IIB INTERNATIONAL REFEREED ACADEMIC SOCIAL SCIENCES JOURNAL
Nisan-Mayıs-Haziran 2014 Sayı: 14 Cilt: 5 İlkbahar Dönemi
April-May-June 2014 Issue: 14 Volume: 5 Spring Semester
Jel: A1-A2
www.iibdergisi.com
ID:372 - K:370

SUNK COSTS, INDUSTRY HETEROGENEITY, EXPECTED PROFITABILITY AND DECISION TO EXPORT: EVIDENCE FROM TURKISH MANUFACTURING

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Abstract: This paper tests both the role of sunk costs which are sources of barrier to entry and future expected profitability on exporting using a panel data set of Turkish manufacturing industries for the period 2003-2008, allowing for sunk costs to be different for small and large industries. To obtain consistent estimates for sunk costs, all other sources of persistence are controlled for through dynamic multivariate probit model. Results show that sunk costs matter for decision to export and small industries face significantly higher sunk costs than large industries. It is also found evidence that capital accumulation and increasing labor quality lead industries to tend to less export, while productivity and industry size have positive impacts on exporting.

Key Words: Sunk Costs, Industry Heterogeneity, Turkish Manufacturing, Dynamic Discrete Choice Models

INTRODUCTION

Advance theoretical and empirical developments in game-theoretical literature on market structure in recent decades (i.e. Dixit & Stiglitz, 1977; Shubik & Levitan, 1980; Spence, 1981; Shaked & Sutton, 1987, 1990; Fisher, 1989; Sutton, 1991, 1998; Pelzman, 1991) have shed a light on well understanding of firms/industries' performance, conduct and behavior in an environment where crucial strategic decisions on investment, research and development (R&D), product differentiation, price discrimination, quality of labor force, managerial abilities and so on are critically important. The common points of much of these studies formulate the framework of games within multi-stages. Therefore over a series of stages, firms make choices that involve the expenditure of fixed and sunk costs, whether by entering a market by structuring a plant, by introducing new products or building additional plant capacity, or by carrying out advertising or R&D. In the final stage of the game, all the results of such prior actions shape the payoff function of final stage, determine the final configuration of plants and/or products that emerges and drive the market to be more or less concentrated or the competition inside or abroad to be tougher or low-intensive.

Export performance reflects success or failure of all the efforts of a firm, industry or nation to sell domestically produced goods and services on international market and undoubtedly decision to export is associated with facing some costs that may be sunk in nature. For instance, while non-exporting firms do research for capturing foreign demand, tastes and competition, establishing effective marketing and distribution channels in

order to meet foreign tastes in terms of price, product quality, whereas exporting firms experience that existence of sunk costs substantially affects their conduct, performance, competition and product quality since the high level of sunk costs creates barrier to entry into international market and forces firms to scrutinize their decision to export and how much to export in addition to i.e. past export trajectories, trade policy, legal and practical conditions.

Basically, the theoretical literature on sunk costs and exporting was developed by Dixit (1989a, 1989b), Baldwin (1988, 1989), Baldwin & Krugman (1989) and Krugman (1989). They begin from the assumption that non-exporters must incur a sunk entry cost in order to enter foreign markets. This makes the current-period export supply function dependent upon the number and type of producers that were exporting in previous periods. Further, it means that transitory policy changes or macro shocks can lead to permanent changes in market structure, and thus that trade flows may not be reversed when a stimulus is removed. That is, sunk entry or exit costs produce hysteresis in trade flows (Roberts & Tybout, 1997). Finally, when future market conditions are uncertain, sunk costs make patterns of entry and exit dependent upon the stochastic processes that govern variables such as the exchange rate. Therefore, under sunk cost hysteresis, a firm will find it advantageous to enter a foreign market once there is, for instance, a temporary exchange rate shock that leads to an appreciation of the foreign currency, which results in profits greater than zero. After the shock reverses itself the firms' profits will start dropping, but as long as profits are non-negative the firm finds it cheaper to stay in the market because of the already incurred sunk cost. If the firm were to exit and re-enter in good times, it would have to re-incur the sunk entry cost (Sinani & Hobdari, 2010).

Even though, it seems that everlasting persistence in exporting status might be caused by some threshold level of sunk costs, some underlying observed and unobserved firm heterogeneity or serial correlation in endogenous or exogenous shocks to exporting profits might also be other leading factors. Therefore in an econometric analysis, econometrician needs to control for all competing sources of persistence. In this context, Robert & Tybout (1997)[1] claim that under plausible conditions, greater uncertainty makes trade flows less responsive to changes in market conditions. Consequently, none of these implications of sunk costs is captured in standard empirical export supply functions, and all could contribute to the instability of empirical relationships. They, *inter alia*, criticize that since most studies treat asymmetries in the response of trade flows to exchange rate appreciation versus depreciation, analysis based on this framework will be misleading because of some external driven factors which are not directly related to sunk costs such as changes in expectations, tastes, adjustment costs and pricing to market behavior. To test for sunk cost hysteresis, they directly analyze entry and exit pattern in plant-level panel data, and then develop and estimate a dynamic discrete-choice model that expresses each plant's current exporting status as a function of its previous exporting experience, observable characteristics that affect its future

1 Their study is the first paper which attempts to test the sunk cost hysteresis hypothesis in exporting for the case of Colombian manufacturing.

profits from exporting, and unobserved serially correlated shocks. The importance of sunk cost on export persistence is captured by the conditional effect of a plant's exporting history on its current exporting status. According to the results, it is thought that sunk costs might cause persistence in exporting, as the hysteresis models suggest. It is also pointed out that persistence might be caused by underlying plant heterogeneity for which differences in gross profit from exporting across plants can be a source of why some exporters enter or some exit the market, a situation for incumbents becoming persistent in exports.

More recent empirical evidence on decision to exports are, for example, Bernard and Jensen (1995, 1999a, 1999b, 2004), Wagner (2002), Eaton, Kortum & Kramarz (2004), Greenaway & Kneller (2004, 2007, 2008), Farinas & Martin-Marcos (2007), Lawless (2009), Schmeiser (2011), Bastos & Silva (2012), Yang & Chen (2012), Yi & Wang (2012), Yi (2014). In these studies, it is showed that exporters are more productive, larger, more capital intensive, and pay higher wages in different countries and different time periods. It is also argued that decision to enter the export market and future profitability are determined by a range of factors, i.e. heterogeneity across firms, differences in productivity, sunk costs, technological, spatial or geographic spillovers, exchange rates, government policies, legal conditions in countries under consideration[2].

2 The majority of studies have investigated the export decision of firms from developed countries, while few have examined the developing or emerging markets' experience (e.g. Roberts & Tybout, 1997; Clerides, Lach, & Tybout, 1998; Yang & Chen, 2012).

In the one of the first attempts, investigating the role of plant characteristics and sunk costs in the entry decision, Bernard &Wagner (1998) present a dynamic model of the export decision by a profit-maximizing firm using a panel of German manufacturing plants over the period of 1978-1992. They find evidence for substantial sunk costs in export entry meaning that exporting today by a plant increases the probability that the plant will export tomorrow by 50%, but then falling by two thirds in a year. They also find evidence that plant success, as measured by size and productivity, increases the likelihood of exporting. In addition, plants intensive in skilled workers are more likely to export. They finally conclude that while exporters have desirable performance characteristics when compared to non-exporters in almost every industry and country, the growing consensus, confirmed in their results, is that essentially success leads to exporting rather than exporting leading to success.

Bernard & Jensen (2004), using a panel of U.S. manufacturing plants for the period of 1984-1992 and yielding 94902 observations, test for the role of plant characteristics, spillovers from neighboring exports, entry costs and government export promotion expenditures, presenting a dynamic model of the export decision by a profit maximizing firm. They show that entry and exit in the export market by U.S. plants is substantial, past exporters are apt to reenter, and plants are likely to export in consecutive years. However, they find evidence that entry costs are significant and spillovers from the export activity of other plants negligible, and state export promotion expenditures have no significant effect on the probability of exporting. They conclude that plant characteris-

tics, especially those indicative of past success, strongly increase the probability of exporting as do favorable exchange rate shocks. But in their study, the question of how firms obtain the characteristics that allow them to easily enter the export market is remained unanswered. Further they deliver a warning so that their results on spillovers and subsidies might result from their sample selection criteria which limits the analysis to large plants.

Campa (2004), on the other hand, investigates the responsiveness of a country's export supply to exchange rate changes and measures its quantitative importance by breaking down export adjustment between changes in output levels by existing exporters (intensive margin) and movements due to changes in the number of exporters (extensive margin). Using data on a representative sample of Spanish manufacturing firms over the years 1990-1997, the paper finds that sunk costs hysteresis in entry and exit to be an important factor in determining export market participation, but unrelated to exchange rate uncertainty. The sunk costs of entering the market appear to be much larger than the costs of exiting the market. A 10% home currency depreciation results in an increase in export volume due to the increases in the number of exporting firms of only 1.4% of export volume.

Blanchard, Huiban & Mathieu (2011) estimate the unobserved individual productivity of firms using a semi-parametric approach. Productivity is estimated from the Olley-Pakes estimation method and then introduced in a model of firm exit. They also introduce the firm's level of sunk costs as an expected barrier to exit. By using an unbalanced panel of 4818 firms in French food industries from 1999 to 2002, they find that a significantly negative relationship between the probability of exit of the firm and its individual efficiency in an industry increases the propensity to exit for firms in that industry. As for the role of sunk costs, it is pointed out that sunk costs appear to play a significant and negative role: the higher the level of sunk costs, the lower the exit rate.

In his well-prepared study, Yi (2014) develops a dynamic discrete-choice model to analyze the exporting decisions of Chinese firms in Zhejiang province, the fourth largest economy and exporter in China, using the data for the years 2001-2003. According to the results, sunk costs are found to be significant and prior export experience, productivity, scale, FDI, export spillovers, coastal area and economic zones are all positively related with the propensity of exporting while state ownership concentration has a negative impact. In conclusion, the export behavior of firms varies with country-specific characteristics.

What one can find evidences from the previous and recent empirical works are briefly as follows: (i) there are efficiency differences between exporting and nonexporting plants or industries, (ii) heterogeneity across firms substantially matters for export decision, (iii) exporting firms enjoy high levels of profitability, and finally (iv) sunk cost creates a barrier to entry (low or high) for export markets.

The 1980s saw important developments that might be described as a turning point for both the Turkish economy. The decisions of 24 January 1980 sparked a structural transformation in the Turkish economy. Price controls were abandoned so that

prices would be formed within the framework of market mechanisms, and a policy of free trade was adopted. With the launch of the financial liberalization process, important steps were taken to ensure the necessary infrastructure for implementation of monetary and exchange rate policies in compliance with the market economy. In the same period, it was decided that interest rates on deposits and loans would be determined by market conditions. Furthermore, the fixed exchange rate regime was abandoned and the Turkish currency devalued against foreign currencies. In 1983, the Central Bank was empowered to manage gold and foreign exchange reserves effectively. In addition, it was incorporated into the law that the bank would carry out its fundamental duties in compliance with the basic requirements of the economy and with the objective of achieving price stability.

Turkey pursued export promotion policies in the 1980s along with efforts to liberalize imports. As part of the export promotion policies the government implemented direct export subsidy, tax rebates and export credit schemes, simplified export procedures and maintained a competitive real exchange rate throughout the 1980s. In the 1980s total export subsidies were quite high, reaching as high as 33.8% in 1989. The reliance on the export incentive schemes have been reduced over time in order to comply with the provisions of the GATT agreement in 1988, the WTO agreement of 1994 and the customs union agreement with the EU in 1996. Despite this downward trend in subsidies in the second half of 1980s, total subsidies through direct payments, export credits, duty and tax allowances had never fallen below 20% until 1994. While some of the major incentive schemes have been marginalized over time from 1996 to 2001, the subsidized export credits remained as the most significant scheme in implementation. Another important dimension of the export promotion policies was the competitive real exchange rate policy. Vigorously pursued in the first half of 1980s, the competitive exchange rate policy was gradually subdued due to the government's efforts to keep the inflation under control while facing a souring government budget deficit (Özler, Taymaz & Yılmaz, 2007: 4-5).

The booming in Turkish economy came into being after a political change in 2002. This was largely thanks to the availability of abundant international capital ready to flow into emerging markets and therefore Turkey led to the real appreciation of the Turkish Lira since 2002. As domestic market resumed growth exports continued to grow in 2002, 2003 and 2004 (15%, 31% and 34%, respectively). But this ever-growing rates remained below the levels that achieved in the previous years (approximately around 16%). The remarkable export performance is in part due to the newly acquired international competitiveness of the Turkish manufacturing industries that was forced by the increased competition after Turkey joined the Custom Union.

Table 1. Turkey's Trade Pattern, 1970-2013.

	1970-79	1980-1995	1996-2001	2002-2007	2008-2013
Trade Balance (billion$)	-2.0	-6.0	-18.8	-38.7	-78.3
Exports /Imports (%)	47.3	64.0	59.7	65.0	62.6
Imports / GDP (%)	6.8	15.8	20.8	24.4	29.3
Exports / GDP (%)	3.0	10.2	12.3	15.8	18.3
(X-M)/GDP (%)	-3.8	-5.6	-8.5	-8.6	-10.9
(X+M)/GDP (%)	*9.7*	26.0	33.0	40.1	47.6
Imports: Ann. Avg. Change (%)	22.6	14.8	4.4	26.8	9.1
Exports: Ann. Avg. Change (%)	17.1	16.2	6.5	23.0	7.2

Source: ***İzmen and Yılmaz (2009) and author's calculations.***

Table 1 depicts trade profile of Turkey since 1970. Before 1980, the economy was characterized by heavy protection which can be seen from figures belong to the 1970-79 period. The ratio of exports to GDP more than tripled while the ratio of imports to GDP increased more than twice in the 1980-2013 period. The integration process gained momentum after the Customs Union decision with the EU in 1996 and once again after the 2001 crisis which is followed by macroeconomic stability and sustained growth in the 2002-2007 period. As a ratio of GDP, imports and exports rose to 24% ─16% in 2002-2007 period, and 29% ─18% in 2008-2013 period, respectively, and the ratio of trade volume has reached to 40% from less than 10% before 1980 (Table 1). The average annual rate of change in imports has been slightly higher than in exports, 26.8%, and 9.1%, respectively in 2002-2007 period and 2008-2013 period**.**

On the imports front, after the implementation of the Customs Union in 1996, the penetration of imports from the EU increased from 17% to 22%. China's accession to the WTO in September 2001 led to an even more dramatic change in the structure of Turkey's imports. Total imports (over a 12-month period) surpassed USD 207 billion in November 2008. The share of imports from East Asia, and especially from China, increased dramatically to 7.8% in the post-2001 period, at the expense of the EU. Besides the Customs Union and China's accession to the WTO, the real appreciation of the Lira since the end of 2001 has been the third critical factor behind the rapid increase in Turkish imports over the last decade. Monthly CPI based exchange rate index published by the CBRT, shows that Turkish Lira appreciated by 66% in real terms from the end of 2001 to August 2008, when it reached its climax. The rapid increase in imports was not the only major development in

Turkey's trade relations with the rest of the world. Despite the appreciation of the Lira, Turkish exports quadrupled since 2000, reaching USD 134 billion (over a 12-month period) in November 2008 (İzmen *et al.*, 2009).

As for the 2008-2013 period import value has increased to USD 1257 billion at the end of 2013 with a 9.1% annual increase rate. On the other hand export volume has increased from USD 132 billion to 151.8 billion, with a 7.2 annual growth rate.

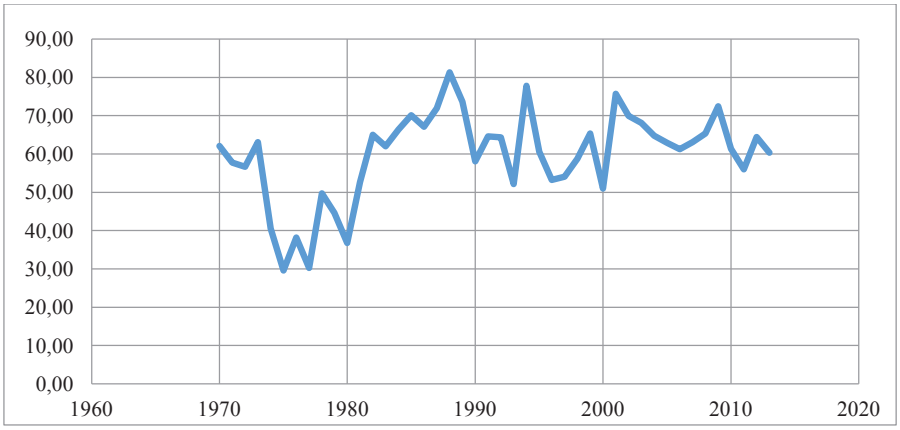


Figure 1. Export / Import Ratio (1970-2013)

According to Figure 1, one can see that the import coverage ratio of exports is highly volatile during the period. After reaching 75.7% in 2001, the export/import ratio steadily declined since then to 61.3% by 2006 before increasing slightly to 63.1%. Compared to the unstable period of 1996-2001, the average export/import ratio during the 2002-07 period has increased slightly to 66.5%. Howsoever the export and import have substantially been increased over the last decade, but the import coverage ratio of exports has been remained high by an average rate of 60% over the last three decades, leading to a chronic trade deficit ever-lasting (99.7 billion dollars in 2013).

To test the effect of sunk cost on entry decision to export markets, few empirical analysis have been done. Notable among them, for example, Özler *et al.* (2007) investigate the factors influencing the export decision of the Turkish manufacturing plants over the 1990-2001 period using plant level data. Their results support the presence of high sunk costs of entry to export markets, as well as the hypothesis that the full history of export participation matters for the current export decision. Aldan & Günay (2008) use firm-level data applying matching and difference-in-difference techniques. They find that; first, larger and more productive firms self-select into export market, second, starting to export further increases labor productivity and employment. The first attempt to separating sunk cost industries into two categories, as endogenous and exogenous sunk cost industries, and to analyze the effect of sunk costs on market structure and competitiveness is made by Arvas & Mıhçı (2014) using industry level data for Turkish manufacturing over the 1992-

2001 period. Applying stochastic frontier method, they find that if an industry is import-intensive it is more competitive in foreign markets than export-intensive industries and the level of sunk costs create barrier to entry on domestic and international markets.

This paper is designed to address to lack understanding and advancing prior works on export studies at industry level analysis for the 2003-2008 period. In this study, it is aimed to assess the importance of sunk costs examining the decision of industry export participation and to test whether sunk costs differ between large and small industries using panel data for Turkish manufacturing. In addition, whereas Roberts & Tybout (1997), Bernard & Wagner (1998), Bernard & Jensen (2004), Campa (2004) and Özler *et al.* (2007) impose a structure on the serial correlation of transitory shocks, following Manez, Barrachina & Sanchis (2008) and Yi (2014), it is allowed for a free serial correlation. Another novelty in this study is that while previous studies cover pre-2002 period, this study focuses on a more stable and recent period in Turkish economy.

The rest of paper is organized as follows: Section 2 describes modelling, estimation issues. Section 3 presents the sample data, variable definition and summarize the characteristics of exporter. Estimation results are summarized in section 4, and finally section 5 concludes the paper.

AN EMPIRICAL MODEL OF EXPORT MARKET PARTICIPATION

The Estimating Model

Following Robert & Tybout (1997), export market participation by a profit maximizing firm is summarized by the dynamic discrete-choice equation as:

$$Y_{it} = \begin{cases} Y_{it} = 1 \quad if \quad \pi_{it}^{*} - F_{it}^{0}.(1 - Y_{it-1}) \geq 0 \\ Y_{it} = 0 \quad if \quad \pi_{it}^{*} - F_{it}^{0}.(1 - Y_{it-1}) < 0 \end{cases} \qquad (1)$$

where Y_{it} is the exporting status, i.e. $Y_{it} = 1$ if the firm *i* exports in period *t* while $Y_{it} = 0$ when exporting is not profitable, π_{it}^{*} is the latent variable representing the increment to expected gross future profits for firm *i* if it exports in period *t*, and F_{it}^{0} is the firm's entry cost. For simplicity, following Yi (2014), its entry involves one-time entry costs once it decides to enter the export market, and these costs are assumed to recur in full it exists the export market for any amount of time, i.e. the firm does not pay the entry cost if it exported in the previous period, $Y_{it-1} = 1$.

In order to estimate equation (1), this paper uses a reduced-form equation proposed by Roberts & Tybout (1997) to approximate π_{it}^{*} as a linear function of exogenous firm-specific characteristics X_{it} (i.e. productivity, size, and wage) and market characteristic Z_{it} (i.e. spillovers, location and industry-group dummies) that are observable to producers in period *t*. However the model, alternatively, could be estimated developing a structural representation of the participation condition. In principle, this approach allows identification of the parameters of the profit function and provides a complete description of the dynamic process. Its main disadvantage is that very restrictive parameterizations are required to make structural estimation feasible. Consequently, this problem is particularly acute in this model because the dependence of sunk entry costs upon the length

of time out of the export market implies a participation series that is *J*th-order Markov process, conditioned on exogenous variables.

To isolate the importance of sunk costs, it is critical that we control for all other sources of persistence (Robers & Tybout, 1997). Much of this task is accomplished by including the vector of observable firm and market specific characteristics. However, it is very likely that some characteristics, such as managerial abilities, perception of output quality, will remain unobserved and their presence will induce serial correlation in the error term, ε_{it} . If we use an estimator that ignores this serial correlation, the model will incorrectly attribute the persistence it induces in exporting status to sunk costs. Thus, variation in π_{it}^{*} might arise not only from sources of observable firm characteristics X_{it} and market characteristics Z_{it} , but also from the sources of unobservable firm characteristics α_i [3] and exogenous random disturbances η_i [4]. Therefore, the term $\pi_{it}^{*} - F_{it}^{0}.(1 - Y_{it-1})$ in equation (1) is expressed

as;

$$Y_{it} = \begin{cases} \pi_{it}^{*} - F_{it}^{0}.(1 - Y_{it-1}) = \beta X_{it} + \gamma Z_{it} \\ \qquad + \theta Y_{it-1} + \varphi Y_{it-1}^{\tau} + \varepsilon_{it} \\ \varepsilon_{it} = \alpha_i + \eta_{it} \end{cases} \qquad (2)$$

where ε_{it} is the error term and assumed to be sum of two components; unobserved α_i which independently and identically distributed normal across firms, and η_i that independently and identically distributed normal across firms and time. Y_{it-1}^{τ} is included in the equation so as to isolate export decision between large and small industries. τ is an indicator variable taking value 1 for large firms and 0 for small ones.

Substituting equation (2) into equation (1), the basic estimating equation of export participation is obtained as:

$$Y_{it} = \begin{cases} \text{üüüü

sunk costs. Therefore, the study uses a model that allows for serial correlation in the error term and assumes that it is a sum a permanent, firm specific component α_i that remains unobserved to control for this effect and a transitory exogenous disturbance component, η_i. Following the approach in Li (2014), the estimation strategies for the dynamic binary discrete-choice model with unobserved heterogeneity may include linear probability models with fixed or random effects, probit models with fixed or random effects, and conditional logit models. Therefore Roberts & Tybout (1997), Bernard & Jensen (2004) and Li (2014) propose to use fixed or random effects probit models since the unobserved heterogeneity of a firm (industry) could be better modeled by the both methods. However, Bernard & Jensen (2004) show that fixed effects models may produce biased and inconsistent parameter estimates, especially for the coefficient on the lagged dependent variable. On the other hand, random effects models require that the unobserved firm (industry) effects be uncorrelated with the regressors in the model. In conclusion, this study chooses to work with random effects specification ($Cov(Z_{it}, \varepsilon_{it}) = 0$) employed by Roberts & Tybout (1997) and Li (2014). Another motivation for choosing the probit model with random effects lies under the fact that linear probability models are problematic as they fail to properly capture the curvature of the regression function in the proximity of 0 and 1.

There remains an additional problem which is called as "initial conditions" problem[5]. In order to choose the lag length of export status as a proxy for sunk cost, following Li (2014), one lag of dependent variable is incorporate. On this issue, Roberts & Tybout (1997) and Manez *et al*. (2008) incorporate three lags of dependent variable, while Bernard & Jensen (2004) include two lags of dependent variable.

This model is a dynamic probit random effect model and is estimated using the *mvprobit* Stata program developed by Cappellari & Jenkins (2003)[6]. This program uses simulated maximum likelihood techniques (SML) to solve the computational problem of evaluation T-dimensional integrals.

THE SAMPLE DATA AND DEFINITION OF VARIABLES

The analysis in this paper is based on four-digit data collected by Turkey's State Institute of Statistics from the Annual Surveys of Manufacturing Industries, and classified based on the NACE Rev. 1.1 over the 2003-2008 period. Since the data covers i.e. number of establishments, capital, output, value added, employment structure, investments items, expenditure on labor and materials, value of exports and imports, we are not able to work with variables such as age, ownership structure, geographic location all of which suit well to plant level studies. The data in this study partially well suited to analyzing export-market participation model. In conclusion, the observations for 2003 are treated as the *J=1* presample year[7] and are

5 A problem according to which that it needs to be correctly specified that at what lag length of dependent variable should be. As known, export decision or profitability of an industry is partially correlated with its past performance.

6 To use this program, inside STATA, type "ssc install mvprobit".

7 Limited time-series only allow for inclusion of one lag of dependent variable in the estimation while more lags of dependent variable (such as in Roberts & Tybout, 1997) tend to reduce the persistence of exporting.

used to control for the initial conditions problem, and the observations for 2004-2008 are used to estimate the parameters of interest in equation (4).

Industry and Spatial Characteristics

The measures of industry success under consideration include productivity and industry size. Industries of higher productivity are more competitive in both domestic and foreign markets. In the literature, there have been different methods of estimating productivity from a range of estimators. The most common measures by researchers are labor productivity or total factor productivity (TFP) or both. This study uses TFP (in logs), measured by the Olley-Pakes estimator and provided by Arvas & Uyar (2014). Larger industries are associated with economies of scale and lower average or marginal costs, allowing for the role of size in raising the likelihood of exporting. Therefore industries of past success tend to grow relative to others. The study uses the number of establishments (in logs) for industry size.

Labor quality is also of significance in an industry's decision to export. Exported products of higher quality tend to be associated with the workforce of higher quality and become more competitive in international markets. To proxy for workforce quality, natural logarithms of average wages (wages / number of employees) are used.

Spillovers, as a distinguishing factor of spatial character of an industry, between the activities of other neighboring firms in the same industry group and export behavior of the firm reduce the cost of access to the export markets. Bernard & Jensen (2004) consider three separate forms of spillovers: region-specific, industry specific, and local to the industry and region. This study, following Manez, Barrachina & Sanchis (2008), focuses on the role of industry-specific spillovers; measured as the proportion of the number of establishments to two-digit NACE industry classification where they are operated.

Sunk Costs

The literature on sunk costs and exporting decision has explained the stylized fact by demonstrating that sunk costs produce persistence in the patterns of export market participation. In this study, the one lagged values of dependent variable Y_{it-1} is used to proxy for sunk costs. The coefficient of Y_{it-1} isolates the importance of sunk costs. If we find that Y_{it-1} has positive sign then we can conclude that the last year's exporting has a positive effect on the probability of exporting this year. That is, the level of sunk costs can be incurred by incumbents who exported in the past, but for potential firms it creates barrier to entry since they were non-exporter in the past and have no prior exact profit expectations from exporting because of varying level of sunkness.

Ultimately, Y_{it-1} is a dummy variable taking value one if the industry is a net-exporter in year *t-1* and zero otherwise. Y_{it-1}^{τ} is dummy variable taking value one if the industry has more than 300 establishments[8] (a large industry) and the industry is a net-exporter in year *t-1*, and zero otherwise.

8 Adapting the approach in Manez *et al.* (2008), large industry criteria is determined as follow: first the median number of establishments is calculated being 275, and then an industry is assigned as "large" if it has 300 establishments which is greater than 275; while industries whose number of establishments are smaller than 275 are assigned as small-sized.

IIB INTERNATIONAL REFEREED ACADEMIC SOCIAL SCIENCES JOURNAL
Nisan-Mayıs-Haziran 2014 Sayı: 14 Cilt: 5 İlkbahar Dönemi
April-May-June 2014 Issue: 14 Volume: 5 Spring Semester
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www.iibdergisi.com
ID:372 - K:370

Market Characteristics

Time effects are included in order to capture macro-level changes in export conditions that are common across industries, such as the business cycle, market conditions, exchange rate movements, trade policy, overall changes in demand for Turkish exports and other time-varying factors. Hence, year dummies take value one for the corresponding year, and zero otherwise.

Industry dummies are also included to control for unobservable characteristics of markets where firms compete, such as use of technology, market concentration, and industry specific behavior for 20 sectors of the NACE Rev. 1.1 classification[9] which take one if the industry belongs the same industry group (division), and zero otherwise.

The vector Z_{it} also includes the log of capital stock variable (calculated as perpetual inventory method) to account for efficiency differences across industries.

ESTIMATION RESULTS

In Table 2, the coefficient on lagged export status as a proxy for sunk costs is highly significant in the export decision. Last year's export decision has a strong positive effect on the probability of exporting this year. This result supports the hypothesis that entering the export market leads to incurring substantial sunk costs for Turkish manufacturing. That means that in Turkey, higher sunk costs raise the level of protection for incumbent exporters and reinforce industry-level persistence of being a net exporter.

For small industries, the estimated coefficient for the $Y_{i,t-1}$ is positive (0.866) and significant, indicating that exporting in the previous year has a positive impact on the probability of exporting this year. For large firms, the coefficient of $Y_{i,t-1}$ + $Y_{i,t-1}{}^{\tau}$ is significantly smaller (0.079) than the one of small industries, but still positive and significant (with a p-value approximately 0). That is, sunk costs incurred before entry are higher for small industries than larger industries.

The time dummies indicate there is a variation over time, but only the 2006 and 2007 coefficients are significantly different from zero. The estimate of the dummies for 2006 and 2007 is probably capturing the Turkish Liras appreciation or some macroeconomic shocks (uncertainty) lead to a less probability to export decision.

As for two out of four variables included to proxy for industry past success have a statistically significant impact on net export profitability: size and labor quality. Larger industries are more likely to become exporters and it may reflect the scale economy-based exporting approach by Krugman (1984). But, the coefficient of labor quality shows that Turkish manufacturing industries are not more competitive with respect to labor quality and hence lowering the probability of future profits that is in contrast sharply to those Bernard & Jensen (2004) (for US) and Greenaway & Kneller (2004) (for UK) that high wages are positively associated with the probability of entering export

9 1. Food and beverages, 2. Tobacco, 3. Textiles, 4. Wearing apparel, 5. Leather and shoes, 6. Wood and wood products, 7. Pulp and paper products, 8. Publishing and printing stuff, 9. Chemical products, 10. Rubber and plastic products, 11. Non-metallic mineral products, 12. Basic metals, 13. Fabricated metal products, 14. Machinery and equipment, 15. Office machinery and computers, 16. Electrical machinery, 17. Radio-TV staff, 18. Medical instruments, 19. Motors and cars, 20. Furniture

market. This heterogeneity regarding the role of labor quality across different countries' samples might be the case for developed countries but not the case for developing countries (the same result is obtained for China by Li, 2014). However, the coefficient of the labor force quality does not necessarily mean that a better quality of the labor force will not help to succeed in the export market. A more qualified labor force may contribute to vertically differentiate the firm's product (Manez *et al*., 2008: 286) On the other hand, even though its coefficient is insignificant, productivity has a positive value (0.666) and indicates that more productive industries are become stronger incumbents and more likely to become exporters. Clearly total factor productivity has more influences than labor quality.

Table 2. Dynamic Random Effects Multivariate Probit Model

Explanatory Variables	Coeff.	Std. Error
$Y_{i,t-1}$	0.866***	(0212)
$Y_{i,t-1}^{\tau}$	-0.787***	(0.254)
Year 2005	0.124	(0.214)
Year 2006	-0.324*	(0.198)
Year 2007	-0.486**	(0.199)
Year 2008	-0.347	(0.206)
Size	0.193***	(0.073)
Productivity	0.666	(0.945)
Labor quality	-0.283*	(0.160)
Capital stock	-0.008	(0.076)
Industry-specific spillover	0.527	(2.968)
Food and beverages	-0.563	(0.497)
Tobacco products	-0.157**	(0.015)
Textiles	-2.116***	(0.487)
Wearing apparel	-1.836***	(0.537)
Tanning and dressing of leather	-3.076***	(0.646)
Wood products	-2.002***	(0.539)
Pulp, paper and paper prod.	-0.771	(0.715)
Publishing, printing and reproduct.	-0.398	(0.571)
Chemical products	-0.568	(0.510)
Rubber and plastic prod.	-0.004**	(0.639)
Other non-metallic mineral prod.	-0.645	(0.484)
Basic metals	-1.184**	(0.544)
Fabricated metal prod.	-1.039**	(0.474)
Machinery and equipment n.e.c.	-0.540	(0.473)
Office machinery and computers	4.915	(9.033)
Electrical machinery and apparatus	4.085	(4.329)
Radio-TV	-1.433*	(0.784)
Medical and optical instruments	0.232**	(0.045)
Motors and cars	-1.453**	(0.574)
Furniture	0.248	(0.618)
Intercept	1.905	(1.839)
Observation	739	
Log likelihood	-242.382	
***,**,*, indicate significance at the level of 1, 5, and 10 percent, respectively		

The results are consistent with the prediction that more productive firms [industries] self-select into export markets in theoretical models of Melitz (2003) and Bernard &Jensen (2004). In addition, it seems likely from the coefficient of capital stock that increasing capital leads industries to more import rather than export. In conclusion, if we track the trade pattern of Turkey for the period considered, it can be seen that the import coverage ratio of exports is increasing thus increases in size and productivity drive industries to become a net exporter, and henceforth speeding up increases in exporting rather than increases in importing. Consequently, growth in exports exceeds growth in imports.

The coefficient of industry specific spillover is insignificant but positive showing that if the number of establishments is increasing in a specific industry, it also increases industry's probability to export and reinforce its persistence of exporting. This result is also consistent with Krugman (1992).

Overall, the results reported in Table 2 reveal that the export participation decision and future expected profitability are affected by time-period, macroeconomic conditions, political situations, observable industry costs and demands and unobserved time-invariant industry heterogeneity.

CONCLUSION

Beyond any doubt, a country's competitiveness on international market, basically is driven by the mutually internal and external forces in real world. Characteristic, spatial or technological heterogeneity across firms, industries and countries has generated new insights for new theories on decision to export, variations in export and role of sunk costs which topics are not well explained by traditional models. Some recent studies, to explain persistence in becoming exporter, have focused on the fact that producers face sunk entry costs when breaking into foreign markets, provided that their expectations for future profits from exporting cover the sunk costs of entering.

Turkish economy is largely dominated by modern industries and the services sector. In terms of manufacturing, it is also one of the leading producing countries in the world for agricultural products; textiles; motor vehicles, ships and other transportation equipment; construction materials; consumer electronics and home appliances and largely Turkey imports non-auto consumer goods, production machinery and equipment, non-fuel industrial supplies, motor vehicles and parts, food, feed and beverages from partner in European Union, China, Canada, Mexico, Japan and many other countries all around the world. Being an emerging market, in Turkey, there needs to be addressed that what factors play an important role on determining manufacturing industries' insight into foreign markets.

In this study, it is tested both for existence of sunk cost in the export decision by Turkish manufacturing industries and whether they differ between large and small industries, and how the future expected profitability increases the probability to more export rather than import. A dynamic multivariate probit model that allows controlling for competing sources of persistence in terms of sunk costs, heterogeneity, and serial correlation in transitory shocks. Using panel data on a four-digit industry group of Turkish manufacturing, it is found evidence that entry costs are important for decision to export. Furthermore, it is also investigated whether sunk costs matter for small

and large industries. Results show that sunk costs matter for both industries but small ones face higher levels of these costs than large ones implying the significance of scale economies and industry heterogeneity in coping with entry barriers. Such factors as obtaining information about foreign demand, advertising, product differentiation and transportation are important sources of sunk costs of entry and many studies show that sunk costs depreciate with the past export experience of firms.

Industries' past success (as measured by size, productivity, labor quality and capital accumulation) has both positive and negative impact on the probability to export and profit expectations. For the Turkish case, while productivity leads firms to more export, on the other hand labor quality and capital accumulation might make importing more profitable for incumbents, thus causing a chronic trade balance deficit, albeit in the last decade it tends to decrease.

For the purposes of public policy implications, the combined relevance of costs and industry characteristics in the probability of exporting suggest possible export promotion policies. For example, policies directed at providing information and access to foreign markets (i.e. a handbook for foreign market profile and conditions) or providing exporting infrastructures could reduce the sunk costs of entry, which is especially crucial for small firms. Obviously, productivity-raising policies, supports to innovation and product differentiation activities, an export premium policy or a change in tax policy would have a positive impact on exporting.

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IIB INTERNATIONAL REFEREED ACADEMIC SOCIAL SCIENCES JOURNAL
Nisan-Mayıs-Haziran 2014 Sayı: 14 Cilt: 5 İlkbahar Dönemi
April-May-June 2014 Issue: 14 Volume: 5 Spring Semester
Jel: A1-A2
www.iibdergisi.com
ID:372 - K:370

BATIK MALİYETLER, ENDÜSTRİ HETEROJENLİĞİ, KARLILIK BEKLENTİSİ VE İHRACAT KARARI: TÜRK İMALAT SANAYİ

Özet: Piyasa yapısı, firma davranışları, ihracat gibi konularla ilgili oyun-teorik yaklaşımlardaki teorik ve deneysel gelişmeler (örneğin Dixit & Stiglitz, 1977; Shubik & Levitan, 1980; Spence, 1981; Shaked & Sutton, 1987, 1990; Fisher, 1989; Sutton, 1991, 1998; Pelzman, 1991) firmaların yatırım, araştırma-geliştirme, ürün farklılaştırma, reklam, fiyat farklılaştırması vb. konularda davranış ve tutumlarının nasıl olduğunu daha iyi anlamamıza yardımcı olmaktadır. Batık maliyetler ve firmaların ihracat kararı arasındaki ilişkiyi açıklayan çalışmalarda Dixit (1989a, 1989b), Baldwin (1988, 1989), Baldwin & Krugman (1989) ve Krugman (1989), daha önce ihracat tecrübesi olmayan firmaların ihracat piyasasına giriş kararı aldıkları zaman batık bir maliyete katlanması gerektiğini ifade etmektedirler. O halde firma, kar beklentisinin batık maliyetleri karşılayacağını umuyorsa o zaman ihracat kararı alır. Diğer taraftan ihracat piyasasına giriş batık maliyetler ile engellenmişken, bu durum önceden beri piyasada bulunan yerleşik firmalar açısından bir avantaj doğurarak piyasadaki hâkim pozisyonlarını korumalarını sağlamaktadır; çünkü ihracat faaliyeti aslında yaparak-öğrenme sürecidir ve yerleşik firmanın katlanacağı batık maliyetler dönemler boyunca azalma eğilimine girer. Bu çalışma batık maliyetlerin ve gelecek kar beklentilerinin ihracat kararı üzerine etkilerini Türk imalat sanayi açısından analiz etmeyi amaçlamaktadır. Bu amaçla NACE Rev. 1.1 sınıflandırmasına tabii 4-basamaklı imalat sanayi endüstrilerine ait 2003-2008 yıllarına ait panel veri seti dinamik çok değişkenli probit modeli kullanılarak analiz edilmiştir. Bu modelin tercih edilmesindeki neden bağımlı değişken olan ihracat kararı değişkenin 1 ve 0 aralığında bir olasılık içermesinden kaynaklanmaktadır. Model analizi, T-boyutlu integral çözümlerinin simülasyon en çok olabilirlik yöntemi (SML) ile tahmin etmektedir. Modelde batık maliyetler önceki dönem ihracat kararı kukla değişkeni ile temsil edilmiştir ($\boldsymbol{Y_{i,t-1}}$). Çalışmada, literatüre bir katkı olarak, giriş denklemi büyük ve küçük endüstriler için tahmin edilmiştir. Dolayısıyla $\boldsymbol{Y_{i,t-1}}^{\tau}$ büyük endüstrileri temsil eden bir kukla değişkenidir. Başlangıç şartları sorununu çözmek amacıyla Bernard & Jensen (2004) tarafından önerilen yöntem benimsenerek 2003 yılı firmanın geçmiş durumunu veya başarısını temsilen seçilmiş ve analizler 2004-2008 yıllarını içerecek şekilde tamamlanmıştır. Diğer taraftan endüstriye has gözlemlenebilir özellikler giriş kararını önemli ölçüde etkilemektedir. Yine bunları temsilen daha tutarlı bir tahmin yöntemi olan Oley-Pakes yöntemiyle elde edilmiş toplam faktör verimliliği (TFP, log); işgücünün kalitesi (ücret / işgücü sayısı) ve yayılma etkisi (endüstrideki girişim sayısı / girişimin ait olduğu iki basamaklı endüstri grubundaki toplam girişim sayısı) değişkenleri kullanılmıştır. Ölçek ekonomilerini yansıtmak üzere "size" değişkeni modele dâhil edilmiştir. Bu değişkenin elde edilmesinde endüstrideki giriş sayısı temel alınmıştır. Piyasa özelliklerini yansıtmak üzere yıl ve endüstri kukla değişkenleri modele dâhil edilmiştir. Yıl veya zaman kukla değişkenleri ilgili yıl için "1", diğer yıllar için "0" değerini almakta ve iş çevrimi, piyasa koşulları, döviz kurundaki dalgalanmalar, ticaret politikası, talepte meydana gelen değişimler ve diğer zaman içerisinde değişen faktörleri temsil etmektedir. Endüstri kukla değişkenleri 20 adet iki basamaklı endüstriyi kapsamakta ve yine ilgili endüstri için "1", diğerleri için "0" değerini almaktadır. Endüstri kukla değişkenleri, teknoloji, piyasa yoğunlaşması, endüstriye has davranışlar gibi gözlemlenemeyen faktörlerin giriş kararı üzerine olan olası etkilerini yansıtabilmek için kullanılmıştır. Yine ayrıca sermaye stoku (aralıklı envanter yöntemiyle hesaplanan) endüstriler arasındaki etkinlik farklılıklarını temsil etmek üzere modele dahil edilmiştir. Analiz sonuçları Tablo 2'de yer almaktadır. Sonuçlara göre; batık maliyetleri temsil eden değişkenin ($\boldsymbol{Y_{i,t-1}}$) katsayısı küçük endüstriler için istatistiki olarak anlamlı ve pozitif çıkmıştır (0.866). Yani, önceki yıl ihracat tecrübesinin cari yıl ihracatı üzerine olumlu katkısı vardır. Büyük endüstriler için, $Y_{i,t-1} + Y_{i,t-1}^{\tau}$ 'in katsayısı pozitif ve istatistiki olarak anlamlı bulunmuştur (0.079). Her iki grup endüstri için sonuçlar karşılaştırıldığında, küçük endüstrilerin büyük endüstrilere oranla ihracatta daha büyük batık bir maliyete katlandıklarını göstermektedir. Dolayısıyla bu sonuç, Türk imalat sanayi açısından ihracat piyasalarında batık maliyetlerin varlığının yerleşik büyük firmaların piyasadaki durumlarının ve de hâkimiyetlerinin

devamı açısından avantaj yarattığı şeklinde yorumlanabilir. Zaman kukla değişkenlerinden 2006 ve 2007 yıllarına ait katsayılar anlamlı ve sıfırdan farklı değerler olarak bulunmuştur. Buna göre, ilgili yıllara ait katsayılar, muhtemelen dövize karşı Türk Lirasındaki değerlenmeyi veya bazı makroekonomik şokları ifade etmektedir. Endüstrinin karlılığını veya başarısını ifade eden dört değişkenden ölçek ve işgücü kalitesi değişkenlerinin katsayıları anlamlı bulunurken, toplam faktör verimliliği ve sermaye stoku değişkeni katsayıları anlamsız bulunmuştur. Demek ki Türk imalat sanayinde büyük ölçekli endüstrilerin ihracat eğilimi artarken, bu endüstrilerdeki işgücü kalitesindeki artışlar ihracat yapma eğilimini azaltmaktadır. Bu eğilimi ise gelecek dönemlere ilişkin kar beklentilerini olumsuz etkilemektedir. Bu sonuç Bernard & Jensen (2004) (ABD için) ve Greenaway & Kneller (2004) (İngiltere için) çalışmalarından elde edilen sonuçlara zıtlık arz etmektedir. Diğer taraftan önemli bir kar beklentisi göstergesi olan verimlilik katsayısı istatistikî olarak anlamlı bulunsa da, katsayısının değeri pozitiftir (0.666). Bu katsayıyı şöyle yorumlamak mümkün: Endüstrilerin sermaye stokundaki artışlar, endüstrilerin daha çok ithalat yapma eğilimini artırmaktadır. Bu sonuç, son yıllarda ihracattaki artışlara karşın dış ticaret açığının neden kapatılamadığının bir nedeni olabilir. Sonuç olarak Türkiye gibi gelişen bir ekonomide, özellikle küçük ve orta ölçekli firmaların uluslararası piyasalara daha etkin, daha rahat ve daha rekabetçi girebilmelerini sağlamak amacıyla kamusal politikalarla bunların piyasalar hakkında bilgi edinme süreçlerinin hızlandırılıp etkinleştirilmesi, verimliliklerini artırıcı uygulamalar, vergi politikası gibi politika uygulamalarının gözden geçirilmesinin faydalar sağlayacağı tartışmasızdır.

Anahtar Kelimeler: Batık Maliyetler, Endüstri Heterojenliği, Türk İmalat Sanayi, Dinamik Kesikli-Seçim Modelleri