate			0.18	0.18	0.17	0.23

Table 17: **Two-equation models: construction**

Variable	1990	1991	1992	1993	1994	1995	1996	1997
Production function								
Constant	0.72 **	0.45	0.16	0.04	-0.19 *	-0.09	0.25 **	0.02
y_{t-1}	0.67 **	0.81 **	0.14 **	0.43 **	0.63 **	0.60 **	0.65 **	0.54 **
log(L)	0.14 *	0.08	0.73 **	0.54 **	0.40 **	0.41 **	0.29 **	0.38 **
log(K)	0.06	0.00	0.04	0.03	0.04 **	0.02	0.06 **	0.11 **
σ	0.81 **	0.94 **	0.96 **	0.87 **	0.59 **	0.81 **	0.83 **	0.70 **
σ_u/σ_v	1.42 **	2.40 **	1.84 **	1.48 **	1.59 **	1.83 **	1.89 **	1.24 **
short-run ret. to scale	0.20 **	0.08 **	0.77 **	0.57 **	0.44 **	0.42 **	0.34 **	0.49 **
long-run ret. to scale	0.59 **	0.44 *	0.90 *	1.00	1.19 **	1.06	0.99	1.08 *
Nob	341	153	416	763	586	896	933	1039
Mean of dep.var	3.99	3.52	3.08	3.05	3.23	2.77	2.65	2.56
S.dev of dep.var	1.08	1.06	1.05	1.13	1.14	1.23	1.25	1.25
R^2	0.66	0.62	0.56	0.66	0.85	0.77	0.77	0.81
Mean inefficiency (%)	-12.93	-19.26	-21.64	-18.51	-12.02	-20.04	-21.31	-16.56
Market share equation								
Constant	0.00	-0.01	0.00 *	0.00 **	0.00 **	0.00 *	0.00 **	0.00 **
market $share_{t-1}$	0.76 **	1.02 **	0.03	0.68 **	0.19	1.00 **	0.88 **	1.02 **
efficiency	0.35	0.77	0.25 **	0.23 **	0.43 **	0.17 **	0.11 **	0.17 **
import penetration	0.02	-0.71 *	0.00	0.00	0.00	0.00	0.00	0.00
concentration	0.93	3.92 *	3.17 **	0.85	1.40	0.31	0.30	0.40
Mean of dep.var	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00
S.dev of dep.var	0.04	0.08	0.01	0.01	0.01	0.01	0.01	0.01
SEE	0.01	0.02	0.01	0.00	0.01	0.00	0.00	0.00
R^2	0.87	0.92	0.15	0.69	0.17	0.84	0.88	0.91
White-hetero	173 **	140 **	197 **	634 **	370 **	231 **	466 **	131 **
Reset y^2	0.14	435.98 **	187.72 **	134.19 **	2441.18 **	15.93 **	1.53	21.53 **
Reset y^2, y^3	10.71 **	232.64 **	93.81 **	227.69 **	1983.21 **	15.02 **	5.27 **	18.02 **
Corr of rel. efficiency								
profit margin	0.59	0.63	0.70	0.64	0.55	0.50	0.44	0.42
investment rate			0.28	0.17	0.16			

Table 18: **Two-equation models: trade**

Variable	1990	1991	1992	1993	1994	1995	1996	1997
Production function								
Constant	0.05	-0.02	-0.14	0.23 **	0.27 **	0.14 **	0.15 **	0.11 **
y_{t-1}	0.64 **	0.73 **	0.22 **	0.63 **	0.78 **	0.75 **	0.77 **	0.79 **
log(L)	0.24 **	0.16 **	0.63 **	0.28 **	0.16 **	0.18 **	0.18 **	0.17 **
log(K)	0.11 **	0.08 **	0.16 **	0.07 **	0.07 **	0.10 **	0.08 **	0.08 **
σ	0.77 **	0.85 **	0.88 **	0.80 **	0.75 **	0.77 **	0.73 **	0.70 **
σ_u/σ_v	1.55 **	1.84 **	1.02 **	0.80 **	1.54 **	1.26 **	1.25 **	1.11 **
short-run ret. to scale	0.35 **	0.24 **	0.78 **	0.35 **	0.23 **	0.28 **	0.26 **	0.26 **
long-run ret. to scale	0.95	0.89	1.00	0.95	1.07	1.11 *	1.13 **	1.19 **
Nob	574	537	915	1886	1585	2315	2602	3030
Mean of dep.var	4.63	3.89	3.55	3.39	3.55	3.17	3.03	2.85
S.dev of dep.var	1.12	1.09	1.34	1.37	1.40	1.46	1.46	1.51
R^2	0.73	0.67	0.71	0.74	0.84	0.83	0.84	0.86
Mean inefficiency (%)	-10.81	-14.94	-14.14	-11.74	-13.66	-14.88	-14.84	-14.29
Market share equation								
Constant	0.00	0.00	0.01	-0.01	0.02 **	0.01 **	0.01 *	0.01 **
market $share_{t-1}$	0.82 **	0.66 **	0.90 **	0.33	0.57 **	0.77 **	0.83 **	0.86 **
efficiency	0.94 *	0.65	1.26 **	2.38 *	1.51 **	1.29 **	1.49 **	1.04 **
import penetration		-0.09 **	0.00	0.00	0.00	0.00	0.00	0.00
concentration	0.65	1.26 **	2.69 **	6.94 *	-0.12	0.48	0.70	0.17
Mean of dep.var	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.01
S.dev of dep.var	0.08	0.06	0.07	0.10	0.07	0.06	0.05	0.04
SEE	0.02	0.02	0.04	0.06	0.03	0.03	0.02	0.02
R^2	0.92	0.86	0.62	0.65	0.81	0.81	0.84	0.83
White-hetero	445 **	519 **	349 **	1864 **	861 **	766 **	1228 **	1157 **
Reset y^2	18.93 **	5.10 *	0.76	9148.01 **	1610.22 **	396.01 **	24.91 **	0.00
Reset y^2, y^3	10.63 **	160.49 **	13.12 **	7473.81 **	807.38 **	197.95 **	50.20 **	64.34 **
Corr of rel. efficiency								
profit margin	0.29	0.28	0.17	0.16		0.17		
investment rate			0.19					

Table 19: **Two-equation models: services**

Variable	1990	1991	1992	1993	1994	1995	1996	1997
Production function								
Constant	0.03	-0.68	0.39	-0.09	0.44 **	0.12	0.27 **	0.29 **
y_{t-1}	0.63 **	0.15	0.28 **	0.58 **	0.79 **	0.75 **	0.75 **	0.65 **
log(L)	0.08	0.57	0.36 **	0.39 **	0.16 **	0.17 **	0.15 **	0.22 **
log(K)	0.25 *	0.30	0.31 **	0.10 **	0.04	0.10 **	0.13 **	0.14 **
σ	0.87 **	1.36 **	0.59 **	0.60 **	0.67 **	0.52 **	0.69 **	0.63 **
σ_u/σ_v	444.46	541.50	0.83	0.91 *	2.00 **	0.87 **	1.71 **	0.99 **
short-run ret. to scale	0.33 **	0.87	0.67 **	0.49 **	0.19 **	0.27 **	0.28 **	0.36 **
long-run ret. to scale	0.89	1.02	0.93	1.17 *	0.92	1.06	1.12	1.01
Nob	45	32	105	316	289	441	491	558
Mean of dep.var	5.42	5.53	4.14	3.35	3.75	3.60	3.45	3.34
S.dev of dep.var	1.80	2.00	1.79	1.49	1.61	1.62	1.67	1.70
R^2	0.86	0.79	0.92	0.88	0.91	0.92	0.91	0.90
Mean inefficiency (%)	-8.21	-14.56	-7.24	-9.58	-12.09	-7.54	-13.23	-10.48
Market share equation								
Constant	-0.01	0.00	0.06	0.01	0.01 *	0.04	0.01	0.01 **
market $share_{t-1}$	0.98 **	1.03 **	0.94 **	0.84 **	0.79 **	0.96 **	0.76 **	0.94 **
efficiency	0.23	2.34	15.38	3.12 *	3.56 **	13.55	2.29 *	3.06 **
import penetration		0.00	0.00	17.63	-19.19	8.23	0.00	0.00
concentration	0.07	0.04	0.91	0.51 **	0.50	0.02	1.08 *	0.17 *
Mean of dep.var	0.20	0.22	0.10	0.09	0.08	0.08	0.06	0.06
S.dev of dep.var	0.31	0.31	0.25	0.35	0.31	0.34	0.28	0.24
SEE	0.04	0.05	0.15	0.05	0.07	0.20	0.08	0.03
R^2	0.99	0.98	0.65	0.98	0.95	0.65	0.92	0.98
White-hetero	27 **	31 **	37 **	102 **	239 **	84 **	460 **	97 **
Reset y^2	1.34	1.87	12.83 **	8.44 **	41.50 **	14.30 **	7.43 **	16.40 **
Reset y^2, y^3	1.19	2.08	7.07 **	19.34 **	161.98 **	10.30 **	178.06 **	25.29 **
Corr of rel. efficiency								
profit margin		0.64	0.59	0.35	0.51	0.50	0.29	0.15
investment rate	0.19	-0.16	0.18			0.22		0.19

Table 20: **Two-equation models: ownership: private**

Variable	1993	1994	1995	1996	1997
Production function					
Constant	0.34 **	0.34 **	0.25 **	0.22 **	0.23 **
y_{t-1}	0.59 **	0.64 **	0.61 **	0.76 **	0.69 **
log(L)	0.31 **	0.26 **	0.27 **	0.20 **	0.23 **
log(K)	0.11 **	0.08 **	0.12 **	0.06 **	0.09 **
σ	0.81 **	0.70 **	0.71 **	0.77 **	0.71 **
σ_u/σ_v	1.29 **	1.42 **	1.07 **	1.69 **	1.50 **
short-run ret. to scale	0.42 **	0.35 **	0.39 **	0.26 **	0.32 **
long-run ret. to scale	1.02	0.97	1.00	1.08	1.04
Nob	1014	1081	1591	1699	1825
Mean of dep.var	3.54	3.88	3.72	3.54	3.46
S.dev of dep.var	1.32	1.33	1.42	1.50	1.53
R^2	0.77	0.84	0.83	0.85	0.88
Mean inefficiency (%)	-14.28	-11.53	-11.09	-14.57	-13.17
Market share equation					
Constant	0.01 **	0.01 *	0.01 **	0.01 **	0.00 **
market $share_{t-1}$	0.86 **	0.81 **	0.81 **	0.94 **	0.91 **
efficiency	1.11 **	2.35 *	2.15 **	1.09 **	0.87 **
import penetration	0.00 **	0.00	0.00	0.00	0.00 **
concentration	0.37 *	0.17	-0.07	0.13	0.17 **
Mean of dep.var	0.03	0.03	0.03	0.03	0.03
S.dev of dep.var	0.09	0.09	0.09	0.09	0.07
SEE	0.03	0.04	0.03	0.03	0.02
R^2	0.92	0.83	0.86	0.88	0.92
White-hetero	283 **	178 **	740 **	467 **	471 **
Reset y^2	0.83	1.75	74.85 **	10.63 **	4.78 *
Reset y^2, y^3	17.08 **	17.31 **	80.14 **	18.73 **	7.40 **
Corr of rel. efficiency					
profit margin	0.50	0.38	0.40	0.27	0.25
investment rate					

Table 21: **Two-equation models: ownership: state**

Variable	1992	1993	1994	1995	1996	1997
Production function						
Constant	-0.09	-0.02	0.04	-0.17 *	0.11	-0.10
y_{t-1}	0.19 **	0.41 **	0.59 **	0.60 **	0.67 **	0.58 **
log(L)	0.67 **	0.51 **	0.35 **	0.38 **	0.26 **	0.38 **
log(K)	0.16 **	0.09 **	0.08 **	0.07 **	0.07 **	0.07 **
σ	0.94 **	0.89 **	0.69 **	0.73 **	0.68 **	0.65 **
σ_u/σ_v	2.10 **	1.78 **	1.95 **	1.79 **	1.86 **	1.21 **
short-run ret. to scale	0.83 **	0.60 **	0.43 **	0.45 **	0.33 **	0.45 **
long-run ret. to scale	1.02	1.02	1.05	1.12 **	1.02	1.06
Nob	788	1072	817	848	693	638
Mean of dep.var	4.27	3.89	4.31	4.02	3.89	3.79
S.dev of dep.var	1.60	1.60	1.63	1.68	1.69	1.63
R^2	0.83	0.83	0.90	0.90	0.91	0.90
Mean inefficiency (%)	-15.56	-15.31	-10.81	-12.12	-11.73	-10.26
Market share equation						
Constant	0.02 **	0.01 *	0.01 *	0.01 **	0.00	0.00
market $share_{t-1}$	0.49 **	0.86 **	0.81 **	0.92 **	1.03 **	0.96 **
efficiency	1.46 **	1.19 **	1.92 **	0.92 **	0.71	1.09 *
import penetration	-0.03 **	0.00	-0.01 **	0.00	-0.01	0.00
concentration	1.74 **	0.36	0.34 *	0.05	0.14	0.07 *
Mean of dep.var	0.05	0.05	0.05	0.05	0.05	0.04
S.dev of dep.var	0.13	0.19	0.20	0.18	0.20	0.20
SEE	0.08	0.03	0.05	0.03	0.04	0.02
R^2	0.61	0.97	0.95	0.98	0.95	0.99
White-hetero	237 **	566 **	646 **	37 **	158 **	182 **
Reset y^2	32.89 **	16.65 **	42.65 **	69.31 **	171.94 **	39.02 **
Reset y^2, y^3	25.09 **	62.34 **	193.86 **	36.00 **	85.85 **	19.62 **
Corr of rel. efficiency						
profit margin	0.24	0.43	0.43	0.23		
investment rate						0.15

Table 22: **Two-equation models: ownership: foreign majority**

Variable	1992	1993	1994	1995	1996	1997
Production function						
Constant	0.38	0.84 **	0.61 **	0.53 **	0.36 **	0.27 **
y_{t-1}	0.17 **	0.51 **	0.65 **	0.67 **	0.64 **	0.72 **
log(L)	0.45 **	0.25 **	0.21 **	0.17 **	0.23 **	0.20 **
log(K)	0.30 **	0.19 **	0.13 **	0.15 **	0.15 **	0.11 **
σ	0.55	0.86 **	0.67 **	0.75 **	0.70 **	0.65 **
σ_u/σ_v	0.05	1.34 **	1.36 **	1.22 **	1.02 **	1.02 **
short-run ret. to scale	0.75 **	0.43 **	0.33 **	0.32 **	0.38 **	0.31 **
long-run ret. to scale	0.90	0.88 *	0.96	0.95	1.04	1.13 **
Nob	174	614	603	1021	1201	1387
Mean of dep.var	4.61	4.39	4.68	4.35	4.33	4.31
S.dev of dep.var	1.24	1.48	1.45	1.55	1.57	1.64
R^2	0.80	0.80	0.87	0.85	0.86	0.89
Mean inefficiency (%)	-0.48	-12.21	-8.94	-10.45	-9.07	-8.51
Market share equation						
Constant	0.27	0.01 **	0.02 **	0.02 **	0.05	0.04 **
market $share_{t-1}$	0.47 *	0.94 **	1.12 **	1.15 **	0.65 **	0.23 **
efficiency	1169.83	1.98 **	3.83 **	4.45 *	9.48	4.37 **
import penetration	-0.02 **	0.00	0.00	-0.01	-0.02 **	-0.02 **
concentration	2.90 **	0.18	-0.19	0.21	1.74 **	2.03 **
Mean of dep.var	0.06	0.05	0.06	0.06	0.06	0.05
S.dev of dep.var	0.12	0.14	0.17	0.21	0.28	0.15
SEE	0.07	0.04	0.05	0.13	0.24	0.11
R^2	0.64	0.91	0.93	0.62	0.26	0.45
White-hetero	56 **	254 **	82 **	143 **	43 **	960 **
Reset y^2	4.89 *	83.62 **	20.41 **	0.98	5.38 *	4961.67 **
Reset y^2, y^3	2.43	78.57 **	10.25 **	0.85	3.67 *	2488.91 **
Corr of rel. efficiency						
profit margin	0.46	0.25		0.40	0.44	
investment rate						0.19

Table 23: **Two-equation models: ownership: important foreign**

Variable	1992	1993	1994	1995	1996	1997
Production function						
Constant	0.47	0.58 **	0.57 **	0.32 *	0.22	-0.19
y_{t-1}	0.17 *	0.52 **	0.69 **	0.67 **	0.77 **	0.67 **
log(L)	0.55 **	0.30 **	0.16 **	0.16 **	0.14 **	0.20 **
log(K)	0.25 **	0.16 **	0.13 **	0.16 **	0.12 **	0.17 **
σ	0.94 **	0.80 **	0.73 **	0.60 **	0.65 **	0.50
σ_u/σ_v	1.42 *	1.70 **	1.44 **	0.92 **	1.28 **	0.03
short-run ret. to scale	0.81 *	0.46 **	0.28 **	0.32 **	0.25 **	0.37 **
long-run ret. to scale	0.97	0.96	0.90	0.98	1.12	1.11
Nob	100	269	229	315	325	350
Mean of dep.var	3.83	4.08	4.37	4.14	3.98	3.92
S.dev of dep.var	1.41	1.52	1.54	1.71	1.82	1.75
R^2	0.74	0.85	0.87	0.91	0.92	0.91
Mean inefficiency (%)	-15.89	-13.23	-10.67	-7.74	-10.11	-0.34
Market share equation						
Constant	0.01 **	0.00	0.01	0.02 **	0.00	0.39 **
market $share_{t-1}$	0.52 **	-0.07	0.66 **	0.86 **	1.09 **	0.97 **
efficiency	1.07 **	0.34	2.35 **	3.63 *	0.30	2939.77 **
import penetration	0.00 **	-0.04	-0.01	0.00 *	0.00	0.00
concentration	0.80 **	5.43	0.80	0.03	-0.02	0.20 **
Mean of dep.var	0.02	0.07	0.07	0.06	0.05	0.05
S.dev of dep.var	0.04	0.39	0.32	0.25	0.26	0.25
SEE	0.02	0.18	0.10	0.04	0.04	0.03
R^2	0.79	0.78	0.91	0.98	0.98	0.99
White-hetero	35 **	267 **	227 **	236 **	138 **	216 **
Reset y^2	7.34 **	10.27 **	3.52	10.63 **	93.37 **	0.00
Reset y^2, y^3	5.09 **	883.52 **	802.15 **	169.44 **	47.10 **	0.13
Corr of rel. efficiency						
profit margin	0.57	0.26	0.36	0.49	0.44	0.29
investment rate	0.29		0.38	0.61		0.18

Table 24: **Two-equation models: ownership: other**

Variable	1992	1993	1994	1995	1996	1997
Production function						
Constant	0.02	0.14 **	0.15 **	0.07	0.15 **	0.24 **
y_{t-1}	0.25 **	0.50 **	0.66 **	0.67 **	0.73 **	0.71 **
log(L)	0.65 **	0.43 **	0.29 **	0.28 **	0.22 **	0.21 **
log(K)	0.04 **	0.02 **	0.05 **	0.06 **	0.05 **	0.07 **
σ	0.81 **	0.81 **	0.65 **	0.69 **	0.69 **	0.71 **
σ_u/σ_v	1.50 **	1.29 **	1.83 **	1.58 **	1.55 **	1.65 **
short-run ret. to scale	0.69 **	0.45 **	0.34 **	0.34 **	0.27 **	0.27 **
long-run ret. to scale	0.91 **	0.90 **	0.98	1.02	0.99	0.93 **
Nob	2394	3421	3062	4382	4905	5697
Mean of dep.var	3.34	3.05	3.17	2.83	2.70	2.53
S.dev of dep.var	1.05	1.09	1.05	1.13	1.17	1.20
R^2	0.66	0.66	0.79	0.79	0.80	0.80
Mean inefficiency (%)	-15.90	-16.49	-13.94	-16.09	-16.79	-18.60
Market share equation						
Constant	0.01 **	0.00	0.00 **	0.00	0.00 **	0.00 **
market $share_{t-1}$	0.66 **	0.73 **	0.74 **	0.97 **	0.81 **	0.80 **
efficiency	0.98 **	0.23	0.35 **	0.26 **	0.55 **	0.27 **
import penetration	-0.01 **	0.00	0.00	0.00	0.00	0.00 *
concentration	0.77 **	0.22	0.21	0.27	0.27	0.20
Mean of dep.var	0.01	0.01	0.01	0.01	0.01	0.01
S.dev of dep.var	0.04	0.03	0.03	0.03	0.03	0.02
SEE	0.03	0.02	0.01	0.01	0.01	0.01
R^2	0.43	0.78	0.73	0.80	0.83	0.86
White-hetero	480 **	1575 **	708 **	1199 **	1349 **	1806 **
Reset y^2	5.11 *	0.01	0.00	217.24 **	32.89 **	1.45
Reset y^2, y^3	66.04 **	2.88	364.21 **	110.83 **	319.78 **	96.59 **
Corr of rel. efficiency						
profit margin	0.51	0.16	0.31		0.20	0.21
investment rate				0.16		0.20

Table 25: **Two-equation models: small firms**

Variable	1990	1991	1992	1993	1994	1995	1996	1997
Production function								
Constant	0.35	0.71 **	0.32 **	0.15 *	0.10	0.01	0.08 *	0.15 **
y_{t-1}	0.71 **	0.78 **	0.19 **	0.57 **	0.69 **	0.69 **	0.75 **	0.72 **
log(L)	0.20 **	0.04	0.62 **	0.38 **	0.29 **	0.28 **	0.24 **	0.23 **
log(K)	0.01	-0.03	0.06 **	0.08 **	0.06 **	0.09 **	0.07 **	0.08 **
σ	0.90 **	0.89 **	0.90 **	0.87 **	0.72 **	0.76 **	0.78 **	0.74 **
σ_u/σ_v	1.45 **	1.93 **	1.42 **	1.33 **	1.57 **	1.38 **	1.60 **	1.50 **
short-run ret. to scale	0.21 **	0.01 **	0.68 **	0.45 **	0.35 **	0.37 **	0.31 **	0.31 **
long-run ret. to scale	0.73	0.05 **	0.84 **	1.06	1.13 *	1.21 **	1.24 **	1.12 **
Nob	569	370	1441	3423	2821	4917	5653	6610
Mean of dep.var	3.19	2.85	2.75	2.71	2.79	2.59	2.48	2.36
S.dev of dep.var	0.97	0.94	0.87	0.99	0.94	1.04	1.10	1.12
R^2	0.49	0.53	0.39	0.53	0.66	0.68	0.72	0.74
Mean inefficiency (%)	-18.07	-21.77	-21.22	-20.28	-17.08	-18.65	-20.65	-20.36
Market share equation								
Constant	0.00 **	0.00 **	0.01 **	0.00	0.01 **	0.00 **	0.00 **	0.00 *
market $share_{t-1}$	0.10	0.66 **	0.14	0.54 *	0.46 **	0.77 **	0.71 **	0.99 **
efficiency	0.20 **	0.14 **	0.79 **	0.54 **	0.60 **	0.54 **	0.51 **	0.34 **
import penetration	-0.03 *	0.00	-0.01 *	-0.02	0.00 **	0.00	-0.01 **	0.00
concentration	0.25 *	0.08 *	0.96 **	1.64	0.31 **	0.18 *	0.44 *	-0.02
Mean of dep.var	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01
S.dev of dep.var	0.01	0.01	0.03	0.08	0.04	0.04	0.04	0.03
SEE	0.01	0.00	0.02	0.06	0.02	0.02	0.02	0.01
R^2	0.29	0.85	0.46	0.32	0.85	0.87	0.80	0.87
White-hetero	313 **	88 **	623 **	841 **	473 **	1930 **	3761 **	4566 **
Reset y^2	409.71 **	1.49	0.26	9.07 **	595.51 **	798.50 **	1368.32 **	2175.52 **
Reset y^2, y^3	209.58 **	8.93 **	63.10 **	334.40 **	349.12 **	495.04 **	817.39 **	1198.71 **
Corr of rel. efficiency								
profit margin	0.36	0.58	0.31	0.17	0.21		0.16	
investment rate								

Table 26: **Two-equation models: medium-sized firms**

Variable	1990	1991	1992	1993	1994	1995	1996	1997
Production function								
Constant	0.56 **	0.16	-0.25	0.41 **	0.25 **	0.12	0.40 **	0.11
y_{t-1}	0.63 **	0.47 **	0.22 **	0.45 **	0.62 **	0.65 **	0.74 **	0.71 **
log(L)	0.09 **	0.31 **	0.55 **	0.35 **	0.23 **	0.23 **	0.09 **	0.16 **
log(K)	0.17 **	0.11 **	0.24 **	0.13 **	0.14 **	0.12 **	0.13 **	0.15 **
σ	0.73 **	0.86 **	0.82 **	0.87 **	0.62 **	0.64 **	0.62 **	0.61 **
σ_u/σ_v	1.94 **	2.10 **	1.62 **	1.61 **	1.58 **	1.39 **	1.56 **	1.20 **
short-run ret. to scale	0.27 **	0.42 **	0.79 **	0.49 **	0.37 **	0.36 **	0.22 **	0.31 **
long-run ret. to scale	0.73 **	0.80 **	1.01	0.88 **	0.97	1.02	0.85 *	1.07
Nob	894	633	1659	2419	2350	2567	2550	2614
Mean of dep.var	3.91	3.56	3.85	3.89	4.06	4.09	4.09	4.06
S.dev of dep.var	0.78	0.81	0.84	0.91	0.85	0.87	0.88	0.91
R^2	0.54	0.42	0.47	0.49	0.69	0.68	0.71	0.71
Mean inefficiency (%)	-12.81	-16.79	-14.26	-14.85	-10.00	-9.80	-9.87	-8.96
Market share equation								
Constant	0.00 *	0.00 *	0.02 **	0.00 *	0.01 **	0.00	0.01 **	0.01 **
market $share_{t-1}$	0.64 **	0.46 **	0.13	0.80 **	0.79 **	1.24 **	0.61 **	0.88 **
efficiency	0.42 **	0.00	1.56 **	0.52	1.96 **	1.52 **	1.70 **	1.60 **
import penetration	-0.02	-0.06 **	-0.01 **	0.00	0.00 *	0.00	-0.01 *	0.00 **
concentration	0.20	0.95 **	1.61 **	0.24	0.19	0.09	1.14 *	0.19 **
Mean of dep.var	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
S.dev of dep.var	0.04	0.03	0.06	0.06	0.05	0.11	0.09	0.08
SEE	0.01	0.01	0.04	0.02	0.03	0.08	0.04	0.02
R^2	0.90	0.86	0.39	0.84	0.73	0.44	0.76	0.95
White-hetero	779 **	192 **	483 **	889 **	283 **	482 **	409 **	743 **
Reset y^2	8.70 **	115.40 **	144.75 **	10.43 **	34.26 **	48.38 **	184.18 **	3.65
Reset y^2, y^3	76.19 **	77.26 **	83.92 **	7.50 **	17.99 **	30.92 **	94.91 **	4.62 *
Corr of rel. efficiency								
profit margin	0.32	0.47	0.36	0.43	0.39	0.35	0.38	0.37
investment rate	0.20			0.20		0.26	0.23	0.22

Table 27: **Two-equation models: large firms**

Variable	1990	1991	1992	1993	1994	1995	1996	1997
Production function								
Constant	1.29 **	0.56 *	1.04 **	0.94 **	1.12 **	1.19 **	0.48	0.92 **
y_{t-1}	0.65 **	0.52 **	0.24 **	0.62 **	0.77 **	0.62 **	0.76 **	0.75 **
log(L)	-0.03	0.19 **	0.34 **	0.12 **	0.01	0.05 **	0.07 **	0.03
log(K)	0.22 **	0.21 **	0.28 **	0.13 **	0.10 **	0.16 **	0.10 **	0.14 **
σ	0.92 **	1.18 **	0.71 **	0.64 **	0.59 **	0.56 **	0.45	0.65 **
σ_u/σ_v	2.43 **	4.04 **	1.25 **	0.51	1.13 **	0.48 *	0.01	0.98 **
short-run ret. to scale	0.19 **	0.40 **	0.63 **	0.25 **	0.11 **	0.21 **	0.16 **	0.17 **
long-run ret. to scale	0.54 **	0.84 *	0.83 **	0.67 **	0.47 **	0.56 **	0.69 **	0.67 **
Nob	698	398	379	495	559	637	622	642
Mean of dep.var	5.47	5.24	5.93	6.05	6.20	6.16	6.15	6.18
S.dev of dep.var	1.11	1.22	0.96	1.13	1.05	1.07	1.11	1.19
R^2	0.65	0.56	0.66	0.72	0.80	0.76	0.76	0.79
Mean inefficiency (%)	-11.66	-16.52	-7.40	-3.87	-5.53	-3.12	-0.08	-5.72
Market share equation								
Constant	0.00	0.01	0.07 **	0.09 **	0.04 *	0.07 **	18.69	0.10 **
market $share_{t-1}$	0.90 **	1.01 **	0.54 **	0.87 **	0.88 **	0.95 **	0.89 **	0.28 *
efficiency	0.86 *	1.90	8.27 **	36.13 **	9.65 *	29.73 **	366866.10	6.33
import penetration	-0.04 *	0.00	-0.02 *	-0.01 *	-0.01 **	-0.01	-0.01	-0.01 **
concentration	0.20 **	0.06	1.23 **	0.41 *	0.22	-0.12	0.20	1.06 **
Mean of dep.var	0.09	0.09	0.10	0.14	0.14	0.14	0.15	0.14
S.dev of dep.var	0.17	0.19	0.17	0.31	0.28	0.26	0.41	0.27
SEE	0.04	0.06	0.11	0.06	0.08	0.06	0.30	0.20
R^2	0.94	0.90	0.59	0.97	0.93	0.94	0.49	0.46
White-hetero	112 **	201 **	115 **	290 **	403 **	406 **	471 **	549 **
Reset y^2	26.71 **	65.90 **	10.83 **	0.09	0.21	2.85	60.73 **	1152.25 **
Reset y^2, y^3	13.49 **	43.82 **	7.41 **	1.59	4.24 *	11.49 **	73.67 **	711.28 **
Corr of rel. efficiency								
profit margin	0.39	0.51	0.35	0.37	0.22	0.23	0.20	0.15
investment rate					0.17			