THE DETERMINANTS OF FIRMS' EXPORT BEHAVIOR

by

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Abstract

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This study of export performance at the micro level investigates firm-specific characteristics that are endemic to exporters, as well as incorporates incentive-related measures that are introduced on a broader, regional scale. The research uses a large sample of Ukrainian manufacturing firms and covers the period 1996-2001. The findings of this research are in line with the results of previous work in this area as regards productivity-related measures. Namely, the empirical evidence shows that exporting firms are indeed "superior" in generally accepted economic terms, relative to other firms in their industry, i.e. they are more productive, pay higher wages and are also larger. The results of the constructed benchmark model of firms' export decisions prove to be robust to alternative specifications. Furthermore, this study supports the presence of pre-selection among Ukrainian producers into the foreign market based on their characteristics. Additionally, this research studies the influence of such external factor as government policy and finds a positive effect of the special economic zones on the exporting activities of the firms.

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GLOSSARY

Export intensity – share of foreign sales (exports) in total volume of sales

Learning-by-exporting – mechanism which implies that established exporters are more likely to increase their productivity and improve performance through technological spillovers and exploitation of economies of scale in a larger market

Self-selection - mechanism which implies that it is mainly those firms that have higher productivity and better performance at the outset (relative to the other in their industry or region) that are likely to enter foreign market and become exporters

Special economic zone (SEZ) – a bounded territory of Ukraine where the special tax and customs regime is established

Sunk costs – costs of entering (re-entering) foreign market, those associated with establishment of new distributional network, development of new marketing techniques, costs of gathering information about foreign conditions and advertising expenditures

Chapter 1

INTRODUCTION

Over the last several years, Ukraine has experienced some improvement in different industries of the manufacturing sector. This fact is, to some extent, reflected in the growth of annual GDP figures: real GDP growth amounted to 6% in 2000 and 9.0% in 2001 compared to negative 1.9% in 1998. Moreover, industrial output grew by 13% in 2000 and by 14.2% in the 2001, thereby remaining the main contributor to GDP growth (MEMU, 2002). The study of the central factors underlying such growth would enable policymakers to both influence and maintain further growth in the economy.

One of the attributes of growth is increasing productivity, since it allows for a better use of those resources which are already available. This is especially true for developing and transition countries, since they have not yet reached the level of the industrialized ones in terms of efficient resource allocation and utilization. However, aside from the traditional explanations provided by a growth accounting framework, one might focus ones attention on the relationship between the increasing export activity of the manufacturing sector and economic growth. This fact is well supported by the annual growth figures: among all other factors, GDP growth appears to be also driven by increases in merchandise exports of 26 percent in 2000 and of 12 percent in 2001. It is widely accepted that an outward orientation of an economy and export-promoting policies are beneficial for growth. From a theoretical point of view, it allows the exploitation of benefits from comparative advantage in factor endowments, and in practice it allows more efficient use of indigenous resources.

Thus, studying the factors that promote this export-oriented growth would allow effective developing government policies aimed at maintaining the steady increase in economic growth in the country. In this respect, another issue arises, that is one concerning the efficacy of government intervention in the foreign trading activities of local producers. Among the variety of policy measures being used, this research investigates the role of special economic zones.

Most of the studies on the determinants of export performance address this issue on a sample of developed or developing countries, and focus on productivity-related characteristics. However, not much work has been undertaken for transitional countries. In the study on Russia, Ukraine and Belarus, Bleaney et al. (2000) support the learning-by-exporting hypothesis, suggesting that those firms that become exporters are likely to increase their productivity through spillover effects. Another study on this same group of countries (Buck et. al., 2000) suggests a more comprehensive framework for the analysis, by incorporating additional factors (such as incentives to raise productivity and to enter export markets, and effects of the ownership types) that are associated with the course of economic reforms in these countries. However, the authors of both of these studies point out two qualifying factors: that the results they obtain might alter, and the presence of learning-by-exporting effects diminishes as transition proceeds and countries converge to the level of economic development of the more developed countries. Nonetheless, the methodology they employ can be used as basis for further research.

In this paper, I intend to incorporate relevant techniques introduced in the previous research in order to investigate the firm characteristics that affect the export decisions of Ukrainian producers, and to estimate what features are endemic to the exporting enterprises compared to the non-exporting ones. Specifically, two alternative measures of exports (*propensity* to export and

export *intensity*) will be employed in the analysis, which will also consider productivity-related and incentive-related factors. Identifying the determinants of export behavior in this way provides the basis for the construction of important policy tools for maintaining and stimulating economic growth in a country. Aside from the intra-industry characteristics that determine export behavior, the role of outside factors such as government policies will also be considered. Government intervention can be described through the adoption and enforcement of appropriate legislative measures (based on the example of special economic zones). Investigation of the effectiveness of such policies will be an important practical implication of my research.

The thesis is organized as follows. Chapter 2 reviews the existing strands in the literature on the performance of exporters in the manufacturing sector. Chapter 3 presents the theoretical model of export activities and expands it in the context of the current institutional framework to account for such factor as government policy. The data used in the research are described in the Chapter 4. This chapter then turns to an econometric analysis of exporting behavior and presents the main findings of the model. Chapter 5 concludes, suggesting some policy implications arising from the analysis and possible directions for further research.

Chapter 2

LITERATURE REVIEW

The existing literature on the determinants of export activity is derived from international trade theory. The original Heckscher-Ohlin model predicted export behavior of a country based on its factor endowments assuming factor homogeneity, competitive markets and same level of technology across the countries. However, the usefulness of this theory is somewhat limited in the current context, and over time, the model has been modified to account for additional factors such as industry- and firm-specific differences, country differences and national policy-based factors. Applying these 'neo-endowment' models to specific country cases, one might argue that firms (and thus industry) competitive advantage is based on their factor endowments, which along with the 'traditional' labor and capital include different dimensions of organizational resources.

Most of the papers presenting models on export decisions are undertaken for developed countries (the United States, the United Kingdom, Germany, and Italy) and some developing countries (such as Mexico, Colombia). *Bernard and Jensen (2001)* present a dynamic model of the export-decision by a profit-maximizing firm on the example of US manufacturing plants. In their work, they consider individual plant characteristics and conclude that plant heterogeneity is substantial and important in the export decision. Such findings are in line with common sense, suggesting that firms of different size, located in different regions, and producing a different product mix are likely to make different decisions with respect to entering the foreign market.

Many studies focus on the relationship between firms' exporting decision or exporting intensity, and firms' productivity. In this respect, two major approaches are adopted. On the one hand, a *self-selection* mechanism implies that it is mainly those firms that have higher productivity at the outset (relative to the other in their industry or region) that are likely to enter foreign market and become exporters. Empirical evidence to support this hypothesis is found in *Bernard and Jensen (1997)* work on the US plants, in *Roper and Love (2001)* study on Ireland, as well as in *Alvarez (2002)* study on Chile.

On the other hand, those firms that become exporters are likely to experience *learning-by-exporting* effects that allow them to further increase their productivity through technology spillovers and exploitation of economies of scale in a larger market. While most researchers agree that *self-selection* does take place, the empirical evidence on the issue of *learning-by-exporting* effects is not conclusive. Specifically, some studies *(Bernard and Jensen, 1999a* and *Clerides et al., 1998)* provide rather robust evidence of **no** *learning-by-exporting* in such countries as the US and Colombia, Mexico and Morocco, respectively. Alternatively, *Kraay (1999)* finds evidence of positive learning effects in China. One of the possible explanations for such divergent results is the use of a binary variable to measure export behavior in the first case, and censored variable to measure export intensity (share of foreign sales in total turnover) in the second case. The interpretation of the dependent variables and the obtained results differs in the following way. Just *entering* the foreign (export) market (described by a binary 0-1 variable) is not likely to have a high impact on productivity changes, thus suggesting no learning-by-exporting effects. At the same time, maintaining a high *intensity* of exports (measured as a ratio – using censored variable), presumably above some threshold level, would positively effect productivity changes.

In line with the learning-by-exporting hypothesis, *Bleaney, Filatotchev and Wakelin (2000)* conduct a study for three transitional economies – Russia, Ukraine and Belarus. The results of their survey support the hypothesis of learning-by-exporting effects, thus contrasting with the previous studies for some developed and developing countries. However, the authors anticipate that as transition proceeds, performance differences between exporters and non-exporters are likely to diminish or even disappear and the situation would become "consistent with the lack of evidence for learning-by-exporting elsewhere in the world"[1] .

Some studies incorporate both approaches and provide empirical evidence indicating the importance of self-selection and learning-by-exporting mechanisms. *Aw, Chung and Roberts (1998)* perform a comparative analysis for Taiwan and South Korea producers to study the link between producers' productivity and their decision to export. In the analysis, a total factor productivity index is constructed using the data on output and inputs of the firms in five sectors. A comparison of productivity measures between exporters and non-exporters confirms the self-selection hypothesis, but is not supportive of the learning-by-exporting hypothesis. Moreover, the empirical findings suggest that productivity index alone is not sufficient to explain the choice of export market participation. The authors suggest that such factors as product heterogeneity, entry costs, and government intervention might result in different patterns of export behavior.

Aside from focusing solely on the determinants of the export decision, *Alvarez (2002)* analyzes the factors that determine success in the exporting process. He distinguishes between two types of exporters, established and sporadic. Distinction between these two categories stipulates the use of ordered probit technique for the econometric analysis. Such approach allows for estimation of the factors that determine the relative success of

[1] Bleaney et al. (2000), p.8.

different firms, in other words, why some remain as exporters and others do not. The model presented in the theoretical framework accounts for firm specific factors that affect production (such as productivity, size, and ownership structure), as well as for the factors and expenses associated with penetrating foreign markets (so called *sunk costs* such as costs of developing new marketing techniques, costs of information about foreign conditions and costs of establishing a distribution system). Econometric results of the paper indicate that firm-specific characteristics do determine the probability of becoming an exporter and advancing in export status, thus being consistent with the previous findings. This study also suggests some other factors that are likely to improve export performance, namely participation of foreign capital and foreign licenses availability.

The role of government policies (export promotion regulations, subsidies, etc.) in determining export behavior of the producers is rather important in the case of Ukraine. This is because exporting activities are not well established in the manufacturing sector of Ukraine, so most of the firms are highly sensitive to government policies in this area. Thus, an extensive analysis of exporting behavior should account for specific regulations that influence producers' decisions to enter the export market.

In addition, a number of authors focus on the role of spillover effects, distinguishing between region-specific (impact of export activities of the firms in different industries in the same region), and industry-specific (effect of the activities of the firms from the same industry that function in different regions) spillovers. *Aitken, Hanson and Harrison (1997)* investigate a sample of Mexican manufacturing plants and find that spillover effects are significant in the case of multinational enterprises (MNE), though they do not matter as much for general export activity decisions. In a more recent paper, *Bernard and Jensen (2001)* investigate for the USA how sectoral export activity is likely to affect the choice of the other producers to enter the

export market, and do not find strong evidence for spillover effects. However, both of these papers only consider possible spillover effects on the decision regarding whether or not to export, rather than on the intensity of exports. *Barrios, Gorg and Strobl (2001)* examine a firm's decision whether or not to export, and the determinants of the export ratio, using firm level data for Spanish manufacturing industries. In their study, they distinguish two channels for spillovers, namely other firms' export activity and other firms' R&D activity. Besides, they consider the importance of the spillovers emanating from both MNE's and domestic firms in the same sector. Their results suggest that while own R&D activities are important determinants of export behavior, R&D spillovers do not have a considerable effect on another firms' export decisions and export intensity.

Most of the studies discussed above deal with the cases of developed or developing countries. However, the same techniques might not be relevant in the case of transitional economy like Ukraine. Moreover, productivity-related variables (total factor productivity, value-added per worker, sales and capital-shares) are not always reliable in the transition economies due to considerable measurement errors and changes in accounting standards. To accommodate for such shortcomings, additional factors should be considered. In this regard, *incentives* for the firms to innovate, raise productivity and enter export markets can be taken not only as proxies for productivity, but rather as preconditions for productivity gains that are inherent to involvement into export activities *(Buck et. al., 2000*). The authors view the structure of ownership that changed in the course of privatization in former Soviet Union (FSU) countries as the basis for incentives for firms in transitional economies. Following these considerations, they examine the relationships between export propensity and different forms of firm ownership. For this purpose they distinguish outside shareholders, employees, managers and the State as key types of owners. The investigation of Russia, Ukraine and Belarus was performed on

a longitudinal data set for 1995-1997. Although the analysis did not find a significant effect of economic reforms on increasing the amounts of exporting in the FSU countries [in that period, transition in FSU had begun, but barely had any discernible positive effects], it has still suggested a reasonable methodology to be used in further studies. Export *propensity* was chosen as the dependent variable, the basic specification was modified to account for the different factors discussed above, and conditional likelihood was used for estimation.

Chapter 3

MODELLING EXPORT ACTIVITIES

To model export activities I focus on the question of why some firms choose to export while other do not, and what determines the share of exports in total sales of the firms in a specific industry. As a starting point, I follow the Bernard and Jensen (2001) approach to build a model for a rational, profit-maximizing firm with no entry costs, and then include entry costs as well as additional external factors.

For the analysis, I assume that the firm i is producing at profit-maximizing level q^* of exports as it enters the foreign market in period t. Profits π_{it} this firm receives can be expressed as:

$$\pi_{it}(X_{it}, Z_{it}) = p_t \cdot q_{it}^* - c_{it}(X_{it}, Z_{it} \mid q_{it}^*) \quad (1)$$

where p_t – price of goods sold abroad (is assumed to also depend on some elements of X_{it} and Z_{it},)

$c_{it}(\cdot)$ – variable production cost

X_{it} – firm-specific characteristics such as size (labor), performance (sales), productivity etc.

Z_{it} - vector of other factors such as government policies, spillover effects etc.

If expected profits are non-negative, the firm will choose to enter the export market, and it will decide not to export with negative expected profits[2]. Defining the export status of firm i in period t as a dichotomous variable Y_{it}, the following is true:

[2] In this framework, firm's profits (losses) from its activities at the local market are not taken into account.

$$Y_{it} = \begin{cases} 1 \;\; if \;\; \pi_{it} \geq 0 \\ 0 \;\; if \;\; \pi_{it} < 0 \end{cases} \tag{2}$$

The decision to export in a given period also depends on the firm's previous performance as well as on the stream of future expected profits from maintaining its status on the export market. Thus, a single period model should be extended to multiple periods, providing expected profits Π_{it} :

$$\Pi_{it}(X_{it}, Z_{it}) = E_t\left(\sum_{s=t}^{\infty} \delta^{s-t}\left[p_s \cdot q_s^* - c_{is}(X_{is}, Z_{is} \mid q_{is}^*)\right]\right) \tag{3}$$

with δ – discount factor

t, s – first and last period under consideration

Firm's profits in period t are also affected by the firm's previous performance since this-period costs c_{it} are affected by last-period production q^*_{it-1} (4). This situation may be due to entering the foreign market in the previous period with $q^*_{it-1}>0$, thus overcoming sunk costs and reducing current period costs c_{it} by this amount.

$$\frac{\partial c_{it}(\cdot)}{\partial q^*_{it-1}} \neq 0 \qquad \text{for} \qquad c_{it} = c_{it}(X_{it}, Z_{it}, q^*_{it-1} \mid q^*_{it}) \tag{4}$$

Thus, allowing for export status today to influence the decision to export tomorrow, which, in turn, determines the level of the future expected profit streams, the value function in the dynamic framework is given by:

$$V_{it}(\cdot) = \max_{\{q^*_{it}\}} \left(\pi_{it} \cdot Y_{it} + \delta E_t\left[V_{it+1}(\cdot) \mid q^*_{it}\right]\right) \tag{5}$$

Consequently, a firm's decision to export in period t would be based on comparison of current and future profits from exporting with those from not exporting:

$$\boldsymbol{Y_{it} = 1} \text{ if } \pi_{it} \cdot 1 + \delta E_t\left[V_{it+1}(\cdot) \mid q_{it}^* > 0\right] > \pi_{it} \cdot 0 + \delta E_t\left[V_{it+1}(\cdot) \mid q_{it}^* = 0\right]$$

$$\text{or} \quad \pi_{it} + \delta E_t\left[V_{it+1}(\cdot) \mid q_{it}^* > 0\right] > \delta E_t\left[V_{it+1}(\cdot) \mid q_{it}^* = 0\right] \quad (6)$$

Moreover, entering foreign markets is usually associated with some additional costs (such as advertising costs, costs of information about foreign demand conditions, costs of establishing distributional network), which are actually sunk in nature. For the purpose of this analysis, it is assumed that a firm pays such costs in full every time it enters the export market, i.e. when it changes its export status from one period to the next. Having incorporated entry costs into a single period model, profits $\tilde{\pi}_{it}$ can be expressed as:

$$\tilde{\pi}_{it}\ (X_{it}, Z_{it}, q_{it-1}^*) = p_t \cdot q_{it}^* - c_{it}\ (X_{it}, Z_{it}, q_{it-1}^* \mid q_{it}^*) - \boldsymbol{N \cdot (1 - Y_{it-1})} \quad (7)$$

where N is a measure of the entry costs.

In such a framework, an exporter has to pay sunk cost N if it has just entered foreign market in period t (and $Y_{it-1} = 0$), and it does not pay if it exported in the previous period ($Y_{it-1} = 1$). In such a way, a measure of entry cost allows to incorporate some information about the firms' previous performance into the framework addressing their current export behavior.

Extending this model to multiple periods in a similar way to above, the value function takes the form:

$$V_{it}(\cdot) = \max_{\{q_{it}^*\}} \left(\tilde{\pi}_{it} \cdot Y_{it} + \delta E_t\left[V_{it+1}(\cdot) \mid q_{it}^*\right]\right) \quad (8)$$

and firms' decision to export in each of the multiple periods would then be modeled as:

$Y_{it} = 1$ if

$$\pi_{it} + \delta E_t\left[V_{it+1}(\cdot) \mid q_{it}^* > 0\right] > \delta E_t\left[V_{it+1}(\cdot) \mid q_{it}^* = 0\right] + N_{it}(1 - Y_{it-1}) \qquad (9)$$

Getting back to the previous notation,

$$Y_{it} = \begin{cases} 1 \;\; if \;\; \hat{\pi}_{it} \geq 0 \\ 0 \;\; if \;\; \hat{\pi}_{it} < 0 \end{cases} \qquad (10)$$

with

$$\hat{\pi}_{it} = (p_t q_{it}^* - c_{it}) + \delta E_t\left[V_{it+1}(\cdot) \mid q_{it}^* > 0\right] - \delta E_t\left[V_{it+1}(\cdot) \mid q_{it}^* = 0\right] - N_{it}(1 - Y_{it-1})$$

In this case, the firms' profits would be corrected to account for the influence of intertemporal *learning* effects (discounted value of future activities) and sunk costs. To identify and separate these two influences, a structural model and production function and cost function would need to be considered. However, since this paper is aimed to study the determinants of export behavior and the role of firm-specific characteristics, externalities and government policies in the decision to export, the model as it is presented in (10) will be employed for the analysis.

The model that I am going to utilize in my work determines *export* as a function of firm characteristics, firm's previous performance and factors like terms of trade, trade shocks, region-industry spillovers, government policies. For measuring the *probability of starting to export* (here, Y_{it}) probit or logit would be preferred, and model specification would take the following form:

$$Y_{it} = \begin{cases} 1 \;\; if \;\; \beta X_{it} + \gamma Z_{it} - N \cdot (1 - Y_{i,t-1}) + \varepsilon_{it} > 0 \\ 0 \;\;\;\;\; otherwise \end{cases} \qquad (11)$$

or, in probability terms,

$$prob\ (export) = prob\ (\varepsilon_{it} > -\beta X_{it} - \gamma Z_{it} + N \cdot (1 - Y_{it-1})) \qquad (11')$$

with Y_{it} – export status (1 – exporter, 0 otherwise)

X_{it} – vector of firm-specific characteristics (size, labor and labor costs, amount of production, etc.)

Z_{it} – vector of other factors such as government policies, spillover effects etc.

N – measure of sunk costs

Further analysis of export activities calls for studying the intensity of exports since, it should not only allow one to determine why firms choose to export, but also how much they choose to export.

For measuring intensity of exports Heckman sample selection model should be used, with dependent variable $Y_{it} \in [0,1]$ – intensity of exports (measured as a ratio of exports to the total sales).

The latter procedure allows incorporating decision about exporting along with the factors that influence the volume of exports into one framework, thus giving additional insights on this issue.

The proposed methodology is intended to determine how influential different factors are in affecting solely the decision to enter an export market versus the intensity of exporting, i.e. share of exports chosen by some particular enterprise.

INSTITUTIONAL FRAMEWORK

Notwithstanding the export growth of about 20% that contributed to substantial GDP growth only in 2001, the foundations for more efficient export activities were laid down in the beginning of transition period in Ukraine. The law of Ukraine "On General Foundation for Creation and Operation of Special (Free) Economics Zones" adopted on October 13, 1992 has been one of the most significant policy measures in this field. This law regulates the creation and liquidation of special economic zones (SEZ) on the territory of Ukraine, determines main legal and economic foundations of their status, as well as envisaging adoption of separate laws to regulate the activities of each particular SEZ.

Under this law, the special economic zone is determined as a bounded territory of Ukraine where the special tax and customs regime is established. Creation of SEZ is aimed to attract foreign investment, promote joint venture activities, increase exports and imports of goods and services, increase supply of high-quality goods at the local market, introduce new technologies and implement new marketing techniques, as well as to create favorable market infrastructure and facilitate social and economic development of Ukraine.

Currently, 11 special economic zones have been created in different regions of Ukraine. SEZ "Donetsk" and SEZ "Azov" were established in 1999 for a period of 60 years in the boundaries of the cities Donetsk and Mariupol (Donetsk oblast) respectively. The creation of SEZ in Donetsk oblast is aimed to support technological innovations, stimulate foreign trade, establish modern production and transport infrastructures, as well as to provide additional employment for the workers released from mining enterprises. SEZ "Mykolaiv" includes three specific ship-building companies, and was created in 2000 for a period of 30 years within the city of Mykolaiv. SEZ

"Porto-franko" was set up in 2000 on the territory of the Odessa sea trading port. Another free economic zone in Odessa oblast, SEZ "Reni" (effective as of 2000) is located at Reni sea trading port. Both of these SEZs are aimed at attracting new investment, developing the infrastructure of the sea ports and promoting foreign trade. One of the main objectives of SEZ "Interport Kovel" is to improve transport infrastructure in the region. SEZ "Zakarpattia" which encompasses all of the Zakarpattia oblast is called to attract new investment, and promote foreign trade activities and increase production of highly competitive goods and services for both, local consumption and export. SEZ "Slavutych" and "Yavoriv" among other tasks are aimed at providing employment opportunities for the workers who are released from the Chernobyl power station and mining and chemical enterprise in Yavoriv.

Despite seemingly different objectives for each of the special economic zones, they are all aimed at promoting foreign trade activities and developing favorable market infrastructure in the regions of Ukraine. The latter, in its turn, should ensure attracting new investment into the companies operating in these regions. Consequently, carrying out of the new investment projects stipulates the need in the imported goods (raw material, equipment, etc.). However, according to the current Ukrainian legislation, there is no import tariff and valued added tax imposed on the goods that are imported to SEZs, and what is more, these goods are not to be reported in detail. This fact creates some "loopholes" in the legislation and allows importing all different goods that can be used for some other purpose rather than for the designated investment project.

Such situation gives rise to a debate among different government institutions and international agencies concerning the effectiveness and necessity of SEZs for the economy of Ukraine. The decision whether to "keep" all existing SEZs or close any of them requires thorough investigation of their activities,

which include carrying out investment projects, creating new working places, improving the performance of the companies in the region, etc. In this regard, different aspects are to be studied, and while some problems with imports have been briefly outlined above, the effect of the SEZs' existence on the export activities will be discussed in this paper.

When the government wants to encourage local producers, it should create favorable export climate. The effectiveness of export promotion measures can be estimated via including dummy variable for SEZ into the model framework. A priori, SEZ are expected to have positive effect on the export activities of the companies within these zones, as well as on other ones through possible spillover effects.

Chapter 4

DATA DESCRIPTION

The data on Ukrainian manufacturing sector comes in two related sub-sets (firm-level and sub-industry level) that have been obtained from the State Committee of Statistics of Ukraine (*Derzhkomstat)* bulletins and are available for the following indicators: volume of production in current prices, volume of sales, value of capital, amount of labor force employed, total wage bill (remuneration), and volume of both exports and imports. The data incorporate virtually all companies in the manufacturing sector and represent all 24 oblasts, Autonomous Republic of Crimea (ARC), and cities of Kyiv and Sevastopol. All data are in real terms, converted using a (yearly) producer price index from the *Derzhkomstat* bulletin (2001).

The firm-level data set is more appropriate and interesting for conducting such research and thus will be given more emphasis in the analysis. Yearly data are available for over 10,000 companies in the manufacturing sector of Ukraine, representing all 9 industries (according to official classification from the *General industrial classifier of the economy*[3]), and are available for the 1996-1999 time period.

The data at the sub-industry level (5-digit classification) can be treated as an extension of the firm-level data, since it covers the period from 1998 to 2001. This data set covers almost the whole manufacturing sector as well, but due to some aggregation it provides over 3,000 cross-sectional units for each of the four years.

Before any further analysis is undertaken, the data in both sub-sets are investigated, corrected for unrealistic observations, missing information and outliers. Due to the nature of the 'drawbacks' (e.g. zero values for

[3] Was available from Kyiv City Department of Statistics (www.kmus.kiev.ua)

wage corresponding to a non-zero labor force employed, negative values for production or sales etc.) such observations were excluded since they constituted just a small proportion of the total data set. This resulted in the data sets incorporating 10,020 firms and 3,061 sub-industries for 4 time-periods.

As export-related activities are of particular interest in this research, presented below are those figures supporting the idea underpinning the so-called export-led growth that has been observed in Ukraine during last several years.

Table 1. Contribution of foreign trade to GDP growth

Year	Real GDP change over previous year	Total exports of goods	Exports change over previous year	Total imports of goods	Imports change over previous year
	%	mn USD	%	mn USD	%
1995	-12.20	14244		16946	
1996	-10.00	15547	0.0915	19843	0.1709
1997	-3.00	15418	-0.0083	19623	-0.0111
1998	-1.90	13699	-0.1115	16283	-0.1702
1999	-0.20	13189	-0.0372	12945	-0.2050
2000	**5.90**	15722	**0.1921**	14943	0.1543
2001	**9.10**	17073	**0.0859**	16886	0.1300

Source: State Committee of Statistics

Since economic growth can be attributed, among other factors, to the improving performance of the manufacturing sector, careful investigation of the latter would help to understand the peculiarities of this process.

Following the pattern of most of the transition economies, Ukraine is experiencing a U-shaped growth path which is particularly evident in the manufacturing sector. Decline in the industrial output (which is characterized by the volume of both production and sales) up until 1999, was eventually followed by partial recovery in the subsequent years. Graphically, this pattern in presented in the figures 1 and 2 using the data at hand[4].

[4] In figures 1-4, all data are taken from Derzhkomstat official statistics

Figure 1. Selected indicators' dynamics for firm-level data (mean statistics)

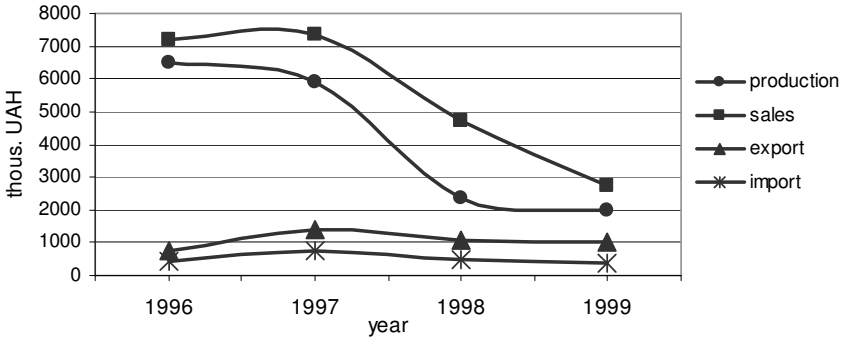
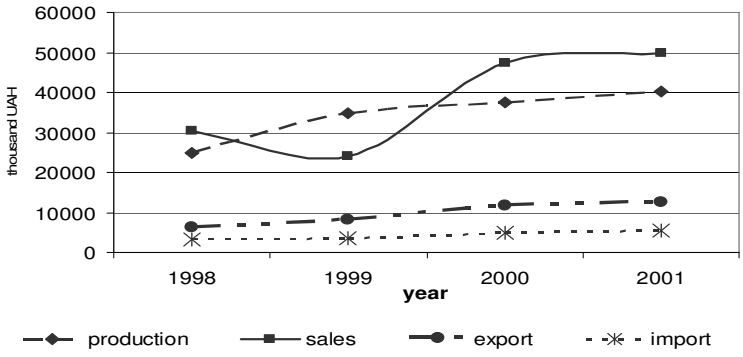


Figure 2. Selected indicators' dynamics for industry-level data (mean statistics)



However, not all sectors of the economy are likely to experience the same pattern of development. In this respect, firms' and industries' heterogeneity influences the evolution of output.

The enterprises in the data sets represent all 9 industries of the manufacturing sector (classified according to the G*eneral industrial classifier of the economy*[5]):

I 11 – energy and fuel industry
I 12 – metallurgy
I 13 – chemical and oil-refining industry
I 14 – machine-building and metal-working industry

[5] Was available from Kyiv City Department of Statistics (www.kmus.kiev.ua)

I 15 – wood processing and pulp and paper industry
I 16 – construction materials
I 17 – light industry
I 18 – food industry
I 19 – others

Not surprisingly, some sectors have been performing better and developing faster (based on such measures as volumes of sales, exports etc.). The dynamics of exporting activities over the 1996–2001 period are presented in figures 3 and 4. The volumes of export in metallurgy sector have been increasing throughout the whole period. At the same time, they are significantly above the volumes of exports of all other industries. Among the other 8 industries, chemical and machine-building sectors have been performing relatively better over this whole period as well. This makes the metallurgy, chemical and machine-building industries the main exporters of the Ukrainian manufacturing sector.

It should be noted, however, that some discrepancy between the figures in the overlapping years exists due to the different sub-sets of data used. However, the general trend if unaffected by this and still presents an accurate enough picture of the exporting dynamics.

Figure 3. Volumes of export in the manufacturing sector (firm-level)

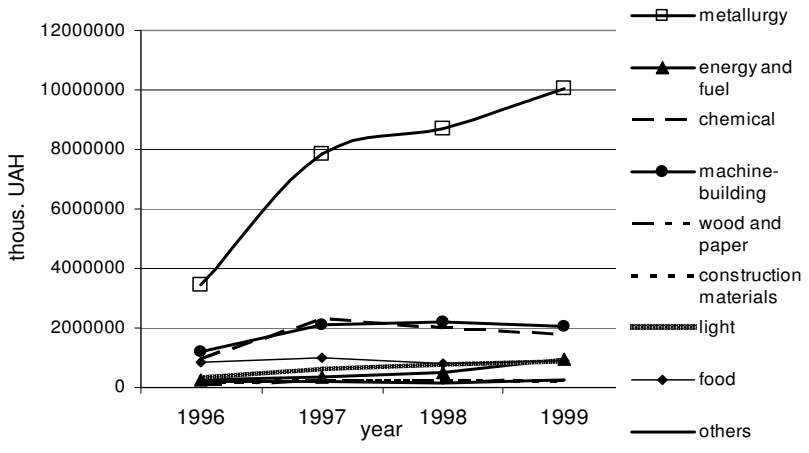
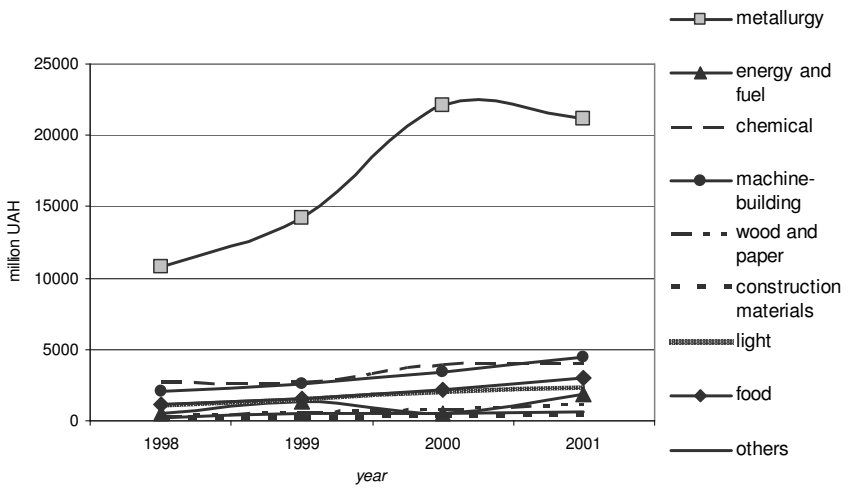


Figure 4. Volumes of export in the manufacturing sector (industry-level)



Along with the available data on production, sales, capital, labor, wages, exports and imports, an additional variable to capture the effect of government policy is introduced. Based on the legislation that regulates activities of the special economic zones (SEZ), a dummy variable is constructed to designate the firms that fall under the scope of SEZ regulation.

As set out in previous sections, there are possibly many determinants of export activities. However, in our empirical model we test the relationship between export propensity/intensity and the following variables:

- *PRODUCTIVITY* is measured as the ratio of production (thousand UAH, real terms) to labor employed;
- *AVERAGE WAGE* is measured as the ratio of total remuneration (thousand UAH) to labor;

- *CAPITAL SHARE* is measured as the ratio of value of capital stock to the volume of sales;
- *EXPORT INTENSITY* is measured as the ratio of exports to the overall volume of sales;
- firm size is approximated by *LABOR* that is measured as average number of workers per year; to control for non-linearity between firm size and the decision to export, the square of firm size (*LABOR2*) is also included in the model;
- a government policy effect is approximated by a dummy variable *SEZ* (with *SEZ=1* for the firms that enjoy the benefits of special economic zones legislation in a given year);
- the *SUNK COST* variable captures the effects of entering (re-entering) a foreign market, i.e. changing the export status relative to the previous period;
- previous export experience (*PREVEXPORT*) is defined as the lagged (one period) volume of exports (thousand UAH);
- to capture firm-specific effects, we include *deviations* [6] from the sector average in the average wage, productivity, capital share and labor;
- industry dummies and regional dummies are intended to capture industry-specific and region-specific effects;
- year dummies will be used to control for some outside shocks to the economy.

[6] *Deviation* variables are constructed as the firm (sub-industry) value less the sector average for the corresponding year

The variables to be tested are expected to have the following signs:

Table 2. Variables to be tested and their expected signs

Variable	Expected sign	Previous studies
PRODUCTIVITY	+	+
AVERAGE WAGE	+	+
CAPITAL SHARE	?	–
LABOR	+	+
LABOR2	–	–
SEZ	+	Not tested
SUNK COST	–	–
PREVEXPORT	+	+
Y_1998	–	

Descriptive statistics for the original variables from the data sets, as well as for those constructed for further analysis are presented in Appendix A.

EMPIRICAL ANALYSIS AND RESULTS

In this section of the thesis, we develop and estimate formal models to study what distinguishes an exporter from a non-exporter on both, firm and industry levels. This will allow comparison of the results across two subsets, which together constitute a continuous representation of the manufacturing activities in the economy.

Modeling and estimating export decisions

Differentiating between exporters and non-exporters implies constructing a model to reflect their export decisions. For this purpose, a theoretical framework developed in chapter 3 will be used. Based on the theoretical model presented above and on the data at hand, the following "benchmark" model specification arises:

$$EXPORT\ STATUS = f(PRODUCTIVITY,\ AVERAGEWAGE,\ CAPSHARE,\ LABOR,\ LABOR^2,\ SEZ,\ SUNKCOST,\ PREVEXPORT,\ INDUSTRY\ DUMMIES,\ YEAR\ DUMMIES) \quad (12)$$

Having multiple observations on cross-sectional units over time might allow exploiting such data structure by estimating individual specific effects which in fact are not observed. For a large number, N, of cross-sections relative to time period T, the econometric theory suggests using panel data analysis.

However, this particular research investigates *what distinguishes exporters from non-exporters*. And the change of the status (from exporter to non-exporter) is a traumatic event which cannot easily be identified with the characteristics of the existing exporter[7]. As such, using panel data techniques may not bring any unambiguous gain to the efficiency of the estimates or additional insight in the interpreting the coefficients. We test this conjecture below where the

[7] I am grateful to Peter Kennedy for this insight.

results of formal test to differentiate among pool and panel data are presented.

A starting point in choosing among the available specifications is the decision whether (unobserved) plant heterogeneity is better modeled as fixed of random effects. Most fixed effects (FE) models produce biased and inconsistent parameter estimates, especially for the coefficient on lagged dependent variable[8] (which is in this research included in the construction of the SUNK COST variable). Moreover, a FE model would not be plausible for binary-choice variables, since under FE all observations that include the variables with no within-group variation are omitted from the estimation (and due to the nature of the data, such observations constitute a significant part of the data sets). On the other hand, the use of random effects (RE) model assumes that unobserved effects present in the model have random structure, and plant effects are uncorrelated with explanatory variables. The following regression model should be applied:

$$\boldsymbol{y_{it} = \beta x_{it} + \alpha_i + u_{it}} \qquad (13)$$

where $\boldsymbol{x_{it}}$ - explanatory variables

$\boldsymbol{\beta}$ - parameters to be estimated

α_i – unobserved individual specific effects, $\alpha_i \sim IN(0, \sigma^2_\alpha)$, assumed to be independent of the $\boldsymbol{u_{it}}$'s and the $\boldsymbol{x_{it}}$'s

$\boldsymbol{u_{it}}$ – random disturbance term, $\boldsymbol{u_{it}} \sim IN(0, \sigma^2_u)$

Following the assumptions on the composite error term ($v_{it} = \alpha_i + u_{it}$), we can state that the correlation between two successive error terms for the same cross-sectional unit (firm or sub-industry) is a constant given by

$$\rho = corr(v_{it}, v_{i,t-1}) = \frac{\sigma^2_\alpha}{\sigma^2_\alpha + \sigma^2_u} \qquad (14)$$

[8] Bernard and Jensen (2001), p. 11.

However, when $\sigma^2_\alpha = 0$, meaning that there is no variance in the unobserved individual effects (i.e. they are not in fact present in the model), it follows that $\rho = 0$ and pooled probit/logit parameter estimates will be equal to RE probit/logit model parameter estimates (Arulampalam, 1996). The formal test of $\rho = 0$ is found in Stata output for the regression on panel data using logit estimation technique:

Likelihood ratio test of $\rho = 0$: $\chi^2_{calculated}(01) = 0.00$
Probability ($\chi^2_{critical} \geq \chi^2_{calculated}$) = 1.000

Such a result implies that there are virtually no gains to be obtained from estimating the model using panel data techniques, and further estimation will be undertaken by pooling the data and treating firms and sub-industries as exporters ($y_{it} = 1$) or non-exporters ($y_{it} = 0$).

Logit analysis was used to estimate the benchmark specification of the model as in (12). The estimated coefficients for the variables are presented in table 3 (with p-values in parentheses).

Calculated p-values for the estimated coefficients suggest that the variables are statistically significant at the conventional (5% and even 1%) significance levels.

Table 3. Decision to export (logit) regressions

Dependent variable	EXPORT STATUS					
	Firms			Industries		
	Coef.	dy/dx		Coef.	dy/dx	
AVERAGEWAGE	0.31153	0.07642	(0.000)	0.14838	0.0000206	(0.000)
PRODUCTIVITY	0.00413	0.00101	(0.002)	0.00112	0.0000002	(0.279)
CAPSHARE	-0.00101	-0.00025	(0.000)			
LABOR	0.00090	0.00022	(0.000)	0.00012	$-1.63 \cdot 10^{-8}$	(0.000)
LABOR2	$-6.36 \cdot 10^{-8}$	$-1.56 \cdot 10^{-8}$	(0.000)	$-2.3 \cdot 10^{-9}$	$-3.19 \cdot 10^{-10}$	(0.000)
SEZ	0.48311	0.12014	(0.003)	0.31845	0.0000442	(0.010)
SUNKCOST	-2.73567	-0.67106	(0.000)	-2.62497	-0.0003640	(0.000)
PREVEXPORT	0.00098	0.00024	(0.000)	0.00162	0.0000002	(0.000)
Y1998	-0.11321	-0.02768	(0.013)	-0.13682	-0.0000190	(0.077)
Industry-specific dummies						
ENERGY AND FUEL	-1.46460	-0.29080	(0.000)			
METALLURGY	1.34025	0.31367	(0.000)			
CHEMICALS	0.90379	0.22101	(0.000)			
MACHINE-BUILDING	0.93537	0.22962	(0.000)			
PULP AND PAPER	1.01468	0.24682	(0.000)			
CONSTRUCTION MATERIALS	0.30250	0.07500	(0.000)			
LIGHT (TEXTILE)	0.73123	0.18077	(0.000)			
_CONS	-0.53148		(0.000)	0.62025	0.0000206	(0.000)
NO OF OBSERVATIONS	23649			8329		
PSEUDO R^2	0.4519			0.4629		

(p-values in parentheses)

However, the model still has to be assessed in terms of the accuracy with which it approximated the observed data. For this purpose, an appropriate *goodness-of-fit* measure has to be employed. In the case of qualitative dependent variable, the accuracy can be evaluated based on the model's ability to forecast observed responses [9], i.e. based on the number of correct prediction for each outcome, $y_{it}=0$ and $y_{it}=1$. To obtain such statistic, one has to calculate the predicted probabilities that $y_{it}=1$, given the explanatory variables $\boldsymbol{x}_{it}$ and using the estimated coefficients. In general, the following is assumed:

[9] Verbeek (2000), p.182.

$$\hat{y}_{it} = \begin{cases} 1 & if \quad L(x_{it}\hat{\beta}) > 0.5 \\ 0 & if \quad L(x_{it}\hat{\beta}) \leq 0.5 \end{cases} \tag{15}$$

The calculated outcomes are then compared with the actual ones, and the results can be presented in the following table:

Table 4. Cross-tabulation of actual and predicted outcomes

Firms		***Actual***		
		1	*0*	*Total*
Calculated	*1*	**5179**	1379	6558
	0	1661	**15430**	17091
	Total	6840	16809	23649

Industries		***Actual***		
		1	*0*	*Total*
Calculated	*1*	**3705**	620	4325
	0	591	**3413**	4004
	Total	4296	4033	8329

The fraction of ones correctly predicted (in the firm-level subset) is 5179/6840=0.7571, and the fraction of zeros correctly predicted is 15430/16809=0.9180. A reasonable measure of goodness-of-fit is the *sum* of these two fractions[10], 0.7571+0.9180=**1.6751**. Since this number exceeds unity, one can argue that the model and the prediction method approximate the data rather accurately.

Similarly, the fraction of ones correctly predicted (in the industry-level subset) is 3705/4296=0.8624, and the fraction of zeros correctly predicted is 3413/4033=0.8463. The sum of these two fractions, 0.8624+0.8463=**1.7087**, which also exceed the unity, shows that the model for industry-level data is also valid.

[10] Kennedy (1998), p.239.

Several remarks should be made before explanation of the coefficients is undertaken. Data on capital was not available for the industry sub-set, thus a capital share variable could not be constructed. Industry dummies turned out to be statistically insignificant for the sub-industry level model, and thus were excluded from the model specification.

Furthermore, to evaluate and interpret the coefficients obtained from the logit model, one has to calculate marginal effects. The latter can be performed by taking partial derivatives of the logistic function with respect to the respective explanatory variables.

The logit model takes on the following functional form:

$$Prob\{y_{it} = 1\} = L(x_{it}\beta) = \frac{e^{x_{it}\beta}}{1 + e^{x_{it}\beta}} \tag{16}$$

and $$\frac{\partial L(x_{it}\beta)}{\partial x_{ik,t}} = \beta_k \frac{e^{x_{it}\beta}}{(1 + e^{x_{it}\beta})^2} \tag{17}$$

It turns out that the effect of a change in $x_{ik,t}$ depends upon the values of x_{it} (mean values of explanatory variables are used for calculations). However, the sign of the effects of a change in $x_{ik,t}$ corresponds to the sign of its coefficient β_k[11].

Marginal effects obtained in this model are statistically significant, but economically are rather small in magnitude, since they reflect the change in the probability of predicted positive outcome (firm is an exporter) as a result of a unit change in the independent variable. Still, the magnitude of a marginal effect of average wage is comparable to that found in other studies (Bernard and Jensen, 2001), while the effect of productivity changes is somewhat

[11] Verbeek (2000), p. 179.

smaller. Such results imply that an exporter in the Ukrainian manufacturing sector will indeed pay higher average wages since the firm is able to sell its products at relatively high prices thus obtaining higher profits, part of which is distributed among the workers in the form of wages. However, Ukrainian exporters are not necessarily as productive as, say, American exporters, and this fact is reflected in lower marginal effect of productivity. Numerically, increasing productivity per year by one thousand UAH per worker at the firm will contribute to 0.1 % higher probability for this firm to start exporting. Noticeably, labor has economically small effect on the differences between the exporters and non-exporters. It turns out that hiring one more worker on a firm will increase probability to become an exporter only by 0.022%, and this effect is even more negligible on the industry level. Furthermore, the effect of firm's size diminishes as size increases. Still, in line with the existing literature, this model confirms that "exporters are larger, more productive and pay higher wages" (Bernard and Jensen, 2001) compared to other firms in the manufacturing sector of Ukraine.

Sunk costs indeed negatively affect a firm's decision to enter foreign market, while previous export experience reinforces the probability of exporting in the current period. The SEZ dummy variable has positive effect on firms' decisions, suggesting that the probability to be an exporter is on average higher by 12% for a sample of firms that operate in the SEZs. This implies that creating special economic zones in the certain regions has been beneficial for promoting individual firm's export behavior, thus contributing to overall improvements in the economy. The effect of SEZ on the industries' performance at the foreign market is much smaller, since it is rarely the case that the whole sub-industry would be subject to SEZ regulations. The negative sign of the coefficient of the capital share variable suggests that those firms with the relatively high share of capital in the total sales are less likely to start exporting. This may be due to the fact that most of the capital used in

the Ukrainian manufacturing enterprises is rather obsolete, out-dated and thus rather non-productive.

Statistically significant industry dummies (for the firm-level sub-set) suggest that affiliation with some particular industry does influence a firm's decision to export. Thus, the companies in the energy and fuel sector are less likely to be exporters compared to the firms in other industries, partially because their products are more important on the domestic market, and partially because most of the firms in this sector have not undergone major structural changes yet and cannot effectively compete at the foreign market.

A year-specific dummy for 1998 is used to capture (Russian) economic crisis of that year, which indeed lowered firm's propensity to export, and especially to Russia, one of the main trading partners of Ukraine.

Having analyzed the "benchmark" model on the data from the two available sub-sets, further analysis is extended to capture firm (industry) specific characteristics by including the "deviation from the average" variables into the model[12]. These "deviation" variables are constructed by subtracting the respective industry means (for each of the 9 industries in each year) from the individual firm (sub-industry) values. Constructed in such a way, deviation variables reflect by how much each firm (sub-industry) is different from the average one in its respective industry in each given year. The model specification takes the following form:

$$EXPORT\ STATUS = \boldsymbol{f}(\ PRODUCTIVITY,\ AVERAGEWAGE,\ CAPSHARE,\ LABOR,\ PRODUCTIVITY\_deviation,\ AVERAGEWAGE\_deviation,\ CAPSHARE\_deviation,\ LABOR\_deviation,\ SEZ,\ SUNKCOST,\ PREVEXPORT,\ YEAR\ DUMMY) \quad (18)$$

[12] By introducing "deviation" variables, I follow the methodology presented by Bleaney and Wakelin (1999).

Intuitively, what is likely to distinguish an exporting firm from a non-exporting one is not purely its high productivity or high average wage, but rather the extent by which it exceeds other firms in the same industry on the basis of these parameters.

A logit model was used for the estimation and the following results were obtained:

Table 5. Decision to export (logit) regressions (deviation variables included)

DEPENDENT VARIABLE	EXPORT STATUS					
	Firms			Industries		
	Coef.	dy/dx		Coef.	dy/dx	
AVERAGEWAGE	**1.16752**	**0.28932**	**(0.000)**	**0.77519**	**0.0000243**	**(0.000)**
PRODUCTIVITY	**-0.14941**	**-0.03702**	**(0.000)**	**-0.01730**	**-0.0000005**	**(0.040)**
CAPSHARE	**-0.00195**	**-0.00048**	**(0.000)**			
LABOR	**0.00102**	**0.00025**	**(0.000)**	**-0.00008**	**$-2.56\cdot10^{-9}$**	**(0.132)**
SEZ	0.35761	0.08916	(0.025)	0.26995	0.0000076	(0.029)
SUNKCOST	-2.87805	-0.71320	(0.000)	-2.61065	-0.0000818	(0.000)
PREVEXPORT	0.00103	0.00025	(0.000)	0.00157	$4.92\cdot10^{-8}$	(0.000)
Y1998	-0.42937	-0.10509	(0.000)	-0.12898	-0.0000042	(0.098)
Deviation variables						
AW_DEV	**-0.89690**	**-0.22226**	**(0.000)**	**-0.64681**	**-0.0000203**	**(0.000)**
PRODUCTIVITY_DEV	**0.15358**	**0.03806**	**(0.000)**	**0.02007**	**0.0000006**	**(0.018)**
CAPSHARE_DEV	**0.00107**	**0.00027**	**(0.000)**			
LABOR_DEV	**-0.00064**	**-0.00016**	**(0.000)**	**0.00021**	**$6.43\cdot10^{-9}$**	**(0.000)**
_CONS	0.10595		(0.275)	0.26078		(0.112)
No of observations	23649			8329		
Pseudo R^2	0.4382			0.4671		

(p-values in parentheses)

In the specification above, industry-specific dummies turned out to be statistically insignificant and were excluded from the model. Here, industry specific effects are effectively captured by including the deviation variables along with the variables in levels (all in bold).

Similarly to the above model, the number of correct and incorrect predictions will be used as a measure of *goodness-of-fit* for this augmented model.

Table 6. Cross-tabulation of actual and predicted outcomes (augmented model)

Firms		*Actual*		
		1	*0*	*Total*
Calculated	*1*	**5294**	1520	6814
	0	1546	**15289**	16835
	Total	6840	16809	23649

Industries		*Actual*		
		1	*0*	*Total*
Calculated	*1*	**3705**	617	4322
	0	591	**3416**	4007
	Total	4296	4033	8329

Following the same logic as above, a measure of goodness-of-fit (for firm-level subset) to be judged upon is the *sum* of the fraction of ones correctly predicted (5294/6840=0.7740), and the fraction of zeros correctly predicted (15289/16809=0.9096), i.e. 0.7740+0.9096=**1.6836**. Similarly, for the industry-level subset, the *sum* of the fraction of ones correctly predicted (3705/4296=0.8624), and the fraction of zeros correctly predicted (3416/4033=0.8470), is 0.8624+0.8470=**1.7094.** Since of these numbers exceed unity as well, we can claim that these models and the prediction method approximate the data rather accurately, too.

Apart from the coefficients on *average wage, productivity, capital share and labor* variables and their deviations (shown in bold in Table 5), all other coefficients have the same signs as in the previous regression model. However, in this case the econometric inference and interpretation of the coefficients obtained cannot be made in a straightforward manner, but rather requires estimating of the partial effects of *average wage, productivity, capital share* and *labor* and their deviations on the probability of exporting. We use the formulas for marginal effects as in (16) and (17) to determine the sign and magnitude of the individual effects in this extended model.

Accounting for the deviation variables included into the augmented model (on the example of *average wage* variable, with all others included into $\boldsymbol{X}$ term), the logit function can be presented as follows:

$$L(x_{it}\beta) = \frac{e^{x_{it}\beta}}{1+e^{x_{it}\beta}} = \frac{e^{\beta_1 Averagewage+\beta_2(Averagewage\_dev)+\beta_3 X}}{1+e^{\beta_1 Averagewage+\beta_2(Averagewage\_dev)+\beta_3 X}} =$$

$$= \frac{e^{\beta_1 Averagewage+\beta_2(Averagewage-\theta)+\beta_3 X}}{1+e^{\beta_1 Averagewage+\beta_2(Averagewage-\theta)+\beta_3 X}} = \frac{e^{(\beta_1+\beta_2)Averagewage-\beta_2\theta+\beta_3 X}}{1+e^{(\beta_1+\beta_2)Averagewage-\beta_2\theta+\beta_3 X}} \quad (19)$$

Thus, by taking partial derivative with respect to the *average wage*, the following result is obtained:

$$\frac{\partial L(x_{it}\beta)}{\partial Averagewage} = (\beta_1+\beta_2)\frac{e^{(\beta_1+\beta_2)Averagewage-\beta_2\theta+\beta_3 X}}{(1+e^{(\beta_1+\beta_2)Averagewage-\beta_2\theta+\beta_3 X})^2} \quad (20)$$

which, in turn, collapses to:

$$\frac{\partial L(x_{it}\beta)}{\partial Averagewage} = (\beta_1+\beta_2)\frac{e^{x_{it}\beta}}{(1+e^{x_{it}\beta})^2} \quad (21)$$

Furthermore, it can be shown that computationally same result can be obtained by summing up the marginal effects of the variables in levels with their respective deviation variables:

$$\frac{\partial L(x_{it}\beta)}{\partial Averagewage_{level}} = \beta_1\frac{e^{x_{it}\beta}}{(1+e^{x_{it}\beta})^2} \quad (22)$$

$$\frac{\partial L(x_{it}\beta)}{\partial Averagewage_{deviation}} = \beta_2 \frac{e^{x_{it}\beta}}{(1+e^{x_{it}\beta})^2} \tag{23}$$

$$\frac{\partial L(x_{it}\beta)}{\partial Averagewage} = \beta_1 \frac{e^{x_{it}\beta}}{(1+e^{x_{it}\beta})^2} + \beta_2 \frac{e^{x_{it}\beta}}{(1+e^{x_{it}\beta})^2} = (\beta_1 + \beta_2) \frac{e^{x_{it}\beta}}{(1+e^{x_{it}\beta})^2} \tag{24}$$

The partial derivatives for *productivity, capital share and labor* variables can be calculated in a similar manner. Such a result implies that in the extended model, the sign of the effect of the respective variables can be determined by summing up the coefficients of the variables and their deviations, and the "total" marginal effects can be obtained by summing up respective marginal effects of the level variables and their deviations, as the following calculation shows:

	Firms	Industries
Average wage	0.06706	0.000004
Productivity	0.00104	0.0000001
Capital share	-0.00021	
Labor	0.00009	0.000000

The results of the extended model stay in line with those obtained from the "benchmark" estimations, suggesting that the model is robust to alternative specifications and correctly describes and estimates the characteristics that distinguish exporters and non-exporters.

Modeling changes in the firms' behavior

Having established what are the features endemic to the exporters compared to the non-exporters, one might ask about the factors that stipulate a non-exporting firm to become an exporter rather than refrain from such a change in its status. To study the changes in the firms' exporting behavior, a subset of continuously operating firms that did not export for at least one period, is used. An additional binary variable *CHANGE*, is constructed in the following way:

$$CHANGE_i = \begin{cases} 1 & if \quad \text{firm i exported for 1 (2 or 3 consecutive) periods, } \forall t \\ 0 & if \quad \text{firm i did not export for all 4 periods , } \forall t \end{cases} \qquad (25)$$

Such notation implies that only the firms that continuously did *not* export, and those that changed their status into exporters once and permanently are considered in this sub-set[13]. The firms "switching" in and out of the export market are not accounted for in this estimation, since internal factors and possibly some unobserved characteristics and conditions that determine their "switches" are different from those that cause some firms to permanently enter the foreign market.

The "benchmark" model specification (12) is extended to account for regional specifics (which were found to be statistically insignificant in the previous specifications). The model is estimated using logit technique, and the results are presented in table 7.

[13] This part of the analysis is performed using only firm-level data sub-set, since export status dynamics cannot be accurately captured at the sub-industry level.

Table 7. Change of status (logit) regression

Dependent variable	CHANGE		
	Coefficient	dy/dx	*p*-value
AVERAGEWAGE	0.29677	0.0251	(0.000)
PRODUCTIVITY	0.00857	0.0007	(0.000)
CAPSHARE	-0.00058	-0.00005	(0.039)
LABOR	0.00113	0.0001	(0.000)
LABOR2	$-6.39 \cdot 10^{-8}$	$-5.39 \cdot 10^{-9}$	(0.000)
SEZ	0.88278	0.1051	(0.000)
Regional dummies[14]			
WEST	0.56681	0.0538	(0.000)
EAST	0.39694	0.0367	(0.000)
SOUTH	0.46955	0.0452	(0.000)
NORTH	0.75364	0.0808	(0.000)
KYIV	0.58998	0.0611	(0.000)
Industry-specific dummies			
ENERGY AND FUEL	-1.39535	-0.0749	(0.000)
METALLURGY	2.69790	0.5065	(0.000)
CHEMICALS	1.48601	0.2160	(0.000)
MACHINE-BUILDING	0.94049	0.1017	(0.000)
PULP AND PAPER	1.37334	0.1853	(0.000)
CONSTRUCTION MATERIALS	0.11427	0.0100	(0.340)
LIGHT (TEXTILE)	0.98257	0.1152	(0.000)
FOOD	-0.08637	-0.0072	(0.400)
_cons	-3.63530		(0.000)
No of observations	17438		
Pseudo R^2	0.1144		

The accuracy of the model is evaluated using the number of correct and incorrect prediction as a measure of goodness-of-fit. The sum of the respective fractions (1.0861>1) suggests that this model serves as an accurate enough representation of the actual data. Noticeably low number of correct positive predictions can be partially justified by the way that dependent variable is constructed. Namely, only the firms with the following "runs" in their export status (0001, 0011, 0111) could classify for dependent variable $CHANGE = 1$.

[14] "Center" dummy is omitted to avoid collinearity.

Table 8. Cross-tabulation of actual and predicted outcomes (*status change* model)

		Actual		
		1	*0*	*Total*
Calculated	*1*	**192**	114	306
	0	1862	**15270**	17132
	Total	2054	15384	17438
Fractions		*0.0935*	*0.9926*	*1.0861*

The variables used in this specification are interpreted as factors that affect firm's probability to change from non-exporter into continuous exporter. Such change is assumed to be a permanent, not a transitory one. Thus, increasing the average wage and productivity, a firm improves its probability to become an exporter. While expanding amount of capital per labor employed is likely to have an adverse effect on possible future exports, since most of the capital stock is rather obsolete and its large amount does not necessarily improve the quality (and thus, competitiveness) of the produced goods. The *size of the firm* variable (approximated by labor) is statistically significant at the conventional significance level, but it is not economically significant, since its effect is close to zero. As it is now, the manufacturing sector of Ukraine is surely dominated by large plants, those established in the Soviet times. Such plants are likely to be monopolists or oligopolists on the specific (local) markets; they have "old" economic ties and can be already known abroad. These factors might positively affect firm's chances to become an exporter. However, large size and predominantly bureaucratic structure might hinder innovation and development of new competitive products on those plants. These two effects acting together diminish the influence of the firm's size on its probability to change firm's current status and enter the foreign market.

Another variable of interest is the "special economic zones" dummy. Its estimated coefficient is both statistically significant and economically meaningful. It appears that the companies situated in SEZ's and enjoying

the benefits provided by the legislature are indeed more likely to start exporting. Moreover, once started they continue to export in the subsequent periods (ensured by the construction of the dependent variable).

The estimated coefficients on the regional dummies (with "center" dummy excluded to avoid collinearity) suggest that locations near the boarder are favorable for the firms to start exporting. This finding conforms to the gravity theory and stays well in line with a common sense, since the transportation costs are smaller and neighboring market is better investigated for the bordering regions, rather than for the central ones.

Modeling export intensity decisions

Yet another way to study exporting activities is to investigate what characteristics of the firms (industries) affect their decisions as for the volumes of exports. The dependent variable in this case is constructed as ratio of exports to the total volume of sales (local sales + exports). By construction, the dependent variable is limited to [0, 1]. Moreover, since there is a significant number of the firms (industries) that do not export during all years in the sample, there would be a considerable number of zero's (figures B-1 and B-2 of the Appendix B). Furthermore, to get a non-zero value for the dependent variable ($0<$export intensity ≤ 1), a firm should *pre-select* itself to enter the foreign market and start exporting.

Deciding on the appropriate econometric technique to be employed for this kind of analysis, one should admit that the factors that stipulate *pre-selection* of the firms into exporters might be different from those that affect the share of exports in total sales. In this case, a *self-selection* (or *sample selection)* model can be used for estimation. However, for this model to hold, the

error term in the export decision function is to be correlated with the error term in the export quantity function.

A Heckman two-stage model with sample selection will be used assuming the following relationship:

$$\begin{aligned} &\textit{Export intensity} = a + \beta \cdot X + \varepsilon, && \varepsilon \sim N(0, \sigma) \\ &\textit{Export status} = \gamma + \delta \cdot Z + u, && u \sim N(0, 1) \\ &corr(\varepsilon, u) = \rho \end{aligned} \tag{26}$$

where *export intensity* can be observed and takes non-zero values only if *export status =1*.

For estimating this model, the following specification will be considered:

quantity function:

Export intensity = f (PRODUCTIVITY, PRODUCTIVITY_deviation, LABOR, LABOR_deviation, SEZ)

decision function:

Export status = f (AVERAGEWAGE_deviaion, PRODUCTIVITY_deviation, LABOR_deviation, SEZ, INDUSTRY DUMMIES) (27)

The choice of the variables is motivated as follows: to become an exporter in the first place, a firm should have better characteristics than the average firm in the specific industry (deviation variables), should enjoy better economic climate (SEZ), and produce goods that are likely to be demanded on the foreign markets (industry dummies). On the other hand, to increase the volume of exports, a firms should try to increase its productivity and possibly its size (to overcome sunk costs more easily), as well as receive some external support (here, in the form of favorable legislation).

Following these considerations, Heckman selection model was estimated (Appendix C).

First of all, to check for the presence of sample selection effects, the correlation coefficient (measuring the degree and direction of correlation between the error terms in the regression and selection equations) is to be calculated. This statistic can be found in Stata output as the inverse hyperbolic tangent of ρ:

Test statistic	Firms' sub-sample		Industries' sub-sample	
/athrho	0.21401	(0.002)	0.25427	(0.000)
rho	0.21080		0.24893	

(p-values in parentheses)

/athrho is calculated as $\text{atanh}\,\rho = \frac{1}{2}\ln\left(\frac{1+\rho}{1-\rho}\right)$ in order to constrain the statistic within the limits,

and recalcutated as "rho", i.e. $\rho = corr(\varepsilon, u)$

Statistically significant ρ-statistic justifies Heckman selection equation with these data, and its positive value suggests that the unobserved factors that positively affect pre-selection of the firm into the foreign market, also positively affect export intensity of those firms.

The marginal effects for the estimated coefficients in the selection equation (Table 9) have expected signs, implying that bigger and more productive firms that on average pay higher wages are more likely to enter the foreign market. What is more, these results resemble those obtained using the "benchmark" specification, and they also show the firms in what industries are more likely to export.

Furthermore, recalculated marginal effects for the coefficients in the regression equation (to account for level and deviation variables) show that both higher productivity and bigger size of the firms are likely to increase the share of exports in total sales (as measured by export intensity).

Table 9. Marginal effects for Heckman selection model

EXPORT INTENSITY (regression equation)	Firms		Industries	
productivity	0.00008	(0.000)	0.00009	(0.000)
labor	0.00001	(0.000)	0.00001	(0.000)
sez	0.06745	(0.000)	0.06465	(0.000)
EXPORT STATUS (selection equation)				
aw_deviation	0.00838	(0.000)	0.01708	(0.000)
productivity_devation	0.00019	(0.000)	0.00024	(0.000)
labor_deviation	0.00003	(0.000)	0.00002	(0.000)
energy and fuel	-0.02421	(0.000)	-0.03644	(0.000)
metallurgy	0.07516	(0.000)	0.09345	(0.000)
chemicals	0.06404	(0.000)	0.04582	(0.000)
machine-building	0.04344	(0.000)	0.02936	(0.000)
pulp and paper	0.02236	(0.000)	0.03133	(0.000)
construction materials	0.00607	(0.001)	0.00175	(0.329)
light (textile)	0.02756	(0.000)	0.02337	(0.000)
food	0.00950	(0.000)	0.03677	(0.000)
sez	0.06745	(0.000)	0.06465	(0.000)

(p-values in parentheses)

In general, the estimated sample selection model does show the presence of pre-selection among Ukrainian producers into the foreign market based on their characteristics. Moreover, this model specification also supports the effectiveness of special economic zones in terms of promoting export activities of the firms.

Chapter 5

CONCLUSIONS

The study of export performance at the micro level enables one to investigate firm-specific characteristics, along with incorporating incentive-related measures that are introduced on a broader (regional, industry-wide) scale. The current research is performed on a sample of Ukrainian manufacturing firms, covering virtually all the manufacturing sector. The findings of this research broadly confirm the results of previous work in this area in terms of the productivity-related measures. Namely, the empirical evidence shows that exporting firms are indeed "superior" in generally accepted economic terms, relative to other firms in their industry, i.e. they are more productive, pay higher wages and are also larger. Furthermore, it is shown that high sunk costs of entering or re-entering foreign market (those associated with establishing a distributional network or advertising expenditures) are likely to prohibit firms from becoming exporters. The results of the constructed benchmark model of firms' export decisions prove to be robust to alternative model specifications.

Developing this issue of firms' exporting behavior further, it is shown that the firms with more "superior" characteristics than the average firm in the specific industry, those that enjoy a favorable economic climate and produce the goods that are more likely to be demanded on the foreign market, are also more likely to self-select themselves into the foreign market and to begin exporting. Once getting involved in export activities, the firms with higher productivity and those that are larger in size (enabling them to overcome sunk costs more easily) will tend to export a relatively bigger share of their output.

Moreover, this research also studies the effect of such additional external factors as government policies in the form of the established "special

economic zones". Originally, SEZ were created to attract foreign investment, promote foreign trade and maintain favorable market infrastructure in different (mostly industrial) regions of Ukraine. The empirical evidence we discover in the current research supports the positive effect of SEZ on the export activities of the firms that enjoy their benefits. More importantly, the firms located in the SEZ territories and those granted such privileges are more likely to enter the foreign market due to favorable legislation. This point, well supported by the data on the manufacturing sector, should add to the current debate on the issue of the continuing further development of the special economic zones on the territory of Ukraine. However, this one-sided effect that the SEZ have on the performance of the firms through their export activities cannot be used as the only argument for maintaining SEZ in the future. As they are intended to promote structural changes in the Ukrainian economy via the attraction of foreign investment, the support of scientific and technological progress, the creation of a modern market infrastructure, and the improved utilization of natural resources, in order to justify their existence, SEZ's should prove to be effective in these directions as well. In this regard a comprehensive study of the SEZ activities still needs to be undertaken. However, in the light of the current findings, some promotion and support of the export activities that is possible via SEZ regulations seem to be a reasonable and effective measure of stimulating the performance of the manufacturing sector.

Still, in order to reach reasonable conclusions on the overall efficiency of SEZs, the costs of administrative effort needed to enforce appropriate preferential measures, on the one hand, and to prevent possible abuse of provided privileges and concessions, on the other, have to be weighed against the gains in improved firms' performance.

It seems reasonable to assert that if the most productive firms are given preferential treatment, they are likely to expand even more, and thereby promote overall growth in the economy as resources are reallocated from less productive to more productive activities. Furthermore, the continuous improvement of productivity (via learning-by-exporting effects) stipulates improvements in the country's standard of living and increases in national welfare. To be more precise in this case, further research can be performed focusing on the learning-by-exporting effects and relating them to some measure of the country's welfare.

Additionally, one should account for possible negative spillovers of the excessive support of exporting activities of the local producers, since this can possibly lead to decreases in the price of a product on the specific (foreign) market while increasing the price of the exported good in the local market. From a national welfare perspective this situation might result in more harm than good.

In the light of the above considerations, current research on the foreign trade activities, conducted at a micro level should give rise to subsequent work that will expand the time frame of the sample in order to capture recent tendencies in Ukrainian foreign trade policy and study its economic effect in terms of the country's national welfare.

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Appendix A

Table A-1. Descriptive statistics for firm-level data: means

Year / Variable	1996	1997	1998	1999
PRODUCTION	6499.672	5898.233	2357.722	1967.765
	(438.036)	(422.840)	(253.329)	(223.080)
CAPITAL	23651.120	21261.180	12928.620	8538.144
	(1220.367)	(1135.916)	(742.692)	(504.812)
WAGE	816.117	734.583	437.064	321.293
	(31.598)	(29.849)	(19.884)	(15.674)
LABOR	437.986	401.001	344.072	317.502
	(11.775)	(11.167)	(10.603)	(10.453)
SALES	7207.240	7369.138	4745.233	2727.008
	(469.409)	(524.657)	(359.891)	(242.234)
EXPORT	740.067	1390.479	1082.652	1044.515
	(100.393)	(203.161)	(169.813)	(168.710)
IMPORT	440.975	767.081	473.533	391.115
	(59.564)	(87.554)	(45.803)	(42.355)
AVERAGE WAGE	1.641	1.401	0.708	0.538
	(0.160)	(0.013)	(0.008)	(0.007)
PRODUCTIVITY	11.066	10.197	3.283	2.516
	(0.289)	(0.254)	(0.189)	(0.133)
CAPSHARE	23.211	27.268	27.203	66.231
	(4.156)	(4.065)	(3.784)	(30.675)
EXINTENSITY	0.053	0.227	0.128	0.135
	(0.005)	(0.081)	(0.010)	(0.019)

Standard errors in parentheses

Table A-2. Descriptive statistics for industry-level data: means

Year / Variable	**1998**	**1999**	**2000**	**2001**
PRODUCTION	17558.320	24209.850	25852.080	27858.210
	(2058.205)	(2946.410)	(3223.068)	(3247.270)
SALES	21351.650	17047.880	29696.850	30838.940
	(2346.133)	(2097.354)	(3443.451)	(3414.763)
LABOR	1242.031	1121.864	1253.193	1146.663
	(98.787)	(94.894)	(105.734)	(101.074)
WAGE	1841.617	1813.287	2155.380	2612.777
	(240.574)	(221.081)	(262.884)	(315.335)
EXPORT	4417.360	5778.753	8275.139	8954.256
	(996.479)	(1310.882)	(1986.749)	(1848.543)
IMPORT	2230.738	2431.629	3441.591	3762.527
	(265.159)	(274.835)	(421.824)	(435.847)
AVERAGE WAGE	1.142	1.238	1.248	1.674
	(0.019)	(0.022)	(0.024)	(0.029)
PRODUCTIVITY	10.181	14.553	14.369	18.221
	(0.421)	(0.734)	(0.627)	(0.770)
EXINTENSITY	0.097	0.110	0.087	0.105
	(0.004)	(0.004)	(0.003)	(0.003)

Standard errors in parentheses

Appendix B

Figure B-1. Distribution of firms according to their export intensity

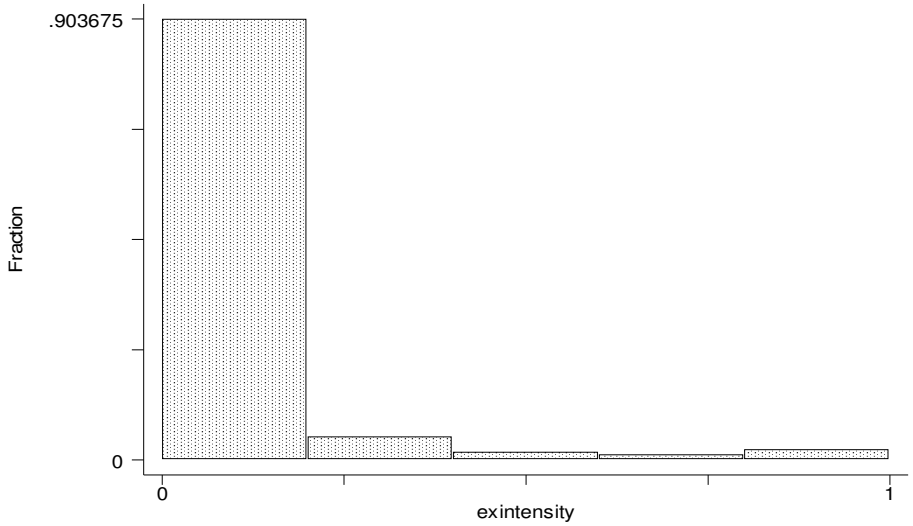
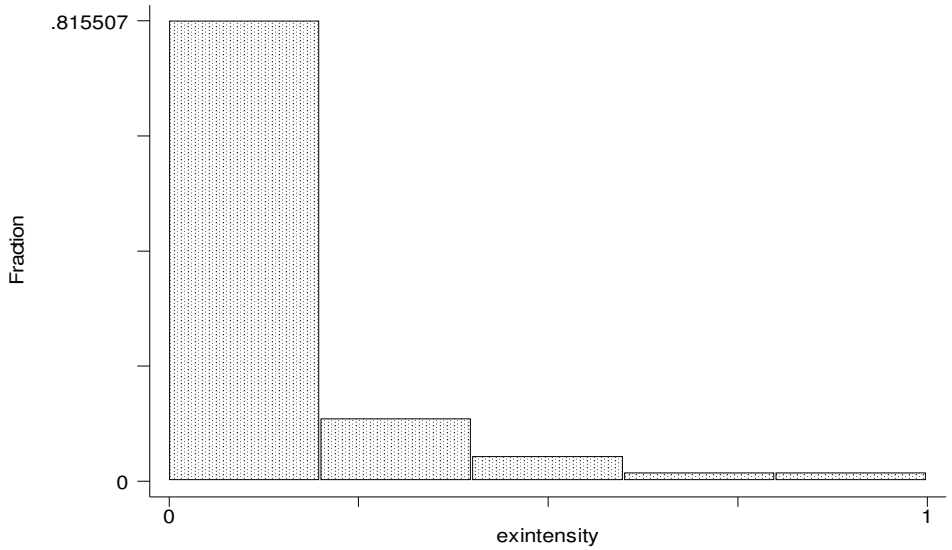


Figure B-2. Distribution of industries according to their export intensity



Appendix C

Table C-1. Estimated coefficients for Heckman selection model

EXPORT INTENSITY (regression equation)	Firms		Industries	
productivity	-0.01080	(0.000)	-0.00297	(0.000)
productivity_deviation	0.01111	(0.000)	0.00312	(0.000)
labor	0.00007	(0.000)	0.00006	(0.000)
labor_deviation	-0.00006	(0.000)	-0.00004	(0.000)
sez	0.19068	(0.000)	0.07110	(0.000)
_cons	0.17590	(0.000)	0.20250	(0.000)
EXPORT STATUS (selection equation)				
aw_deviation	0.16695	(0.000)	0.20081	(0.000)
productivity_deviation	0.00374	(0.000)	0.00282	(0.000)
labor_deviation	0.00065	(0.000)	0.00026	(0.000)
energy and fuel	-0.54019	(0.000)	-0.44829	(0.000)
metallurgy	2.51770	(0.000)	1.34122	(0.000)
chemicals	1.48154	(0.000)	0.55176	(0.000)
machine-building	0.86115	(0.000)	0.34607	(0.000)
pulp and paper	0.43325	(0.000)	0.37112	(0.000)
construction materials	0.11938	(0.001)	0.02060	(0.329)
light (textile)	0.53509	(0.000)	0.27507	(0.000)
food	0.18746	(0.000)	0.43595	(0.000)
sez	0.14853	(0.019)	0.22893	(0.000)
_cons	-1.06689	(0.000)	-0.21388	(0.000)
/athrho	0.21401	(0.002)	0.25427	(0.000)
/lnsigma	-1.42509	(0.000)	-1.63743	(0.000)
rho	0.21080		0.24893	
sigma	0.24049		0.19448	
lambda	0.05070		0.04841	