“THE EFFECTS OF FOREIGN
DIRECT INVESTMENT
ON THE EFFICIENCY OF
UKRAINIAN MILK
ENTERPRISES”

by

Iryna Konchenko

A thesis submitted in partial fulfillment of
the requirements for the degree of

Master in Economics

National University “Kyiv-Mohyla
Academy”

2003

Approved by ____
Head of the State Examination Committee: Ms. Svitlana Budagovska
Economist, World Bank of Ukraine

____

____

____

Program Authorized
to Offer Degree ____

Date ____

National University "Kyiv-Mohyla

Academy"

Abstract

"THE EFFECTS OF FOREIGN DIRECT INVESTMENT ON THE EFFICIENCY OF UKRAINIAN MILK ENTERPRISES"

by Iryna Konchenko

Head of the State Examination Committee: Ms. Svitlana Budagovska
Economist, World Bank of Ukraine

Foreign direct investment (FDI) is supposed to contribute greatly to the restructuring and development of transition economies. Various studies show that FDI plays an important role in the enhancement of the quality of the capital stock, international technology transfer, and stimulation of competition. However, the exact nature and magnitude of the FDI effects are still poorly understood. In addition, the evidence suggests that FDI impact crucially depends on industry characteristics, which implies the necessity of doing research at the industry level. The paper uses recently developed DEA techniques to analyze the different patterns of labor productivity changes in a sample of Ukrainian milk enterprises with FDI and without FDI. We decompose the change of labor productivity into 3 components: technological change, efficiency improvement, and capital deepening. The results suggest that the effect of FDI on the performance of Ukrainian milk enterprises is significantly positive. Firms with FDI perform better than firms without FDI because of higher (managerial, organizational, etc.) efficiency and capital accumulation.

TABLE OF CONTENTS

ACKNOWLEDGMENTS

I'm extremely grateful to my thesis advisor Prof. Valentyn Zelenyuk for his fresh ideas, hard work, and expert guidance. I also wish to express my gratitude toward Prof. Tom Coupé, who has always been ready to give me a piece of insightful advice concerning the thesis. Also, I want to thank to Profs Roy J. Gardner, Vasyl Golovetskyy, and Michael A. Bowe for their attention and useful comments. Finally, I wish to express my appreciation to EERC MA students Natalia Zaderey and Oleg Badunenko and EERC MA alumny Oleksiy Burlaka for their support.

LIST OF FIGURES

LIST OF TABLES

Chapter 1

INTRODUCTION

> "In many ways, the lively ongoing debate on the possible sources of economic growth has obscured one of the key rationales for policy reform: increasing investment productivity."
>
> *Jonathan Isham and Daniel Kaufmann, "The Forgotten Rationale for Policy Reform: the Productivity of Investment Projects", 1999*

According to Görg et al. (2001), "production from foreign direct investment, that is, production in enterprises located outside the country of residence of their owners, reached a little over 10 per cent of total world output in 2000, by a rough estimate." There is a lot of evidence that foreign direct investment (FDI) contributes greatly to the restructuring and development of transition economies (Rybalka (2001), Schoors et al. (2002), Haddad et al. (1993), Talavera (2001), Görg et al. (2001), Lipsey (2002), etc.). It is well known that FDI plays a crucial role in the enhancement of the quality of the capital stock, international technology transfer, stimulation of competition and the transformation of host countries from being exporters of raw materials to being exporters of manufactures (Kathuria (2002), Blomström et al. (1998), Kathuria (2000), Rybalka (2001), Ugur (2001), etc.). Thus, in 1998, out of 145 regulatory changes made by 60 countries, 94% created more favorable conditions for FDI (Görg et al. (2001)). In his survey of empirical papers that analyze the impact of FDI, Lipsey (2002) concludes: "Within host countries it has been abundantly shown that foreign-owned firms pay higher wages than domestically-owned firms." He also stresses on strong evidence that foreign-owned firms generally have higher productivity than local ones. However, precise mechanism by which FDI affects Ukrainian firms is still poorly understood. Thus, it becomes evident that empirical evidence is needed in order to determine whether it is important to encourage FDI.

In this paper, we apply a recently developed technique by Kumar et al. (2002) to the analysis of productivity growth for a sample of enterprises with FDI and fully locally owned Ukrainian milk enterprises. We investigate what factors contributed most to the change of labor productivity of enterprises with FDI and without FDI and use this information to derive conclusions about the impact of FDI on the efficiency of Ukrainian enterprises.

The paper is organized as follows. Chapter 2 discusses approaches to studying the effects of FDI and empirical results of the papers on this topic. In Chapter 3 we develop methodology, describe data, and discuss the results.. Finally, Chapter 5 is devoted to the conclusions

C h a p t e r   2

LITERATURE REVIEW

The role of FDI in international technology transfer, enhancement of capital stock, and restructuring had been a matter of debate for many years. As a rule, the effects of FDI were studied using regression analysis. Value added, or labor productivity or their change was regressed on a dummy of the presence of foreign capital controlling for firms' characteristics such as capital intensity, skill intensity, scale efficiency, etc. Also, total factor productivity (TFP) measurement has been used to compare the performance of foreign-owned and domestically owned firms.

For instance, Egger et al. (2001) analyze the productivity effects of inward FDI within industries using a small panel of Austrian manufacturing sectors over the period 1981-1994. He tests empirically the hypothesis that the transfer of production know-how improves overall productivity of FDI-receiving firms. In a flexible CES-framework, general and labor-augmenting productivity improving effects of inward direct investments are found.

Not surprisingly, numerous investigations devoted to the estimation of the influence of FDI on the enterprises' performance paid particular attention to developing and transition countries (Lipsey (2002), Kathuria (2000), Rybalka (2001), Kathuria (2002), Haddad et al. (1993), Talavera (2001), Blomström et al. (1983), Blomström et al. (1998), Blomström et al. (1999), Schoors et al. (2002)). It was often found that the direct effects were positive and joint ventures indeed benefited from FDI (Haddad et al. (1993), Kathuria (2000), Talavera (2001), Kathuria (2002), Schoors et al. (2002)).

Haddad et al. (1993) employ a unique firm-level dataset to test for the positive effects of FDI through transferring technology to domestic firms in Morocco. He compares the relative performance of foreign and domestically-owned firms measured using the following indicators: output per worker, exports as a percentage of total sales, real wages, deviation from overall norms in the sector for multi-factor productivity and total factor productivity growth. This comparison of the relative performance of foreign and domestically owned firms reveals that firms with some foreign ownership exhibit higher level of overall multi-factor productivity. However, the rate of productivity growth is higher for their wholly domestically owned counterparts. He finds that this is due in part to the distortion effects of protection – foreign firms lag behind domestic firms in productivity growth in protected markets.

Kathuria (2000) employs techniques from panel data and stochastic production frontier to test a hypothesis for large sized firms in India that "presence of foreign-owned firms and foreign technical capital stock in a sector leads to reduced dispersion in efficiency in the sector and fall is higher for the firms that invest in R&D activities." The results of the study show that foreign-owned firms are close to the frontier in 13 of the total 26 sector. Also, he finds out that foreign technical capital stock has a positive impact.

Schoors et al. (2002) investigate the effect of foreign ownership on the labor productivity of enterprises in Hungary, the largest recipient of FDI in Eastern Europe. They estimate a simple CD-type production function at firm level allowing for a productivity optimal scale and controlling for firm specific effects and possible selection bias. They arrive at the following conclusions: foreign firms are more productive than local ones, which remains true after controlling for selection bias. In addition, they find that the higher foreign participation is the higher the productivity effect is.

Kathuria (2002) tests two hypotheses: whether liberalization in India has improved the productivity of local firms and whether the spillovers from technology transfer has increased in the liberal regime. He uses panel data literature and stochastic production frontier techniques on 487 Indian firms belonging to 24 three-digit manufacturing industries for the period 1989-90 to 1996-97. The results suggest that after liberalization, the productivity of Indian industry, especially the foreign-owned firms, has improved.

Lipsey (2002) writes: "Productivity comparisons between foreign-owned and domestically-owned firms or establishments almost always find that the foreign-owned firms have higher productivity levels. As with the wage comparisons, some of the differences can be associated with the larger scale of production in foreign-owned plants." But in most cases there was no explanation why foreign-owned firms have higher productivity. Moreover, standard productivity comparisons have other drawbacks. "Much of the effects is from the transfer of knowledge of world markets and of ways of fitting into worldwide production networks, not visible in standard production measurements." (Lipsey, 2002).

As for the impact of FDI on the efficiency of Ukrainian enterprises, Talavera (2001) writes: "Despite popularity in other transition countries, the topic of the effect on firm performance is rarely described in Ukrainian applications". He uses unpublished micro-level annual data for 1998-1999 for testing for statistical significance of FDI impact on labor productivity and export volumes. The results of his research suggest that presence of FDI has a positive influence on both labor productivity and exports. They also imply the different impact of FDI on the labor productivity level of enterprises from different industries.

Nevertheless, precise mechanism by which FDI affects Ukrainian firms remains poorly understood. Lack of adequate data for econometric analysis often lead either to insignificant, or to rather general results in most cases. O. Talavera

(2001), for example, states that "… it would be advantageous to estimate the effects of industry and regional spillovers separately". Schoors et al. (2002) come to the same conclusion: "As regards further research, I think more theoretical and empirical work is required to understand how precisely direct investment affects the performance of domestic firms in fastly developing economies."

Therefore, a new approach is needed for investigating the influence of FDI on the performance of Ukrainian enterprises.

Chapter 3

EMPIRICAL STUDY

3.1. Methodology

The major methods of measuring performance of productive units include the following ones:

1. Least-squares econometric production models;
2. Total factor productivity (TFP) indices;
3. Data envelopment analysis (DEA);
4. Stochastic frontiers (SF).

They differ according to the type of measures they produce; the data they require; and the assumptions regarding the structure of the production technology and the economic behavior of decision makers. The first two methods are often applied to panel data and assume all productive units are technically efficient. In contrast, methods 3 and 4 are most frequently used to analyze a sample of productive units and do not assume that all firms are technically efficient. Therefore, they are more appropriate for our research.

The next step in developing the methodology for studying FDI effects is to choose between DEA and SF. The main difference between these 2 approaches is that while the former involves the statistical estimation of parametric functions (and thus called "parametric" method), the latter does not assume any particular functional form for technology and involves mathematical programming estimation. In addition, they are different by other behavioral assumptions, data requirement (SF need much more data points), and the fact that SF recognizes random errors with specific known structure in the data while DEA does not.

Although SF have some disadvantages over the DEA (such as a possibility to test a hypothesis regarding the existence of inefficiency and the structure of production technology) we choose DEA for this research for the following reasons:

- SF have strong data requirements, which are not met by the data available;

- behavioral assumptions needed for SF are difficult to justify in this particular case; therefore, the DEA method has an important advantage in comparison with SF approach in sense that it does not require any particular functional specification for technology[1].

Thus, to investigate what factors contributed most to the change of labor productivity of enterprises with FDI and without FDI we use data envelopment analysis, which is the non-parametric mathematical programming approach to frontier estimation. We follow Kumar et al. (2002) and decompose the growth of labor productivity of each enterprise into three components:

1. Technological change (i.e. shift of observed "Best Practice" frontier assumed to capture innovation);

[1] For more detailed discussion of DEA and SF advantages and disadvantages, see please Coelli (1996).

2. Technological catch-up (improvement in efficiency, i.e. getting closer to the "Best Practice" frontier);

3. Capital accumulation.

The technological component reflects shift in the industry production frontier, determined by the state-of-art, potentially transferable technology. The technological catch-up reflects how much closer (far) a firm gets to (from) the industry frontier and reduces (increase) technical and allocative inefficiencies. Finally, capital accumulation reflects movement of a firm along the frontier. This decomposition allows us to see to what extent improvement in labor productivity of enterprises with and without FDI was due to technological catch-up. Having obtained such information we can derive important theoretical and policy implications about the impact of FDI on the efficiency of Ukrainian enterprises.

We proceed as follows:

We construct the Industry "Best Practice" Frontier in each of the analyzed years. The frontier is built under the assumption of the constant return to scale technology.

Each firm is then compared to this frontier by calculating efficiency levels – distances from the frontier – of firms using Farrell output-based efficiency index[2]. Then, we decompose the change in output per worker into the above-mentioned components.

---

[2] The choice between input- and output orientation here depends on which quantities (inputs or outputs) the firms have control over. If there is a fixed amount of resources in the industry and firms try to produce as much output as possible, an output orientation is more appropriate. If, on the contrary, input quantities are the primary decision variables, it is more appropriate to select input orientated model. Since we assume constant return to scale (CRS) technology in our paper, the output- and input-oriented measures provide equivalent measures of the efficiency.

The next step of our analysis is to compare the change in the efficiency of enterprises with FDI and enterprises without FDI obtained as one of the components of the tripartite decomposition. The indices were introduced by Caves et al. (1982 a,b) and developed by Färe et al. (1994), who computed Malmquist productivity indices and decomposed them into two components: change in the efficiency of the productive unit (catching up) and change in overall (e.g. world) level of technology (technical change).

Similar methodology was successfully applied by Zaim (1997), who has compared the performance of the enterprises from public sector with the performance of those from private sector in Turkey. He claims that this approach is superior to the total factor productivity approach where each sector or ownership type is compared only to itself in previous period and not to common benchmark. The other advantages of this methodology is that allows us to distinguish between efficiency change and technological progress for the given time period. It is also important that the technology and the associated distance functions are independent of the units of measurement. In addition, DEA methodology presumes no particular institutional structure or managerial efficiency and, therefore, production frontier in this construction and the associated efficiency encompass institutions and policies as well as purely technical phenomena.

For our analysis of productivity growth in local firms and firms with FDI we use the methodology modified by Kumar and Russell (2002), who isolated one more important component of productivity change, namely, capital accumulation.

We construct the industry "Best Practice" frontier at the end points of the sample period, 1998 and 1999 using DEA method, and calculate and analyze efficiency levels- distances from the frontier- of individual firms using Farrell output-based efficiency index. Then we construct and analyze the tripartite decomposition of changes in labor productivity over the sample period and analyze the shifts in the overall distribution of productivity in terms of this tripartite decomposition.

In our analysis, we deal with only three microeconomic variables: one output and two inputs: labor and capital. T observations on these three variables for each of **J** firms are represented as $\{Y^j_t, L^j_t, K^j_t\}$, t = 1, … ,T, j = 1, … , J. Under the assumptions of constant returns to scale and strong disposability of inputs and outputs, the reference technology is defined by

$$T_t = \left\{ \langle Y, L, K \rangle \in R^3_+ \mid Y \leq \sum_j z^j Y^j, L \geq \sum_j z^j L^j, K \geq \sum_j z^j K^j, z^j \geq 0 \forall j \right\} \quad (1)$$

The Farrell output-based efficiency index for firm **j** at time **t** is defined by

$$E(Y^j_t, L^j_t, K^j_t) = \min \{ \lambda \mid \langle Y^j_t / \lambda, L^j_t, K^j_t \rangle \in T_t \} \quad (2)$$

This index is an inverse of the maximal proportional amount by which output Y^j_t can be expanded while remaining technologically feasible given the technology T_t and the input quantities L^j_t and K^j_t..

The Farrell efficiency index can be calculated by solving the following linear programming problem for each observation k (k = 1, … , J):

$$\min_{\lambda, z^1, \ldots, z^J} \lambda \text{ subject to} \quad (2(a))$$

$$Y^k / \lambda \leq \sum_j^J z^j Y^j_t \,,$$

$$L^k \geq \sum_j^J z^j L_t^j$$

$$K^k \geq \sum_j^J z^j K_t^j$$

$$z^j \geq 0, \forall j$$

Obtained value of λ is the value of the efficiency index for firm **j** at time **t**.

Since our decomposition exploits the assumption of constant-return-to-scale (CRS) technology, we can use one input- one output set, where capital per labor stands for input **k** and output per labor stands for output **y:**

k = K/L; y = Y/L.

.

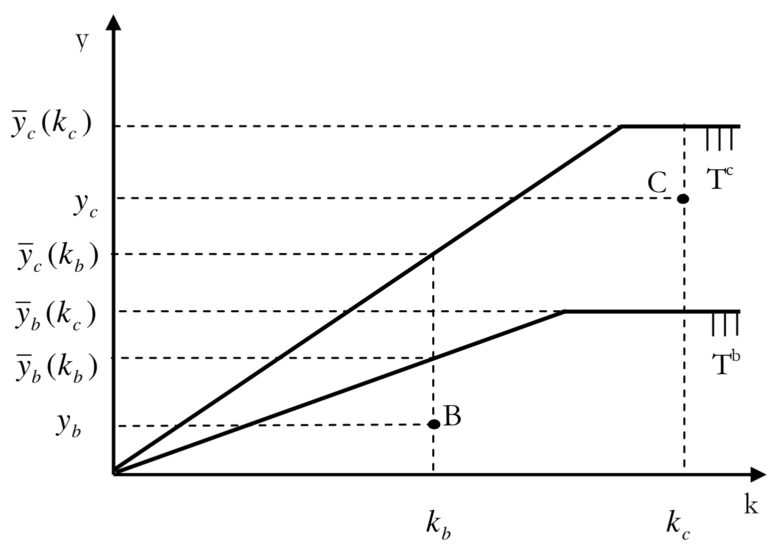


Figure3.1. Tripartite Decomposition

Let us denote values of the efficiency indices in base and current period e_b and e_c. Then,

$$e_b = y_b / \bar{y}_b(k_b); \; e_c = y_b / \bar{y}_c(k_c), \tag{3}$$

where $\bar{y}_b(k_b)$ and $\bar{y}_c(k_c)$ are potential outputs in the base and current periods, respectively, y_b and y_b are observed outputs in the base and current periods, respectively,

and thus

$$\bar{y}_b(k_b) = y_b/e_b; \; \bar{y}_c(k_c) = y_c/e_c \tag{4}$$

It follows from (4) that

$$\frac{y_c}{y_b} \equiv \frac{e_c * \bar{y}_c(k_c)}{e_b * \bar{y}_b(k_b)}. \tag{5}$$

Multiplying the numerator and denominator of this expression by $\bar{y}_b(k_c)$, which is the potential output-labor ratio at current-period capital intensity using the base-period technology, we get the following expression:

$$\frac{y_c}{y_b} = \frac{e_c}{e_b} * \frac{\bar{y}_c(k_c)}{\bar{y}_b(k_c)} * \frac{\bar{y}_b(k_c)}{\bar{y}_b(k_b)}. \tag{6}$$

(i) (ii) (iii)

This is decomposition of the relative change in the output-labor ratio in the two periods into the following components:

(i) the change in efficiency (i.e. the change in the distance from the frontier) EFFCH;

(ii) the technology change (i.e. the shift in the frontier) TECH;

(iii) the effect of the change in the capital-labor ratio (i.e. movement along the frontier) CACCUM.

This decomposition measures technological change by the shift in the frontier in the output direction at the **current-period** capital-labor ratio and it measures the effect of capital accumulation along the **base-period** frontier. We could alternatively measure the technological change at the **base-period** capital-labor ratio and capital accumulation by movements along the **current-period** frontier (by multiplying the numerator and denominator of (3) by the potential output-labor ratio at base-period capital intensity using the current-period technology, $\bar{y}_c(k_b)$, which yields the following:

$$\frac{y_c}{y_b} = \frac{e_c}{e_b} * \frac{\bar{y}_c(k_b)}{\bar{y}_b(k_b)} * \frac{\bar{y}_c(k_c)}{\bar{y}_c(k_b)} . \qquad (7)$$

(i) (ii) (iii)

Adopting the "Fisher ideal" decomposition based on geometric averages of the two measures of the effects of technological change and capital accumulation, obtained by multiplying the numerator and denominator of (7) by $(\bar{y}_b(k_c) * \bar{y}_c(k_b))^{\frac{1}{2}}$, we define the relative change in the output-labor ratio in the two periods as follows:

$$\frac{y_c}{y_b} = \frac{e_c}{e_b}\left(\frac{\bar{y}_c(k_c)}{\bar{y}_b(k_c)} * \frac{\bar{y}_c(k_b)}{\bar{y}_b(k_b)}\right)^{1/2} * \left(\frac{\bar{y}_b(k_c)}{\bar{y}_b(k_b)} * \frac{\bar{y}_c(k_c)}{\bar{y}_c(k_b)}\right)^{1/2}$$

= EFFCH * TECH * KACCUM, (8)

3.2. Data description

As we have seen from Chapter 2, using aggregated data (especially in cross-section studies) makes it impossible to control for a large variety of industry of firm characteristics and some industry or firm effects could be "washed out" as a result of the aggregation. This is a basis for argument that it is better to use firm-level data for the analysis of FDI impact on labor productivity growth.

For our analysis of direct effects of FDI, we need the data on output, labor, and capital of local-owned firms and firms with FDI for at least two years. According to Ukrainian legislation, all joint-stock companies should publish the major financial indicators. Firm-level panel data for the years 1998-1999 is provided by the FENIX-database (2001). The panel is balanced. Data for all variables (output, labor, and capital) is expressed in monetary terms. Sale proceeds stand for output, balance value of capital assets at the end of year stands for capital, and annual average number of workers stands for labor in our research.

The firms belong to the milk industry of Ukraine. The reasons why we decided to investigate milk industry are the following:

- Milk industry of Ukraine is highly competitive and not strongly regulated; firms are well motivated to introduce new technologies[3];
- There are a lot of enterprises with FDI in the milk industry, and, therefore, we have a good base for comparison.

Our sample consists of 25 enterprises, 12 of which are firms with FDI and 13 are firms without FDI. The firm is determined to be a firm with FDI if foreign

[3] This information was obtained from Ukrainian mass media.

ownership exceeds 10% threshold. This border is chosen as it is an internationally accepted standard and is applied by IMF to characterize foreign ownership.

Since we exploit the CRS assumption our capital per labor stands for input and output per labor stands for output. Their values for base and current years (1998 and 1999 years, respectively) are represented at figures 1 and 2, respectively[4].

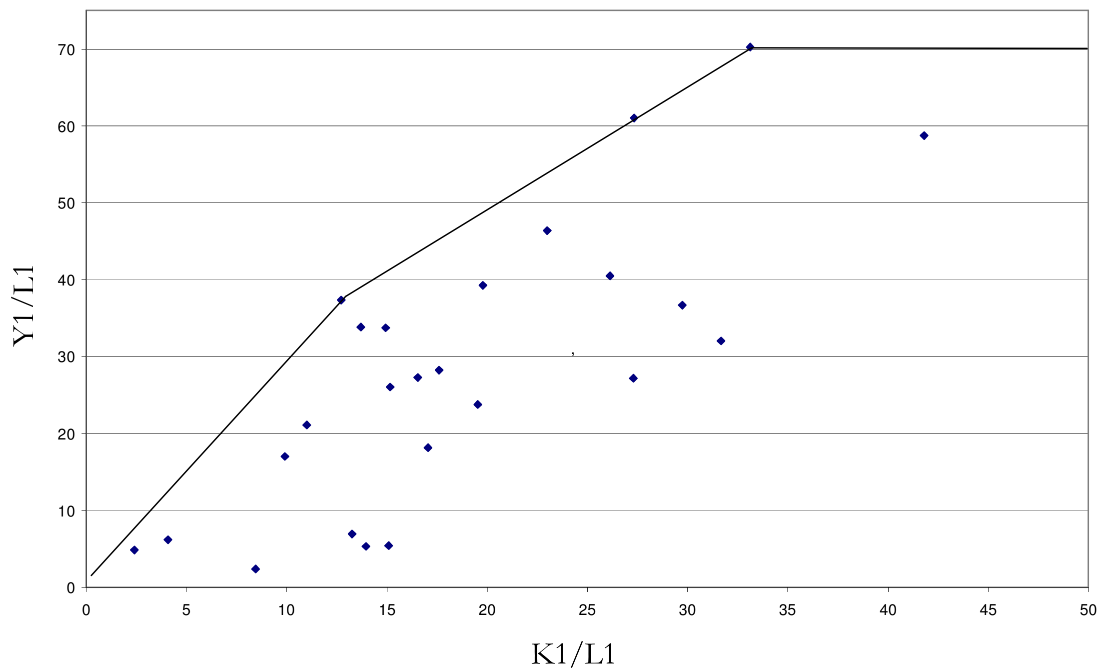


Figure 4.1 Capital per labor against output per labor, milk industry, 1998.
Source: FENIX-database (2001).

[4] Diagram illustrating the abor productivity of the analyzed firms over the years 1998-1999 is presented in Appendix 3.

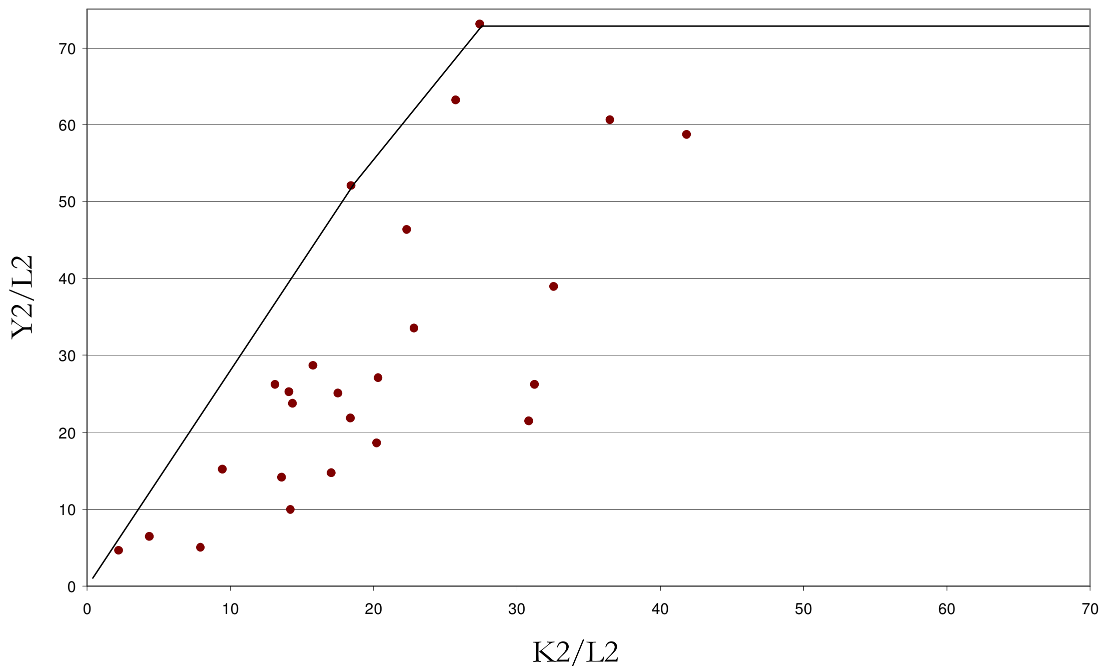


Figure 4.2 Capital per labor against output per labor, milk industry, 1999.
Source: FENIX-database (2001).

As we see from both figures, the performance of the enterprises being analyzed is very different. This implies that a lot of them are working inefficiently and we indeed need methods of analysis allowing for inefficiency of firms.

3.3. Discussion of results

We have carried out the above-mentioned calculations of Farrell efficiency indices and tripartite decomposition indices using A Data Envelopment Analysis (Computer) Program DEAP (Version 2.1). The instruction file is in the Appendix A2, the output file is in the Appendix A3.

Table 1 lists the efficiency levels of each of the 25 enterprises for the beginning and the end years of our sample, 1998 and 1999[5]. The value of efficiency index is from 0 to 1. The closer the magnitude of technical efficiency to 1 is, the closer the firm to the «Beat Practice» industry frontier is.

Table1. Efficiency indices for 25 firms, 1998 and 1999

#	FDI	TE1	TE2
1	0	0.179	0.306
2	0	0.586	0.368
3	1	0.364	0.326
4	1	0.687	0.869
5	0	0.122	0.250
6	1	0.095	0.225
7	1	0.687	0.746
8	0	0.562	0.644
9	0	0.722	0.588
10	1	0.770	1.000
11	1	0.129	0.633
12	1	0.344	0.423
13	1	0.478	0.496
14	0	0.842	0.587
15	0	1.000	0.705
16	0	0.546	0.520
17	0	0.513	0.526

[5] Diagram illustrating technical efficiencies is presented in Appendix 4.

18	0	0.651	0.569
19	1	0.676	0.473
20	1	0.527	0.736
21	0	0.759	0.944
22	0	0.586	0.507
23	1	0.414	0.420
24	0	0.339	0.297
25	0	0.420	0.246
mean		0.520	0.536
geom.av.		0.449	0.494
st.dev.		0.235	0.215
min		0.095	0.225
max		1.000	1.000

Note: **FDI**, indicator of FDI presence: "**1**" means "With FDI", "**0**" means "Without FDI"; **TE1**, technical efficiency in year 1998; **TE2,** technical efficiency in year 1998.

While the efficiency level 1 in 1998 is achieved by locally owned firm (# 15), the most efficient firm in 1999 is firm with foreign investment (#10). The average value of technical efficiency has increased over 1998-1999 from 0.520 to 0.536.

The next step is to analyze the results of the decomposition of labor productivity change. They are reported in the Table 2 below:

Table 2. Decomposition of change in labor productivity over 1998-1999 years

#	FDI	y2/y1	EFFCH	TECH	CACCUM
1	1	2.111	1.709	0.607	2.034
2	0	0.828	0.628	1.654	0.798
3	1	1.024	0.896	1.158	0.988
4	1	1.361	1.265	0.821	1.311
5	0	1.851	2.049	0.508	1.777
6	1	2.134	2.368	0.439	2.053
7	1	0.955	1.086	0.956	0.920
8	0	1.053	1.146	0.906	1.015
9	0	0.864	0.814	1.276	0.832
10	1	1.541	1.299	0.799	1.485
11	1	4.763	4.907	0.212	4.588

12	1	1.217	1.230	0.845	1.171
13	1	1.000	1.038	1.001	0.963
14	0	0.703	0.697	1.490	0.677
15	0	0.701	0.705	1.473	0.675
16	0	1.187	0.952	1.091	1.142
17	0	1.044	1.025	1.013	1.006
18	0	0.723	0.874	1.188	0.697
19	1	0.691	0.700	1.485	0.665
20	1	1.147	1.397	0.744	1.104
21	0	1.199	1.244	0.835	1.155
22	0	0.962	0.865	1.200	0.926
23	1	0.918	1.014	1.024	0.884
24	0	0.963	0.876	1.185	0.928
25	0	0.586	0.586	1.772	0.564
mean		1.261	1.255	1.027	1.214
geom.av.		1.116	1.101	0.943	1.075
st.dev.		0.838	0.872	0.379	0.807
min		0.586	0.586	0.212	0.564
max		4.763	4.907	1.772	4.588

Note: **FDI**, indicator of FDI presence: "**1**" means "With FDI", "**0**" means "Without FDI"; **y2/y1,** labor productivity index; **TECH**, technological change index; **EFFCH**, efficiency change index; **CACCUM**, capital accumulation index.

It appears from this table that, on average, labor productivity of the analysed firms has improved by about 26%[6]. It has happened mostly due to efficiency change (on average, the efficiency index equals 1.255) and capital deepening (on average, the capital accumulation index equals 1.214). This implies that the shift toward the «Beat Practice» industry frontier and capital deepening are the most important reasons for the improvement of the labor productivity of the enterprises.

In order to compare the difference between firms with and without FDI, we have divided our sample on two parts. Table 3 lists tripartite decomposition indices for enterprises with FDI.

[6] The percentage changes of the labor productivity and components of tripartite decomposition indices are in Appendix 5.

Table 3. Decomposition of change in labor productivity of firms with FDI over 1998-1999 years (summary)

#	y2/y1	EFFCH	TECH	CACCUM
mean	1.572	1.576	0.841	1.514
geom.av.	1.357	1.360	0.763	1.307
st.dev.	1.102	1.134	0.332	1.061
min	0.691	0.700	0.212	0.665
max	4.763	4.907	1.485	4.588

Note: **y2/y1,** labor productivity index; **TECH**, technological change index; **EFFCH**, efficiency change index; **CACCUM**, capital accumulation index.

The descriptive statistics suggests that, on average, the labor productivity of enterprises with FDI has risen by about 57%. The major factors of this change are improvement in efficiency of functioning of the enterprises (efficiency change index is equal to 1.576) and capital deepening (capital accumulation index is equal to 1.514). Also, interesting is that the technological change index is, on average, less that 1, which implies that technological level of the enterprises with FDI has worsened over the analyzed period. It could seem strange but this situation is not unusual for Ukrainian economy. Some heads of some Ukrainian companies with FDI say that at this stage of running business they tend to change production organization and implement brand new managerial and marketing techniques rather than to modernize or provide new equipment for these enterprises.[7]

Let us now look at the fully locally owned enterprises. The results of decomposition of labor productivity change at these firms are presented at table 4.

[7] This information was obtained via private discussion of Valentyn Zelenyuk with some managers of foreign-owned firms in Ukraine.

Table 4. Decomposition of change in labor productivity of firms without FDI over 1998-1999 years (summary)

#	y2/y1	EFFCH	TECH	CACCUM
mean	0.974	0.959	1.199	0.938
geom.av.	0.932	0.906	1.146	0.897
st.dev.	0.325	0.380	0.347	0.312
min	0.586	0.586	0.508	0.564
max	1.851	2.049	1.772	1.777

Note: **y2/y1,** labor productivity index; **TECH**, technological change index; **EFFCH**, efficiency change index; **CACCUM**, capital accumulation index.

First of all, as we can see from the table, on average, labor productivity at firms without FDI has decreased (by about 2.6%). Secondly, the only one component of tripartite decomposition indices which exceeds 1 is technological change index.. Thus, the technology has improved over this period at the enterprises without FDI but efficiency and capital accumulation have worsened. The difference in performance of the firms with FDI and fully locally owned firms is evident. However, we could carry out more detailed analysis by dividing our resulting information into 4 subgroups using additional criterion: whether labor productivity increased or not during the analysed years.

These disaggregated results are reported in the next 4 Tables:

Table 5. Decomposition of change in labor productivity of enterprises with FDI which have increase in labor productivity (summary) over 1998-1999 years

#	y2/y1	EFFCH	TECH	CACCUM
mean	1.811	1.790	0.736	1.744
geom.av.	1.588	1.551	0.669	1.530
st.dev.	1.186	1.245	0.285	1.142
min	1.000	0.896	0.212	0.963
max	4.763	4.907	1.158	4.588

Note: **y2/y1,** labor productivity index; **TECH**, technological change index; **EFFCH**, efficiency change index; **CACCUM**, capital accumulation index.

As it is seen from the Table 5, the most important factor of the labor productivity improvement for the enterprises with FDI is increase in the efficiency of their functioning. Most of the enterprises with FDI have shifted toward the frontier during the year 1999. On average, efficiency change of these enterprises equals 1.811. Also, capital accumulation is an important factor of labor productivity improvement. The average magnitude of the capital accumulation factor is 1.744 in the subgroup. This means that capital inflow and new managerial techniques brought to the enterprises of given subgroup have promoted their development.

Table 6 contains tripartite decomposition indices of the firms with FDI which have decrease in labor productivity.

Table 6. Decomposition of change in labor productivity of enterprises with FDI which have decrease in labor productivity (summary) over 1998-1999 years

#	y2/y1	EFFCH	TECH	CACCUM
mean	0.855	0.933	1.155	0.823
geom.av.	0.846	0.917	1.133	0.815
st.dev.	0.143	0.205	0.288	0.138
min	0.691	0.700	0.956	0.665
max	0.955	1.086	1.485	0.920

Note: **y2/y1,** labor productivity index; **TECH**, technological change index; **EFFCH**, efficiency change index; **CACCUM**, capital accumulation index.

From Table 6, it appears that the efficiency change and capital accumulation indices are, on average, less then 1 for the enterprises with decrease in labor productivity. In contrast, technological change has still occurred at these enterprises. Also, we see that there are 3 times fewer enterprises with FDI that have a decrease of the labor productivity that those that have an increase (3 versus 9). To the contrary, the number of the firms without FDI that have a decrease in their labor productivity is a quarter larger that number of those which have an increase in their labor productivity (8 versus 6). It can be seen from the tables below.

Table7. Decomposition of change in labor productivity of enterprises without FDI which have increase in labor productivity (summary) over 1998-1999 years

#	y2/y1	EFFCH	TECH	CACCUM
mean	1.408	1.354	0.827	1.355
geom.av.	1.237	1.233	0.843	1.191
st.dev.	0.456	0.432	0.228	0.439
min	1.044	0.952	0.508	1.006
max	2.111	2.049	1.091	2.034

Note: **y2/y1,** labor productivity index; **TECH**, technological change index; **EFFCH**, efficiency change index; **CACCUM**, capital accumulation index.

The results of decomposition of the increase in labor productivity of enterprises without FDI show that efficiency change and capital accumulation are the most significant factors of the improvement in their labor productivity. These results are similar to what we have found for the enterprises with FDI that have increase in productivity. But the magnitudes of the efficiency change and capital accumulation indices are much lower for the firms in this subgroup. While efficiency and capital accumulation at the firms with FDI have improved by about 79% and about 74%, respectively, the same indicators have improved only by about 35% at the firms without FDI.

Let us now look at the results for the enterprises without FDI whose labor productivity decreased.

Table8. Summary of enterprises without FDI which have decrease in labor productivity over 1998-1999 years

#	y2/y1	EFFCH	TECH	CACCUM
mean	0.791	0.756	1.405	0.762
geom.av.	0.781	0.748	1.389	0.752
st.dev.	0.135	0.117	0.228	0.130
min	0.586	0.586	1.185	0.564
max	0.963	0.876	1.772	0.928

Note: **y2/y1,** labor productivity index; **TECH**, technological change index; **EFFCH**, efficiency change index; **CACCUM**, capital accumulation index.

From Table 8, we can see that efficiency and capital accumulation indices are less than 1 (and much less than analogous indices for the enterprises with FDI which have decline in the labor productivity) and technological change index exceeding 1 (and being larger than the technological change index for the enterprises with FDI which have decline in the labor productivity).

To sum up, the decomposition of labor productivity change of the enterprises with FDI and without FDI has shown that presence of FDI have influenced the performance of the enterprises under analysis. To elaborate this more, we have regressed logs of the labor productivity change and the components of tripartite decomposition on FDI dummy and have got the following results (t-statistics are in parentheses):

LPROD = -0.07 + 0.375*FDI, (9)

(0.55) (0.034)

LEFFCH = -0.099 + 0.406*FDI, (10)

(-0.835) (2.38)

$$LTECH = 0.136 – 0.406*FDI, \qquad (11)$$

$$(1.157) \quad (-2.38)$$

$$LCACCUM = -0.108 + 0.376*FDI, \qquad (12)$$

$$(-0.932) \quad (2.246)$$

(Here, LPROD is Ln (y2/y1), LEFFCH is Ln(EFFCH), LTECH is Ln (TECH), LCACCUM is Ln (CACCUM)).

The results of regressions suggest that if an enterprise from milk industry of Ukraine has FDI, it, on average, experiences labor productivity change larger by about 37.5% and efficiency change larger by about 40.6% in comparison with an enterprise without FDI. They also show that, on average, the enterprises with FDI demonstrate technological change smaller by about 40.6% and capital accumulation larger by 37.6% as compared with the enterprises without FDI. FDI coefficients are 5% significant and have expected signs in all 4 regressions[8].

Therefore, we can conclude that there is a significant impact of FDI on the efficiency change (catch-up) of the Ukrainian milk enterprises. Firstly, while larger part of the wholly locally-owned enterprises have a decrease in the labor productivity during the years 1998-1999, the firms with FDI, on average, have increase in the labor productivity over this period. Also, while the efficiency change is the most significant factor of the change in labor productivity of the enterprises with FDI, this is not true for the enterprises without FDI.

[8] All outputs for these regressions from Eviews are presented in Appendix 6.

Chapter 5

CONCLUSIONS

Foreign direct investment is considered to be a convenient way for the transfer of international technologies (including managerial) into developing and transition countries. Thus, developing and transition countries have been encouraged to devise FDI-friendly policies in order to attract FDI in order to solve the problem of lack of capital and technology. However, there is no comprehensive evidence on the exact nature or magnitude of the effects of FDI. Thus, applying new techniques of analysis of the efficiency of enterprises' functioning is necessary for determining of the impact of FDI on the performance of the enterprises in host country.

As for Ukraine, it was found in previous research that the effect of FDI on the efficiency of Ukrainian enterprises is generally positive although it was often suggested that the effects could vary between different industries. Indeed, the institutional factors, the degree of monopolization of the industry and the value of gaps in technological level between foreign and domestic firms may play a crucial role in the direction and magnitude of FDI effects. However, these important differences could be "washed out" as a result of aggregation. This implies the importance of making research on industry level using micro-level data.

The results of our research clearly show that the effect of FDI on the performance of Ukrainian milk firms is significantly positive. The efficiency change is more significant factor of the change in labor productivity of the enterprises with FDI than of those without FDI. Firstly, the labor productivity of the firms with FDI have improved, on average, and the labor productivity of the firms without FDI have, on average, worsened over the sample period despite of the fact that fully locally owned firms have got a significant technological change and the firms with FDI have not. Secondly, there was an efficiency improvement at the firms with FDI during the years 1998-1999. In contrast, the efficiency of functioning of local firms has decreased over this period. In addition, the enterprises with FDI are much more successful in capital accumulation. Thus, we conclude that FDI presence leads to higher (managerial, organizational and so on) efficiency and labor productivity as well as capital deepening at the Ukrainian milk enterprises. This, in turn implies that Ukrainian government should encourage FDI into Ukrainian milk industry.

This, however, is not necessarily true for all industries in Ukraine. Thorough analysis is needed for other industries as well, especially with larger number of observations. Also, thorough empirical research on indirect (spillover) effects (perhaps using DEA techniques) is required.

WORKS CITED

Blomström, M., Kokko A. (1998), "Multinational Corporations and Spillovers," *Journal of Economic Surveys,* Vol.12, #2

Blomström, M. and Persson, H. (1983), "Foreign Investment and Spillover Efficiency in an Underdeveloped Economy: Evidence from the Mexican manufacturing Industry," *World Development*, Vol. 11, pp. 493-501

Blomström, M. and Sjoholm, F. (1999), "Technology Transfer and Spilllovers: Does Local Participation with Multinationals Matter?" *European Economic Review,* Vol. 43, pp. 915-923

Caves, D., Christensen, l., Diewert, E. (1982a), "Multilateral Comparisons of Output, Input, and Productivity Using Superlative Index Numbers," *Economic Journal*, Vol. 92(365), pp.73-86

________ (1982b), "The Economic Theory of Index Numbers and Measurement of Input, Output, and Productivity." *Econometrica*, Vol. 50(6), pp. 1393-1414

Coelli, T. (1996), "A Guide to DEAP Version 2.1: A Data Envelopment Analysis (Computer) Program," *CEPA Working Paper 96/08*

Egger, P., Pfaffermayr M. (2001), "A note on Labour Productivity and Foreign Inward Direct Investmen," *Applied Economics Letters*, Vol. 8, pp. 229-232

Färe, R., Grosskopf, S., Norris M., Zhang Z. (1994), "Productivity Growth, Technical Progress, and Efficiency Change in Industrialized Countries," *American Economic Review*, Vol. 84, #1

Haddad, M., Harrison, A. (1993), "Are There Positive Spillovers from Direct Foreign Investment? Evidence from Panel Data for Morocco," *Journal of Development Economics,* Vol. 42, pp. 51-74

Görg, H. and Greenaway, D. (2001), "Foreign Direct Investment and Intra-industry Spillovers," paper delivered at the UNECE/EBRD Expert Meeting.

Isham, J. and Kaufmann, D. (1999), "The Forgotten Rationale for Policy Reform: The Productivity of Investment Projects," *Quarterly Journal of Economics*, Vol. 114(1), pp. 149-184

Kathuria, V. (2002), "Liberalization, FDI, and Productivity Spillovers – an Analysis of Indian Manufacturing Firms," *Oxford economic review*, Vol. 54, pp. 688-718

Kathuria, V. (2000), "Productivity Spillovers from Technology Transfer to Indian Manufacturing Firms," *Journal of International Development*, Vol. 12, pp. 343-369

Kumar, S., Russell, R. (2002), "Technological Change, Technological Catch-up, and Capital deepening: Relative Contributions to Growth and Convergence," *American*

Economic Review, Vol. 92, #3, pp. 527-544

Lipsey, R. (2002), "Home and Host Country Effects of FDI", NBER Working Paper #9293.

Rybalka, O. (2001), "Foreign Direct Investment and Economic Development of Transition Countries. The case of Ukraine", Master's Thesis, mimeo, EERC-Kyiv

Shoors, K., Tol, B. (2002), "The Productivity Effect of Foreign Ownership on Domestic Firms in Hungary," version presented at the August 2002 EEA conference in Venice

Talavera, O. (2001), "The effect of Foreign Direct Investments on Firm Performance in Ukraine," Master's Thesis, mimeo, EERC-Kyiv

Taskin, F., Zaim, O. (1997), "Catching-up and Innovation in High- and Low-income Countries," *Economic Letters*, Vol. 54, pp. 93-100

Ugur, A. (2001), "Foreign Direct Investment and Productivity Spillovers in the Irish Manufacturing Industry," *Quarterly Journal of Economics*, Vol. 112(1), pp.151-155

Zaim, O. and Taskin F. (1997), "The Comparative Performance of the Public Enterprise Sector in Turkey: A Malmquist Productivity Index Approach," *Journal of Comparative Economics*, Vol. 25, pp. 129-157

APPENDICES

A1. **DEAP instruction file**

```
data25.dta      DATA FILE NAME
data25.out      OUTPUT FILE NAME
25              NUMBER OF FIRMS
2               NUMBER OF TIME PERIODS
1               NUMBER OF OUTPUTS
1               NUMBER OF INPUTS
1               0=INPUT AND 1=OUTPUT ORIENTATED
0               0=CRS AND 1=VRS
2               0=DEA (MULTI-STAGE), 1=COST-DEA,
2=MALMQUIST-DEA, 3=DEA (1-STAGE), 4=DEA (2-STAGE)
```

A2. **DEAP output file**

Results from DEAP Version 2.1

Instruction file = data25.ins
Data file = data25.dta

Output orientated Malmquist DEA

DISTANCES SUMMARY

year = 1

firm no.	crs te rel to tech in yr t-1	t	t+1	vrs te
1	0.000	0.179	0.186	0.232
2	0.000	0.586	0.608	0.633
3	0.000	0.364	0.377	0.389
4	0.000	0.687	0.713	0.796
5	0.000	0.122	0.127	0.171
6	0.000	0.095	0.099	0.284
7	0.000	0.687	0.713	1.000
8	0.000	0.562	0.584	0.576
9	0.000	0.722	0.750	1.000
10	0.000	0.770	0.799	0.775
11	0.000	0.129	0.134	0.183
12	0.000	0.344	0.358	0.348
13	0.000	0.478	0.497	0.621
14	0.000	0.842	0.874	0.848
15	0.000	1.000	1.038	1.000
16	0.000	0.546	0.567	0.558
17	0.000	0.513	0.533	0.689
18	0.000	0.651	0.676	0.685
19	0.000	0.676	0.702	0.703
20	0.000	0.527	0.548	0.560
21	0.000	0.759	0.789	1.000
22	0.000	0.586	0.608	0.603

23	0.000	0.414	0.430	0.431
24	0.000	0.339	0.352	0.348
25	0.000	0.420	0.436	0.420
mean	0.000	0.520	0.540	0.594

year = 2

firm no.	crs te rel to tech in yr ************************ t-1	t	t+1	vrs te
1	0.295	0.306	0.000	0.332
2	0.354	0.368	0.000	0.400
3	0.314	0.326	0.000	0.345
4	0.837	0.869	0.000	0.900
5	0.240	0.250	0.000	0.284
6	0.217	0.225	0.000	0.295
7	0.719	0.746	0.000	1.000
8	0.621	0.644	0.000	0.662
9	0.566	0.588	0.000	0.605
10	0.963	1.000	0.000	1.000
11	0.610	0.633	0.000	0.656
12	0.408	0.423	0.000	0.428
13	0.478	0.496	0.000	0.508
14	0.565	0.587	0.000	0.610
15	0.679	0.705	0.000	0.728
16	0.500	0.520	0.000	0.529
17	0.507	0.526	0.000	0.649
18	0.548	0.569	0.000	0.615
19	0.455	0.473	0.000	0.487
20	0.709	0.736	0.000	0.739
21	0.910	0.944	0.000	1.000
22	0.488	0.507	0.000	0.525
23	0.404	0.420	0.000	0.439
24	0.286	0.297	0.000	0.307
25	0.237	0.246	0.000	0.258
mean	0.516	0.536	0.000	0.572

[Note that t-1 in year 1 and t+1 in the final year are not defined]

MALMQUIST INDEX SUMMARY

year = 2

firm	effch	techch	pech	sech	tfpch
1	1.707	0.963	1.428	1.195	1.644
2	0.628	0.963	0.633	0.993	0.605
3	0.896	0.963	0.886	1.011	0.863
4	1.265	0.963	1.131	1.119	1.218
5	2.047	0.963	1.665	1.230	1.972
6	2.370	0.963	1.038	2.284	2.283
7	1.087	0.963	1.000	1.087	1.047
8	1.147	0.963	1.149	0.998	1.104
9	0.815	0.963	0.605	1.346	0.784
10	1.299	0.963	1.290	1.007	1.251
11	4.892	0.963	3.592	1.362	4.711
12	1.229	0.963	1.229	1.000	1.184
13	1.038	0.963	0.818	1.268	0.999
14	0.697	0.963	0.719	0.969	0.671
15	0.705	0.963	0.728	0.968	0.679
16	0.952	0.963	0.949	1.004	0.917
17	1.025	0.963	0.942	1.088	0.987
18	0.875	0.963	0.898	0.975	0.843
19	0.699	0.963	0.693	1.009	0.673
20	1.395	0.963	1.319	1.058	1.344
21	1.244	0.963	1.000	1.244	1.198
22	0.865	0.963	0.870	0.994	0.833
23	1.013	0.963	1.020	0.993	0.976
24	0.875	0.963	0.881	0.993	0.843
25	0.587	0.963	0.614	0.956	0.565
mean	1.101	0.963	0.997	1.104	1.061

MALMQUIST INDEX SUMMARY OF ANNUAL MEANS

year	effch	techch	pech	sech	tfpch
2	1.101	0.963	0.997	1.104	1.061

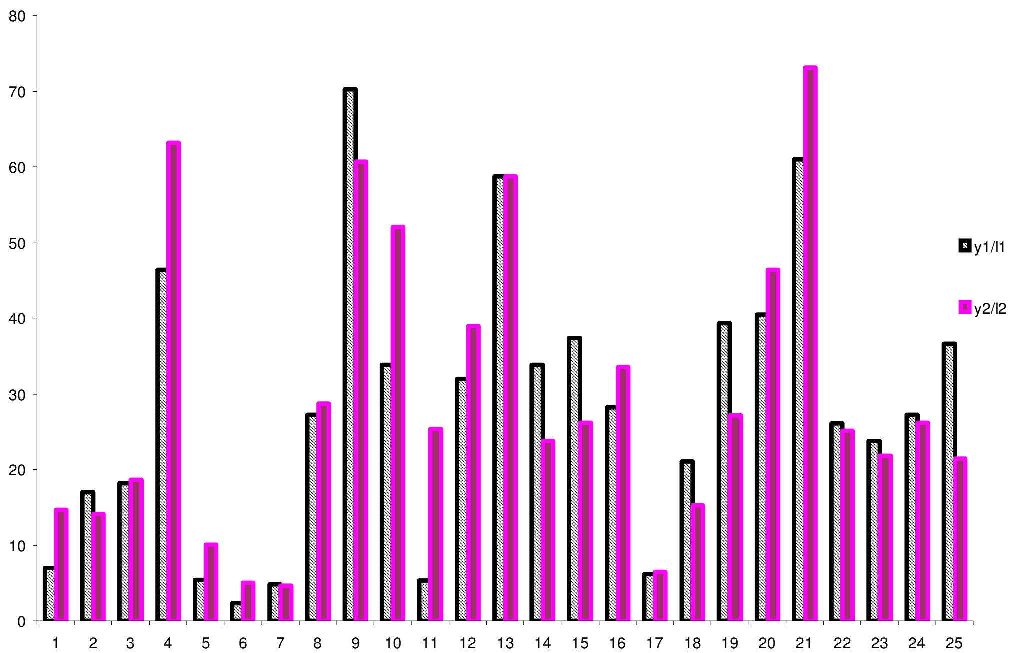
mean	1.101	0.963	0.997	1.104	1.061

MALMQUIST INDEX SUMMARY OF FIRM MEANS

firm	effch	techch	pech	sech	tfpch
1	1.707	0.963	1.428	1.195	1.644
2	0.628	0.963	0.633	0.993	0.605
3	0.896	0.963	0.886	1.011	0.863
4	1.265	0.963	1.131	1.119	1.218
5	2.047	0.963	1.665	1.230	1.972
6	2.370	0.963	1.038	2.284	2.283
7	1.087	0.963	1.000	1.087	1.047
8	1.147	0.963	1.149	0.998	1.104
9	0.815	0.963	0.605	1.346	0.784
10	1.299	0.963	1.290	1.007	1.251
11	4.892	0.963	3.592	1.362	4.711
12	1.229	0.963	1.229	1.000	1.184
13	1.038	0.963	0.818	1.268	0.999
14	0.697	0.963	0.719	0.969	0.671
15	0.705	0.963	0.728	0.968	0.679
16	0.952	0.963	0.949	1.004	0.917
17	1.025	0.963	0.942	1.088	0.987
18	0.875	0.963	0.898	0.975	0.843
19	0.699	0.963	0.693	1.009	0.673
20	1.395	0.963	1.319	1.058	1.344
21	1.244	0.963	1.000	1.244	1.198
22	0.865	0.963	0.870	0.994	0.833
23	1.013	0.963	1.020	0.993	0.976
24	0.875	0.963	0.881	0.993	0.843
25	0.587	0.963	0.614	0.956	0.565
mean	1.101	0.963	0.997	1.104	1.061

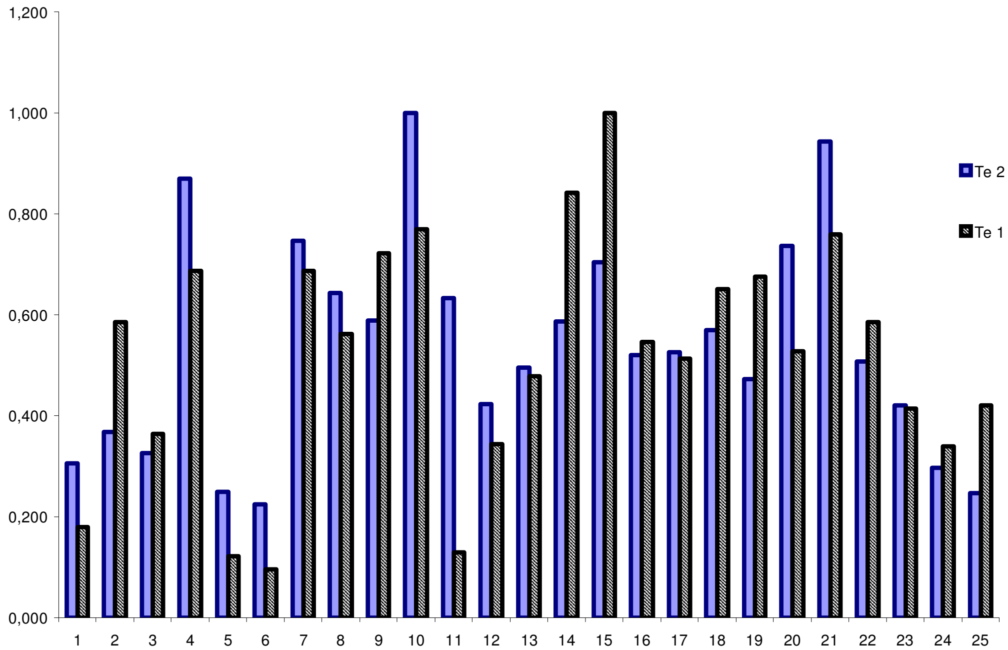
[Note that all Malmquist index averages are geometric means]

A3. **Labor productivity of the analyzed enterprises in years 1998-1999**



Note: **y1/l1**, labor productivity of the firms in 1998; **y2/l2**, labor productivity of the firms in 1999.
Data source: FENIX-database (2001).

A4. **Technical efficiencies of the analyzed enterprises in years 1998-1999**



Note: **TE1,** technical efficiency of the firms in 1998; **TE2,** technical efficiency of the firms in 1999.

A5. **Percentage change of tripartite decomposition indices, 1998-1999**

#	FDI	(y2/y1)*	Contribution of:		
			EFFCH*	TECH*	CACCUM*
1	0	111.138	70.950	-39.269	103.370
2	0	-17.152	-37.201	65.377	-20.226
3	1	2.410	-10.440	15.784	-1.241
4	1	36.135	26.492	-17.936	31.146
5	0	85.059	104.918	-49.183	77.715
6	1	113.419	136.842	-56.111	105.313
7	1	-4.494	8.588	-4.437	-7.964
8	0	5.339	14.591	-9.409	1.474
9	0	-13.597	-18.560	27.556	-16.826
10	1	54.136	29.870	-20.071	48.487
11	1	376.347	390.698	-78.842	358.806
12	1	21.663	22.965	-15.527	17.127
13	1	0.009	3.766	0.101	-3.717
14	0	-29.678	-30.285	48.960	-32.283
15	0	-29.945	-29.500	47.255	-32.519
16	0	18.729	-4.762	9.119	14.247
17	0	4.417	2.534	1.257	0.572
18	0	-27.653	-12.596	18.800	-30.326
19	1	-30.944	-30.030	48.493	-33.537
20	1	14.702	39.658	-25.607	10.401
21	0	19.937	24.374	-16.506	15.497
22	0	-3.819	-13.481	20.002	-7.361
23	1	-8.179	1.449	2.428	-11.636
24	0	-3.656	-12.389	18.525	-7.219
25	0	-41.437	-41.429	77.225	-43.583
Mean		26.115	25.481	2.719	21.429
St.dev.		83.808	87.211	37.946	80.701
Min		-41.437	-41.429	-78.842	-43.583
Max		376.347	390.698	77.225	358.806

Note: **FDI**, indicator of FDI presence: "**1**" means "With FDI", "**0**" means "Without FDI"; **y/l,** output per labor in year 1; **y/l,** output per labor in year 2; **(y2/y1)***, percentage change in output per worker; **EFFCH***, percentage change in efficiency; technological change index; **TECH***, percentage change in technology; **CACCUM***, capital deepening (percentage change).

A6. **Eviews output: regressions of tripartite decomposition indices on FDI dummy**

Dependent Variable: LPROD
Method: Least Squares
Date: 05/17/03 Time: 15:40
Sample: 1 25
Included observations: 25

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.070232	0.115974	-0.605585	0.5507
FDI	0.375493	0.167394	2.243178	0.0348
R-squared	0.179505	Mean dependent var		0.110005
Adjusted R-squared	0.143831	S.D. dependent var		0.451909
S.E. of regression	0.418149	Akaike info criterion		1.170660
Sum squared resid	4.021516	Schwarz criterion		1.268170
Log likelihood	-12.63325	F-statistic		5.031847
Durbin-Watson stat	1.681783	Prob(F-statistic)		0.034814

Dependent Variable: LEFFCH
Method: Least Squares
Date: 04/29/03 Time: 16:43
Sample: 1 25
Included observations: 25

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.098508	0.117965	-0.835061	0.4123
FDI	0.406327	0.170267	2.386408	0.0256
R-squared	0.198465	Mean dependent var		0.096529
Adjusted R-squared	0.163616	S.D. dependent var		0.465072
S.E. of regression	0.425328	Akaike info criterion		1.204704
Sum squared resid	4.160780	Schwarz criterion		1.302214
Log likelihood	-13.05880	F-statistic		5.694944
Durbin-Watson stat	1.798598	Prob(F-statistic)		0.025629

Dependent Variable: LTECH
Method: Least Squares
Date: 04/29/03 Time: 16:44
Sample: 1 25
Included observations: 25

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.136396	0.117850	1.157372	0.2590
FDI	-0.406194	0.170101	-2.387956	0.0255

R-squared	0.198671	Mean dependent var	-0.058577
Adjusted R-squared	0.163831	S.D. dependent var	0.464679
S.E. of regression	0.424913	Akaike info criterion	1.202753
Sum squared resid	4.152672	Schwarz criterion	1.300263
Log likelihood	-13.03442	F-statistic	5.702335
Durbin-Watson stat	1.798992	Prob(F-statistic)	0.025543

Dependent Variable: LCACCUM
Method: Least Squares
Date: 04/29/03 Time: 16:46
Sample: 1 25
Included observations: 25

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.108099	0.115894	-0.932744	0.3606
FDI	0.375710	0.167279	2.246015	0.0346

R-squared	0.179877	Mean dependent var	0.072242
Adjusted R-squared	0.144220	S.D. dependent var	0.451702
S.E. of regression	0.417862	Akaike info criterion	1.169288
Sum squared resid	4.016000	Schwarz criterion	1.266798
Log likelihood	-12.61609	F-statistic	5.044582
Durbin-Watson stat	1.682415	Prob(F-statistic)	0.034606