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Determinants of Entry in Turkish Manufacturing Industries

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ABSTRACT. The entry of new firms into markets plays an important role in efficient resource allocation and evolution for long term economic growth. Employing dynamic panel data techniques, this paper investigates entry behavior in 66 four-digit Turkish manufacturing industries for the 1993–1999 period. The results of this paper suggest that potential entrants observe the market before the entry takes place; entry is, in general, a follow-up process; and incumbent firms seem to collude to prevent entry in Turkish manufacturing industries. In addition, the real interest rate appears to be a very important determinant of entry decision.

KEY WORDS: Entry, Exit, Dynamic Panel Data, Turkish Manufacturing

JEL CLASSIFICATION: C23, L11, L60

1. Introduction

There has been a long-standing interest in the entry behavior of firms and its determinants. Especially since the work of Schumpeter (1934), the importance of new firms for the renewal and evolution of industries has been widely recognized. As an important element of the competitive selection mechanism in market economies, entry leads to efficient resource allocation and can promote long term economic growth.[1] The entry of new firms into markets is influenced by functions of market structure and firm behavior, such as entry barriers and incentives. The literature on entry was initiated by Bain (1949). After the importance of entry was recognized, efforts were focused on quantifying barriers to entry (e.g., Mann (1966)). Orr (1974) used a regression analysis in his paper to investigate the determinants of entry. Orr's methodology was employed by many studies, such as MacDonald (1986), Khemani and Shapiro (1986), Acs and Audretsch (1989), Rosenbaum and Lamort (1992), Fotopoulos and Spence (1998a, b) and Ilmakunnas and Topi (1999).

The purpose of this paper is to analyze the determinants of entry in Turkish manufacturing industries using the same methodology. In justifying the inclusion of variables in the entry equation, however, this study utilizes not only the traditional theories but also the more recent literature on the post-entry performance of firms. In addition, most entry studies analyze the determinants of entry for developed countries. Since entry dynamics in developing countries may differ, using Turkish data could provide insight regarding entry behavior in those countries.

The size of new entrants in Turkey is around 25 percent that of established firms, implying that the entrants are mostly small and medium-sized enterprises (SMEs) as in many other countries (E. Taymaz and M. Y. Köksal (2003) unpublished manuscript). Therefore, this study will also provide a better understanding of the entry behavior of SMEs. Both in Turkey and other developing countries, the contribution of SMEs in the process of economic development and growth has become increasingly recognized (Aquilina et al., 2006; Liedholm, 2002; Taymaz, 2005; Wang and Yao, 2002; Weeks, 2003; Wiboonchutikula, 2002). There are several arguments favoring SMEs in this process (Beck

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et al., 2005; Taymaz, 2005). Firstly, by fostering competition, SMEs lead to innovation, aggregate productivity growth and an increase in overall efficiency in the economy. Secondly, SMEs are important sources of employment growth and are more successful in job-creating than large firms (Audretsch, 2002). This may be due to the fact that they are generally more labor intensive compared to large firms. Finally, with their flexible and versatile structures, SMEs are better able to adjust to changing business conditions. Besides, they might serve as a buffer against business fluctuations. While large firms supply the stable and predictable part of the demand, SMEs supply the residual demand (Taymaz, 1997: 15).

The sample for this study consists of 66 four-digit manufacturing industries for the 1993–1999 period. Some industries are excluded due to the lack of data. The period begins with 1993 because 1992 was the census year and therefore the number of entrants exhibits a significant increase. The period analyzed includes an economic crisis year, 1994, so the effect of the crisis on the number of firm entries can also be observed.

The paper is organized as follows. The theory is presented in the next section. In Section 3, the model used is introduced. The empirical analysis and results are discussed in Section 4. Finally, the last section concludes the paper.

2. Theory

According to conventional microeconomic theory, firms in an industry are concerned only with the actual competition within the industry when setting prices. However, potential competition, which is the competition between incumbent firms and potential entrants, is also important in determining the behavior of incumbent firms (Bain, 1949, 1956; Gilbert, 1989a, b).

Firms check the conditions of the market before making the decision to enter. If there are incentives, firms may be more willing to enter an industry. Empirical work on entry has focused primarily on two incentives: market growth and expected profit.

As the growth rate of output increases, there will be more room for new firms in the industry, and the price will not be driven down significantly by the entrant's addition to the total industry output, given a specific rate of supply expansion by established firms. Moreover, potential entrants may expect it to be easier to sell their products to new consumers than to take the consumers away from an incumbent firm in a market where the demand is stable. The second incentive is expected profit. A profit maximizing firm will enter an industry if the net present value of expected profits adjusted for risk is positive. These two incentives were included in most of the entry studies such as Mata (1991), Acs and Audretsch (1989) and Hölzl (2002).

Another determinant of entry is barriers to entry. Although there are several alternative definitions of entry barriers, the one provided by Bain is employed most widely in the literature. He defined entry barriers as market conditions that allow incumbent firms to increase their prices above the competitive level without attracting entry. Bain basically talked about three structural barriers arising from the technical or structural characteristics of an industry. These are economies of scale, absolute cost advantages and product differentiation advantages. Capital requirement, one source of absolute cost advantages, is considered in some studies to be another structural barrier. It should be noted that some of these entry barriers act also as barriers to firm growth and survival.

Bain's first type of entry barrier arises from significant scale economies relative to market size. If the minimum efficient scale (MES) is sufficiently large relative to the market demand, the extra capacity introduced by the entrant will decrease the price below unit costs for everyone in the market. If this is anticipated by the entrant, large-scale entry (at the minimum efficient scale) will be deterred. Alternatively, the entrant may come into the market at a small (suboptimal) scale. In this case, the entry will have no perceptible effect on market price (or on the market shares of incumbent firms), but the entrant will have to operate at a cost disadvantage in comparison with large (incumbent) firms. Thus, in those industries where the minimum efficient plant scale is large relative to the market demand, incumbent firms will be able to increase their prices above their minimum average costs without attracting entry.

The cost disadvantage of entering at suboptimal scales may not necessarily deter entry. The literature on entry process suggests that the small-scale entry of new firms may be an indication of a ''try and see'' behavior. The theoretical model of noisy selection introduced by Jovanovic (1982) suggests that newborn firms do not know what their true cost is, implying that they are uncertain about their relative efficiency. Instead, they learn about it as they operate in the industry. Efficient firms will grow and survive while inefficient firms will decline and fail. In contrast to this ''passive learning'' by firms, Ericson and Pakes (1995) and Pakes and Ericson (1998) emphasize the importance of ''active learning'' by firms through investments in productivity-enhancing innovations or by cost reductions. The future of a firm is determined by factors such as the success of its own innovations, that of its rivals, the relative efficiency of new firms, and the availability of substitute products. The firm may decide to exit if the evolution of the industry is not favorable.

In the Jovanovic model, surviving new firms which are generally smaller than the minimum efficient scale may be expected to maintain higher growth rates in order to close the gap between their start-up size and the MES (Santarelli and Vivarelli, 2002). When the minimum efficient scale is high in an industry, the post-entry growth rates of the surviving firms will also be high.[2] In such an industry, however, the exit rates may be high since some of the new firms may not be able to grow and approach the MES.[3] On the other hand, in industries where the minimum efficient scale is low, relatively lower growth rates but higher survival rates would be expected since, in this case, the need for growth and the disadvantage of operating at suboptimal scales will not be as severe (Audretsch et al., 1999).

In such passive learning models, therefore, economies of scale may constitute a barrier to firm survival rather than a barrier to entry. However, the low likelihood of survival in industries with high minimum efficient scale may discourage new entries into such industries; hence, the existence of significant scale economies may act as a barrier to entry in a different way than suggested by Bain.

There are several reasons why an absolute cost barrier to entry exists if established firms produce at a lower average cost than potential entrants. For example, they may have already employed talented managers and staff; they may have control of strategic input supplies; and they may have access to superior production technologies. Furthermore, an entrant will probably be subject to higher interest rates than established firms due to the uncertainty associated with being a new firm. This will be more effective as an entry barrier when the capital requirements for entrants increase. Thus, financing constraints will either deter entry or cause new firms to enter at suboptimal scales.

In the context of passive learning models where the reason for small scale entry is a ''try and see'' behavior, the existence of financing constraints make it difficult to raise capital in later periods, and may constitute a barrier to firm growth (Cabral and Mata, 2003). The existence of such a barrier may discourage entry in the first place if it is expected to be binding for a long period; or, once the entry takes place, it may prevent small firms from maintaining high enough growth rates to close the gap between their start-up size and the MES.

Product differentiation advantages arise mostly from the accumulated preferences of buyers for the brands of established firms, which have been created mainly by high levels of advertising intensities. Heavy advertising expenditures allow incumbent firms to convince buyers about the desirability, prestige or superior quality of their products, and contribute to buyer inertia and brand loyalty. Thus, advertising lowers the cross-price elasticities of demand between the products of incumbent firms and new entrants (Bain, 1956; Comanor and Wilson 1967, 1974, 1979). As a result, new entrants will need to spend heavily on advertising to gain a market share for the first time while incumbent firms need to advertise only to protect their established brands. Hence, new entrants will have greater average costs at equal outputs, allowing incumbent firms to earn supernormal profits without attracting entry.

Another factor affecting the entry decision is exit barriers, which are the costs or forgone profits that a firm must bear if it leaves an

industry. For example, a firm might have to pay its workers severance fees if it leaves the market. Exit barriers exist if a firm cannot move its capital into another activity and earn that much return (Gilbert, 1989a). Exit barriers are generally thought of as sunk costs, which typically arise from investments in assets that are durable, immobile, and specific to the firm or the product. Advertising, R&D and marketing expenses are other examples of sunk costs.

The existence of exit barriers has a negative effect on entry in two ways. They have a direct effect on an entrant by increasing the costs that entrant must bear in case of failure. This raises the risk of entry. Sutton (1990, 1991) emphasizes the endogenous character of sunk costs. By incurring greater advertising or R&D expenditures, firms can increase the demand for their product in subsequent periods. This leads to a higher level of sunk costs, which limit the rate of new firm entry, even in the case of expansion in market size. Exit barriers affect entry also indirectly by being a signal sent by established firms to potential entrants. To limit or deter entry, incumbent firms may be engaged in heavy advertisement and R&D expenditures, and/or investments in industry-specific assets, sending potential entrants a signal that they will be in the market tomorrow. The studies of Spence (1977, 1979), Dixit (1979, 1980), Eaton and Lipsey (1981) and Judd (1985) are examples of this kind of strategic entry deterrence models.

The existence of sunk costs could also be a reason for a "try and see" behavior. If the degree of sunk costs is high in an industry, new firms may prefer to enter at a small-scale since they know that some part of their setup costs will not be recoverable in the case of failure. On the other hand, following entry, the existence of sunk costs decreases the likelihood of exit and leads to lower growth rates of survivors (Audretsch, 1991). To sum up, just like the financing constraints, sunk costs might deter entry or cause new firms to enter at suboptimal scales.

Entry and exit studies find that entry and exit rates are highly correlated (Bartelsman et al., 2003; Geroski, 1995). Industries with high rates of entry tend to have high rates of exit. One of the reasons for this correlation is the interaction between entry barriers and exit barriers. Caves and Porter (1976) state that each source of structural barriers to entry identified by Bain is also an exit barrier. The results of Shapiro and Khemani (1987) also support this hypothesis. Another reason for the correlation between entry and exit rates could be the possible interdependencies between them. New firms may push inefficient firms out of the industry. In addition, exits in previous periods may create room for new entrants in the current period.

The correlation between entry and exit could be explained also by the concept of "turbulence" (Beesley and Hamilton, 1984). In industries with more deaths and more births than other industries, the rate of exit may be expected to be positively related to the rate of entry. Baldwin and Rafiquzzaman (1995) find that higher instantaneous entry leads to lower survival rates. New firms overshoot and enter in large numbers into those industries where high growth rates are expected. Thus, more firms may be expected to be eliminated by the selection process in such industries.

Some studies have examined the effects on entry of the entrepreneur's personal characteristics (such as age, education and experience) and the factors influencing his/her motivations for entrepreneurship (such as family tradition, desire to achieve social status, inheritance and unemployment status) (Blanchflower and Oswald, 1990; Vivarelli, 2004). Vivarelli (2004) points out that the factors that favor entry also lead to better post-entry performances and thus lower exit rates. Hopenhayn (1992) argues that, being a signal of superior entrepreneurial capabilities, higher sunk costs in the industry lead to better post-entry performance and reduce the likelihood of early exit. Finally, Audretsch and Vivarelli (1995) examine the effect of regional industry characteristics on new-firm formation in Italy. They find that factors such as higher profitability, lower wages and greater job losses positively influence the extent of new-firm entry.

There is little literature on macroeconomic determinants of entry. However, the studies of Yamawaki (1991), Audretsch (1995) and Mata (1996) are the exceptions. The real interest rate is one of the major determinants of entry decision and a good indicator of the general economic climate. Persistent high inflation increases

uncertainties and hence real interest rates considerably in an economy. Due to uncertainties, entry decision may be postponed or even cancelled. Investors may choose to have some riskless assets instead of starting a new business. High real interest rates may also affect entry decision adversely by increasing the opportunity cost of starting a new business. Thus, a negative relationship may be expected between real interest rates and entry.

3. Model

Before presenting our model, it will be useful to discuss briefly the entry and exit figures in the Turkish manufacturing industries for the period under study. Figure 1 shows the total number of entering and exiting firms. Entry and exit numbers exhibited differences from year to year. The number of firms entering declined from 1993 to 1994 and then increased steadily between 1994 and 1998. In 1999, a decline in the number of entrants occurred again. Exit, on the other hand, seems to exhibit a pattern which is independent from entry in these years.

In 1993, 1994 and 1999 the number of entries was less than the number of exits. In both 1994 and 1999, there was a decline in the number of entrants. The severe economic crisis experienced in 1994 seems to have decreased the number of entrants, leading to a negative net entry (difference between the number of entries and exits) in that year. Afterwards, during the economic recovery period the number of entries exhibited a substantial increase, and this trend continued until 1999. It can be seen from the figure that in 1998 the number of entries increased to its highest level in the period studied. In 1999, however, the sector experienced a sharp decline in entries resulting again in a negative net entry. This may be due to both the recession and the devastating earthquakes that hit the highly industrialized region of the country in that year.

One of the problems in the process of new firm formation in Turkey is the presence of excessive bureaucracy. In addition, firms face difficulties in financing their investments. During the last decade, the arbitrage opportunities due to the high real interest rates made it attractive for the banking sector to finance large public sector deficits. As a result, the financial intermediation function of the sector declined considerably. In addition, banks do not lend money to start-up companies on the basis of a feasibility study or a work plan. Firms can borrow from banks only if they provide assurance regarding the return of the credit in the form of a guaranty. In general, such guaranties are among the most important obstacles that entrepreneurs face. Because start-up firms do not usually have enough resources to give those guaranties, banks usually request a mortgage as the guaranty. However, the firms often cannot meet such mortgage claims of the banks. Moreover, the inadequacy of the capital market and the lack of venture companies in Turkey make it difficult for firms to find investment capital. Finally, taxes, duties and other levies which firms are obliged to pay and the high energy prices impose a very heavy financial

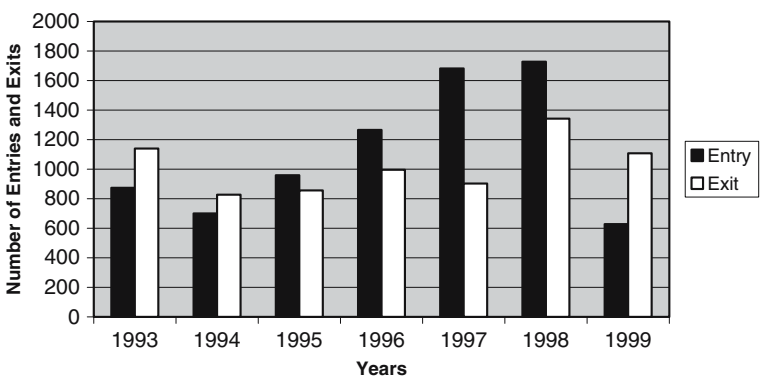

Figure 1. Entries and Exits in Turkish Manufacturing, 1993–1999 (66 industries).

burden on the new firms. These are the most important factors adversely affecting the entry decisions of new firms in Turkey.

The number of entrants and exitors are calculated in this study as follows: A firm observed at time t is an entrant if it was absent at time $t-1$ but present at $t+1$. Likewise a firm observed at time t is an exitor if it is present in $t-1$ but absent in $t+1$. However, it is also possible for a firm observed at time t to be absent in $t-1$ and $t+1$, i.e., an entrant that exits within a year. Such a firm is considered to be both an entrant and an exitor. We specify entry as a function of past entry rate ($\mathrm{ENT}_{i,t-1}$), minimum efficient scale ($\mathrm{MES}_{i,t}$), capital requirement ($\mathrm{CAP}_{i,t}$), advertisement intensity ($\mathrm{ADV}_{i,t}$), past profit rate ($\mathrm{PRO}_{i,t-1}$), industry growth rate ($\mathrm{IG}_{i,t}$), concentration ratio ($\mathrm{CON}_{i,t}$), rent of machinery and equipments ($\mathrm{RENT}_{i,t}$), export ($\mathrm{EX}_{i,t}$), real interest rate (r_t), and past exit rate ($\mathrm{EXT}_{i,t-1}$). The linearly formed econometric model is as follows:[4]

$$\begin{aligned}\mathrm{ENT}_{i,t} = {} & a_0 + a_1\,\mathrm{ENT}_{i,t-1} + a_2\,\mathrm{MES}_{i,t} \\ & + a_3\,\mathrm{CAP}_{i,t} + a_4\,\mathrm{ADV}_{i,t} \\ & + a_5\,\mathrm{PRO}_{i,t-1} + a_6\,\mathrm{IG}_{i,t} \\ & + a_7\,\mathrm{CON}_{i,t} + a_8\,\mathrm{RENT}_{i,t} \\ & + a_9\,\mathrm{EX}_{i,t} + a_{10}\,r_t \\ & + a_{11}\,\mathrm{EXT}_{i,t-1} + u_{i,t}\end{aligned}$$

The dependent variable is entry rate. It is calculated as the number of entrants at time t over the number of total firms at time t.

The first independent variable is the past entry rate ($\mathrm{ENT}_{i,t-1}$). Chambers of commerce are very common in Turkey and so the interaction among entrepreneurs via this channel is high. Thus, entry may be expected to be a "follow-up" process (herd behavior). If entry occurs in an industry, it may continue in the following period.[5] The expected sign of this variable is positive.

The variables included in our entry equation to represent structural entry barriers are those usually employed in the related literature. The first barrier is economies of scale, and it is represented by the minimum efficient scale ($\mathrm{MES}_{i,t}$). Following Comanor and Wilson (1967, 1974) and many others, we measure the minimum efficient scale as the average plant size in the upper class of plants ranked from large to small, which accounts for 50% of industry output. The variable MES is expected to have a negative relation with entry.

The second entry barrier used is capital requirement ($\mathrm{CAP}_{i,t}$). If the industry into which a firm is planning to enter uses a capital intensive technology, the cost of the initial investment could be substantial. This variable is calculated as the logarithm of the ratio of depreciation to the average number of employees. We use depreciation in place of capital due to the lack of capital data. A negative relationship between entry and capital requirement is expected.

Advertisement ($\mathrm{ADV}_{i,t}$), reflecting the degree of product differentiation, is the last structural barrier in our model. Following many studies in the literature (e.g., Kessides, 1991; Orr, 1974), we include advertisement in the equation in the form of the ratio of advertisement expenditures to total industry output; that is, we use advertisement intensity. This variable is included in the equation with the expectation of a negative sign.

We employ two variables reflecting the incentives for entering: the past profit rate and the industry growth rate. The past profit rate ($\mathrm{PRO}_{i,t-1}$) is included in the model to represent the expected profit. Following Collins and Preston (1968, 1969), it is calculated as the ratio of the difference between value added and payroll to total output. If there is high profitability in an industry, then that industry will be attractive for new firms, and its rate of entry will be high, so a positive sign is expected for this variable.

The second incentive is the industry growth rate ($\mathrm{IG}_{i,t}$), which is calculated as the change in output from one year to another (Ilmakunnas and Topi, 1999). Being another incentive, this variable is also expected to be positively correlated with entry.[6]

The incumbent firms could act in a collusive way to deter entry. If the number of incumbent firms is less (concentration ratio is high), this collusion will be easier and strategic barriers to entry will exist. Because of this, an increase in the concentration ratio ($\mathrm{CON}_{i,t}$) may decrease entry. The Herfindahl index is used to measure the level of concentration. This variable is

expected to have a negative impact on the rate of entry.

As was mentioned in the previous section, high sunk costs in investments may affect entry decisions. If a firm uses machinery and equipment specific to the industry, it would be difficult for such a firm to resell this machinery and equipment in the event of failure. In order to represent this specificity, the ratio of rental expenditures on machinery and equipment to depreciation ($RENT_{i,t}$) is used in the model. If the value of this ratio is high for an industry, then the possibility that the machinery and equipment used in that industry is specific to that industry is low, so a positive sign is expected for this variable.

In countries with fragile economies, the entrepreneurs may choose to enter industries which have more export possibilities. By doing so, they could protect themselves against a reduction in demand during an economic crisis. On the other hand, international competition may dissuade investors, so they may choose not to enter industries that face international competition. In order to investigate the effect of exports on entry decision, export intensity ($EX_{i,t}$) is included in the model without any sign expectation. Export intensity is defined as the ratio of industry exports to industry output.

The possibility of an interaction between entry and exit was mentioned in the previous section. Such a possibility is investigated in many studies, though most of these studies concern only the effect of entry on exit. However, it is also likely that exits in the previous period may leave room to new entrants in the current period. This possibility is incorporated into the model by employing the past exit rate ($EXT_{i,t-1}$). This variable is also expected to have a positive relation with entry.

Turkey has been experiencing high rates of inflation (approximately 60% on average) and hence high real interest rates since the 1980s. The inflation inertia and persistently high real interest rates make Turkey an extraordinary case among emerging market countries (Berument and Malatyali, 2001). This suggests that, unlike the case in developed countries, macroeconomic variables may be more important than microeconomic variables in a country such as Turkey. Therefore, as a good indicator of the macroeconomic climate in Turkey, the real interest rate, r_t, is included in the model with a negative sign expectation. The real interest rate is calculated in this study as the ratio of logarithm of one plus nominal interest rate to the logarithm of one plus inflation rate.[7]

All variables in the entry equation, their calculations and expected signs are summarized in Table I. Table II presents descriptive statistics related to these variables.

4. Estimation results

Our empirical results are based on annual data covering the period 1993–1999 for 66 four-digit Turkish manufacturing industries. There are 86 ISIC (Revision 2) four-digit manufacturing industries, but (as mentioned before) some industries were excluded from the analysis due to lack of data. Data were obtained from the Annual Survey of Manufacturing Industry conducted by the State Institute of Statistics of Turkey and consists of all state-owned establishments and private establishments employing more than ten people. It should be noted that although the words "plant" and "firm" are used interchangeably in this study, the data used in estimations are at the plant level. Interest rate data is gathered from the Central Bank of the Republic of Turkey.

Since we are using the past value of the entry rate as an explanatory variable, our model becomes a dynamic panel data model. When the model is dynamic, the difficulty in both the fixed and random effects models is that the lagged dependent variable is correlated with the error term (Greene, 2000: 583). Arellano and Bond (1991) proposed a generalized method of moments (GMM) procedure to overcome this problem. In this study we use the one-step Arellano-Bond GMM estimation technique in order to estimate our dynamic panel data model.[8] This technique uses (y_{i1}, y_{i2},...$y_{i,T-2}$) as the set of instruments for the dependent variable and uses all the x_{it} as the valid instruments of exogenous variables. The past profit rate, concentration ratio and industry growth rate are also included as additional instruments to

TABLE I
Descriptions of the Variables

Variable	Description	Expected Sign
$ENT_{i,t}$	Entry Rate (Dependent Variable) The number of entrants at time t over the number of total firms at time t	
$ENT_{i,t-1}$	Past Entry Rate The number of entrants at time $t-1$ over the number of total firms at time $t-1$	Positive
$MES_{i,t}$	Minimum Efficient Scale The average plant size in the upper class of plants ranked from large to small which accounts for the 50 percent of industry output	Negative
$CAP_{i,t}$	Capital Requirement The logarithm of the ratio of depreciation to the average number of employees	Negative
$ADV_{i,t}$	Advertisement Intensity The ratio of advertisement expenditures to total industry output	Negative
$PRO_{i,t-1}$	Past Profit Rate The ratio of the difference between value added and payroll to total output at time $t-1$	Positive
$IG_{i,t}$	Industry Growth Rate The ratio of the difference between output at time t and output at time $t-1$ to output at time $t-1$	Positive
$CON_{i,t}$	Concentration Ratio Herfindahl index	Negative
$RENT_{i,t}$	Rental Expenditures on Machinery and Equipment The ratio of rental expenditures on machinery and equipment to depreciation	Positive
$EX_{i,t}$	Export Intensity The ratio of industry exports to industry output	–
r_t	Real Interest Rate The ratio of ln(1 + nominal interest rate) to ln(1 + inflation rate)	Negative
$EXT_{i,t-1}$	Past Exit Rate The number of exits at time $t-1$ over the number of total firms at time $t-1$	Positive

TABLE II
Descriptive Statistics (462 observations)

Variable	Mean	Standard Deviation	Minimum	Maximum
ENT	0.11183	0.06749	0.00000	0.43519
EXT	0.10455	0.05437	0.00000	0.26667
ADV	0.00929	0.01749	0.00006	0.27053
IG	0.08329	0.30554	−0.71100	2.03860
EX	0.20050	0.23952	0.00002	1.78257
CON	0.09680	0.08173	0.00640	0.38930
PRO	0.30842	0.08972	0.11718	0.60814
RENT	0.00226	0.00471	0.00000	0.08263
MES	23.63799	1.23768	19.50844	26.58278
r	1.083674	0.086387	0.975519	1.254865
CAP	14.17728	0.81536	11.43018	16.41175

overcome the possible endogeneity problem with the dependent variable.

Estimation results are given in Table III. All the variables in the table are defined as first differences. While the second column of the table (labeled as Model 1) shows the estimation results with only microeconomic variables, the third column (labeled as Model 2) presents the result of estimating the model with both the microeconomic variables and the real interest rate. The F values shown in these columns indicate that the models perform quite well. In addition, Sargan test statistics for Model 1 and Model 2 are calculated to be 18.25 and 17.58, respectively, suggesting that overidentifying restrictions hold. Finally, while the null hypothesis of no first-order autocorrelation for the residuals is rejected with $z = -6.97$, the null hypothesis of no second-order autocorrelation cannot be rejected with $z = -1.54$. This result is just as expected since the model is estimated in first differences.

As can be seen from the table, past entry has a positive effect on current entry according to both estimation results. If there is high rate of entry at the previous period, the firms follow the entrants and enter that industry in the current period, so entry may be viewed as a "follow-up" process in Turkey.

TABLE III
Determinants of Entry in Turkish Manufacturing

Variables	Model 1	Model 2
Constant	−0.0036	0.013025
	(0.0026)	(0.004013)
ENT_{-1}	0.3370[a]	0.229682[b]
	(0.1002)	(0.09643)
MES	0.0372[a]	0.312004[b]
	(0.0143)	(0.134117)
CAP	−0.0118	−0.00305
	(0.0136)	(0.012966)
ADV	0.1978	0.037715
	(0.2702)	(0.253821)
PRO_{-1}	0.1626[b]	0.144143[c]
	(0.0843)	(0.079159)
IG	0.0553[a]	0.054061[a]
	(0.0158)	(0.014872)
CON	−0.4399[b]	−0.49365[b]
	(0.2076)	(0.234092)
EX	−0.0343	−0.04149
	(0.0595)	(0.054163)
RENT	−0.4348	−0.01071
	(0.9666)	(0.025299)
EXT_{-1}	−0.0484	−0.00619
	(0.0893)	(0.084534)
r	–	−0.29855[a]
		(0.067305)
F	5.16[a]	6.77[a]
Sargan Test	18.25	17.58
AR(1)	−7.18[a]	−6.97[a]
AR(2)	−1.61	−1.54

Notes: Figures in parentheses are standard errors.
[a]significant at 1%, [b]significant at 5% and [c]significant at 10%.

The two incentive variables, past profit rate and industry growth rate, are found to be significant and positively related to entry as expected. This result indicates that potential entrants observe the industry, and when they see a profit opportunity (positive past profit rate) and a growing demand, they decide to enter. However, the inclusion of the real interest rate in the model decreases the significance of the past profit rate. Lower real interest rates indicate a better economic environment where profits may be higher, so some of the effect of past profit on entry may be captured by the real interest rate.

Another significant variable in both columns of the table is concentration ratio. A negative relationship was found between concentration and entry. This suggests that the collusion hypothesis seems to hold at least for some of the Turkish manufacturing industries. That is, high concentration may facilitate collusion between incumbent firms, enabling them to erect strategic entry barriers.

It can be seen in the table that the real interest rate has a highly significant negative coefficient. This suggests that the macroeconomic environment in the country has an important effect on entry decisions in manufacturing industries. The reason may be that investors prefer to keep sure assets rather than bear the risk of a new business start-up or high opportunity costs. Whatever the reason, the real interest rate seems to be taken into consideration by investors for entry decisions.

The last significant variable in both columns of the table is the minimum efficient scale. Unexpectedly, the coefficient of this variable is found to be positive. In order to check whether this is due to a multicollinearity problem, we calculated the partial correlation coefficients between the explanatory variables. They are all very low with one exception. The minimum efficient scale variable seems to be highly correlated with the concentration ratio variable ($r = 0.86$). However, dropping one of these variables does not have an important effect on the remaining variable, nor on the other exogenous variables in the model. We have also estimated different models by dropping some of the variables thought to be theoretically correlated. The results seem to be highly robust to such alternative specifications.

Another explanation for this unexpected result may be found in studies suggesting that in industries where the minimum efficient scale is high, many small firms enter the market, and the survival rate of these small firms is usually high (Audretsch, 1995). This may be related to Sutton's (1998) concept of submarkets. In industries with a high MES, small firms may be expected to have a greater ability to find a niche in a submarket where the MES is below the average industry MES.

The rest of the variables in the entry equation do not seem to have significant effects on entry. An insignificant coefficient for the past exit variable might mean that an exit in the previous period does not make room for entrants in the

current period. It should be noted that an exit study for the same set of industries and the same time period indicates a similar result with respect to the effect of entry on exit, namely entry at the current period has no effect on exit (Günalp and Cilasun, 2005). Therefore, entry and exit behaviors do not seem to be a replacement process in Turkish manufacturing industries. This result is different from what has generally been found for developed countries and may be the case if Turkish manufacturing industries have not yet arrived at their saturation points; in other words, if full capacity level has not yet been reached in those industries.

We have also carried out the OLS and random effects estimations, which helped us to determine the impact of fixed effects on other variables. RENT and CAP variables, which do not have great time variation, increased in significance as expected. Hence, the fixed effects may capture the effects of these variables.

In addition, we have included time dummies in the model to capture the effects of all other macroeconomic shocks. The results show that the coefficients of time dummies have the expected signs and are mostly significant. The negative sign on the 1994 dummy may reflect the adverse effects of the severe economic crisis experienced in that year while a similar coefficient for the 1999 dummy may reflect the effects of both the recession and the devastating earthquakes. On the other hand, dummies for 1995 through 1998 are all positive and gradually increasing in magnitude, indicating the existence of a recovery period after the 1994 economic crisis.

5. Conclusion

This study aims to analyze the determinants of entry behavior in Turkish manufacturing by using data on 66 four-digit industries for the period 1993–1999 by employing dynamic panel data techniques. For the first estimation, the results show that the past profit rate, the industry growth rate and the past entry rate are statistically significant and affect entry positively. Based on these results, it can be argued that new firms observe the industry they are planning to enter, and entry is a "follow-up" process. The concentration ratio is another significant variable. The negative parameter on this variable might suggest that in Turkish manufacturing industries with higher concentration ratios, incumbent firms may act in a collusive way to deter entry. Therefore, industries with high concentration ratios, where firms abuse their dominant positions, should be regulated to promote entry and to increase competition.

Adding a macroeconomic variable in the model does not change the picture much, indicating that results concerning the microeconomic variables are generally robust. Only the significance of the past profit rate decreases with the inclusion of the real interest rate, probably because it captures some part of the influence of past profit on entry. The estimation results indicate that the real interest rate is an important factor adversely influencing the entry decision in Turkish manufacturing. Thus, it would be recommended for the government to decrease persistently high real interest rates not only to attain macroeconomic stability but also to increase competition and efficiency. To achieve that end, Turkey has implemented various disinflation programs in recent years supported by the International Monetary Fund.

Finally, the results of the study show that exit does not make room for entry. This suggests that entry, in general, does not seem to be a replacement process in Turkish manufacturing industries during the period studied. An explanation for this finding could be that firms and sectors in Turkish manufacturing have not yet reached their optimal sizes.

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Notes

[1] There is considerable empirical evidence that firms' rational decisions on entry, survival, and exit lead to macro (industry) level total factor productivity growth. See, for example, Baily et al. (1992), Tybout (1992), Liu (1993), and Haltiwanger (1997).

[2] Lotti and Santarelli (2004) present evidence for the Italian manufacturing industries that the selection and learning processes are much slower in traditional consumer goods (bread) and in mature industries (radio and television) than in technologically progressive industries (office machinery) and in industries exploiting the externalities of industrial districts (footwear).

[3] The findings of a cross-country study of ten OECD countries by Bartelsman et al. (2003) suggest that the entry of small firms is relatively easy while that of larger firms is more difficult. In addition, and more importantly, while many small firms exit the market before reaching the minimum efficient scale, surviving firms tend to grow rapidly.

[4] i and t subscripts denote industry and year, respectively.

[5] As suggested by an anonymous referee, the existence of a long gestation period for investment could be another justification for including past entry rate as an independent variable. Although the firms may decide to enter at the same time, their entrance could occur on different dates for several reasons such as differences in their abilities to finance the required investments.

[6] Since new entries will in turn lead to an increase in the output of the industry, the inclusion of the current industry growth rate may cause an endogeneity problem. In order to overcome this problem, industry growth rate has been used as an instrumental variable.

[7] As another important indicator of the economic environment, gross domestic product is included in the equation. However, its inclusion resulted in very poor estimations mainly because it is highly collinear with some variables in the equation. Therefore, results of estimating the model with this variable are not presented in the study.

[8] For panel data models and estimation techniques, see Hsiao (1986), Mátyás and Sevestre (1996), and Baltagi (2001).

References

Acs, Z. J. and D. B. Audretsch, 1989, 'Small-Firm Entry in US Manufacturing', *Economica* **56**(222), 255–265.

Aquilina, M., R. Klump and C. Pietrobelli, 2006, 'Factor Substitution, Average Firm Size and Economic Growth', *Small Business Economics* **26**(3), 203–214.

Arellano, M. and S. Bond, 1991, 'Some Tests of Specification for Panel Data: Monte Carlo Evidence and An Application to Employment Equations', *Review of Economic Studies* **58**(2), 277–297.

Audretsch, D. B., 1991, 'New Firm Survival and the Technological Regime', *Review of Economics and Statistics* **73**(4), 520–526.

Audretsch, D. B., 1995, *Innovation and Industry Evolution*, Cambridge, MA: MIT Press.

Audretsch, D. B., 2002, 'The Dynamic Role of Small Firms: Evidence from the U.S', *Small Business Economics* **18**(1–3), 13–40.

Audretsch, D. B., E. Santarelli and M. Vivarelli, 1999, 'Start-up Size and Industrial Dynamics: Some Evidence from Italian Manufacturing', *International Journal of Industrial Organization* **17**, 965–983.

Audretsch, D. B. and M. Vivarelli, 1995, 'New-Firm Formation in Italy: A First Report', *Economics Letters* **48**(1), 77–81.

Baily, M., C. Hulten and D. Campbell, 1992, 'Productivity Dynamics in Manufacturing Plants', *Brookings Papers on Economic Activity, Microeconomics*, 187–249.

Bain, J. S., 1949, 'A Note on Pricing in Monopoly and Oligopoly', *American Economic Review* **39**(2), 448–464.

Bain, J. S., 1956, *Barriers to New Competition*, Cambridge, MA: Harvard University Press.

Baldwin, J. R. and M. Rafiquzzaman, 1995, 'Selection versus Evolutionary Adaptation: Learning and Post-entry Performance', *International Journal of Industrial Organization* **13**(4), 501–522.

Baltagi, B. H., 2001, *Econometric Analysis of Panel Data*, New York, NY: John Wiley & Sons Ltd.

Bartelsman, E., S. Scarpetta and F. Schivardi, 2003, *Comparative Analysis of Firm Demographics and Survival: Micro-Level Evidence for the OECD Countries*, Paris, France: OECD Economics Department Working Papers, no. 348. OECD.

Beck, T., A. Demirgüç-Kunt and R. Levine, 2005, *SMEs, Growth, and Poverty. NBER Working Paper Series, no. 11224*, Cambridge, MA: National Bureau of Economic Research.

Beesley, M. E. and R. T. Hamilton, 1984, 'Small Firms' Seedbed Role and the Concept of Turbulence', *Journal of Industrial Economics* **33**(2), 217–231.

Berument, H. and K. Malatyali, 2001, 'Determinants of Interest Rates in Turkey', *Russian and East European Finance and Trade* **37**(1), 5–16.

Blanchflower, D. G. and A. J. Oswald, 1990, *What Makes a Young Entrepreneur? NBER Working Paper Series, no. 3252*, Cambridge, MA: National Bureau of Economic Research.

Cabral, L. M. B. and J. Mata, 2003, 'On the Evolution of the Firm Size Distribution: Facts and Theory', *American Economic Review* **93**(4), 1075–1090.

Caves, R. E. and M. E. Porter, 1976, 'Barriers to Exit', in P. D. Qualls and R. Masson (eds.), *Essays on Industrial Organization in Honor of Joe S. Bain*, Cambridge, MA: Ballinger, 39–70.

Collins, N. R. and L. E. Preston, 1968, *Concentration and Price-Cost Margins in Manufacturing Industries*, Berkeley, CA: University of California Press.

Collins, N. R. and L. E. Preston, 1969, 'Price-Cost Margins and Industry Structure', *Review of Economics and Statistics* **51**(3), 271–286.

Comanor, W. S. and T. A. Wilson, 1967, 'Advertising, Market Structure and Performance', *Review of Economics and Statistics* **49**(4), 423–440.

Comanor, W. S. and T. A. Wilson, 1974, *Advertising and Market Power*, Cambridge, MA: Harvard University Press.

Comanor, W. S. and T. A. Wilson, 1979, 'The Effect of Advertising on Competition: A Survey', *Journal of Economic Literature* **17**(2), 453–476.

Dixit, A. K., 1979, 'A Model of Duopoly Suggesting a Theory of Entry Barriers', *Bell Journal of Economics* **10**(1), 20–32.

Dixit, A. K., 1980, 'The Role of Investment in Entry Deterrence', *Economic Journal* **90**(357), 95–106.

Eaton, B. C. and R. G. Lipsey, 1981, 'Capital, Commitment, and Entry Equilibrium', *Bell Journal of Economics* **12**(2), 593–604.

Ericson, R. and A. Pakes, 1995, 'Markov-Perfect Industry Dynamics: A Framework for Empirical Work', *Review of Economic Studies* **62**(1), 53–82.

Fotopoulos, G. and N. Spence, 1998a, 'Entry and Exit from Manufacturing Industries: Symmetry, Turbulence, and Simultaneity – Some Empirical Evidence from Greek Manufacturing Industries, 1982–1988', *Applied Economics* **30**(2), 245–262.

Fotopoulos, G. and N. Spence, 1998b, 'Accounting for Net Entry into Greek Manufacturing by Establishments of Varying Size', *Small Business Economics* **11**(2), 125–144.

Geroski, P. A., 1995, 'What Do We Know about Entry?', *International Journal of Industrial Organization* **13**(4), 421–440.

Gilbert, R. J., 1989a, 'Mobility Barriers and the Value of Incumbency', in R. Schmalensee and R. D. Willig (eds.), *Handbook of Industrial Organization*, Amsterdam, Holland: North-Holland Publishing Company, 475–535.

Gilbert, R. J., 1989b, 'The Role of Potential Competition in Industrial Organization', *Journal of Economic Perspectives* **3**(3), 107–128.

Greene, W. H., 2000, *Econometric Analysis*, Upper Saddle River, NJ: Prentice Hall.

Günalp, B. and S. M. Cilasun, 2005, Türk Imalat Endüstrilerinde Piyasaya Giriş ve Piyasadan Çikiş: Bir Dinamik Panel Veri Analizi' [Entry and Exit in Turkish Manufacturing Industries: A Dynamic Panel Data Analysis], in 2004 *Turkish Economics Congress*, vol. 4, Ankara, Turkey: State Planning Organization, 341–367.

Haltiwanger, J., 1997, 'Measuring and Analyzing Aggregate Fluctuations: The Importance of Building from Microeconomic Evidence', *Review of the Federal Reserve Bank of St. Louis* **79**(3), 55–77.

Hopenhayn, H. A., 1992, 'Entry, Exit, and Firm Dynamics in Long Run Equilibrium', *Econometrica* **60**(5), 1127–1150.

Hölzl, W., 2002, *Exit, Entry and Industry Turbulence in Austrian Manufacturing 1981–1994. Vienna University of Economics and Business Administration Working Paper Series, no. 21*, Vienna, Austria: Vienna University.

Hsiao, C., 1986, *Analysis of Panel Data*, Cambridge, MA: Cambridge University Press.

Ilmakunnas, P. and J. Topi, 1999, 'Microeconomic and Macroeconomic Influences on Entry and Exit of Firms', *Review of Industrial Organization* **15**(3), 283–301.

Jovanovic, B., 1982, 'Selection and the Evolution of Industry', *Econometrica* **50**(3), 649–670.

Judd, K., 1985, 'Credible Spatial Preemption', *Rand Journal of Economics* **16**(2), 153–166.

Kessides, I. N., 1991, 'Entry and Market Contestability: The Evidence from the United States', in P. A. Geroski and J. Schwalbach (eds.), *Entry and Market Contestability*, Oxford, UK: Basil Blackwell, 23–48.

Khemani, R. S. and D. M. Shapiro, 1986, 'The Determinants of New Plant Entry in Canada', *Applied Economics* **18**(11), 1243–1257.

Liedholm, C., 2002, 'Small Firm Dynamics: Evidence from Africa and Latin America', *Small Business Economics* **18**(1–3), 225–240.

Liu, L., 1993, 'Entry-Exit, Learning and Productivity Change', *Journal of Development Economics* **42**(2), 217–242.

Lotti, F. and E. Santarelli, 2004, 'Industry Dynamics and the Distribution of Firm Sizes: A Nonparametric Approach', *Southern Economic Journal* **70**(3), 443–446.

Macdonald, J. M., 1986, 'Entry and Exit on the Competitive Fringe', *Southern Economic Journal* **52**(3), 640–652.

Mann, H. M., 1966, 'Seller Concentration, Barriers to Entry, and Rates of Return in Thirty Industries, 1950–1960', *Review of Economics and Statistics* **48**(3), 296–307.

Mata, J., 1991, 'Sunk Costs and Entry by Small and Large Plants', in P. A. Geroski and J. Schwalbach (eds.), *Entry and Market Contestability*, Oxford, UK: Basil Blackwell, 49–62.

Mata, J., 1996, 'Small Firm Births and Macroeconomic Fluctuations', *Review of Industrial Organization* **11**(2), 173–182.

Mátyás, L. and P. Sevestre, 1996, *The Econometrics of Panel Data: A Handbook of the Theory with Applications*, Boston, MA: Kluwer Academic Publishers.

Orr, D., 1974, 'The Determinants of Entry: A Study of the Canadian Manufacturing Industries', *Review of Economics and Statistics* **56**(1), 58–65.

Pakes, A. and R. Ericson, 1998, 'Empirical Implications of Alternative Models of Firm Dynamics', *Journal of Economic Theory* **79**(1), 1–45.

Rosenbaum, D. I. and F. Lamort, 1992, 'Entry Barriers, Exit, and Sunk Costs: An Analysis', *Applied Economics* **24**(3), 297–304.

Santarelli, E. and M. Vivarelli, 2002, 'Is Subsidizing Entry an Optimal Policy?', *Industrial and Corporate Change* **11**(1), 39–52.

Schumpeter, J. A., 1934, *The Theory of Economic Development*, Cambridge, MA: Harvard University Press.

Shapiro, D. M. and R. S. Khemani, 1987, 'The Determinants of Entry and Exit Reconsidered', *International Journal of Industrial Organization* **5**(1), 15–26.

Spence, A. M., 1977, 'Entry, Capacity, Investment and Oligopolistic Pricing', *Bell Journal of Economics* **8**(2), 534–544.

Spence, A. M., 1979, 'Investment Strategy and Growth in a New Market', *Bell Journal of Economics* **10**(1), 1–19.

Sutton, J., 1990, 'Endogenous Sunk Costs and Industry Structure', in G. Bonanno and D. Brandolini (eds.), *Market Structure in the New Industrial Economics*, Oxford, UK: Oxford University Press, 22–37.

Sutton, J., 1991, *Sunk Costs and Market Structure Industry Structure: Price Competition, Advertising and the Evolution of Concentration*, Cambridge, MA: MIT Press.

Sutton, J., 1998, *Technology and Market Structure: Theory and History*, Cambridge, MA: MIT Press.

Taymaz, E., 1997, *Small and Medium-Sized Industry in Turkey*, Ankara, Turkey: State Institute of Statistics.

Taymaz, E., 2005, 'Are Small Firms Really Less Productive?', *Small Business Economics* **25**(5), 429–445.

Tybout, J. R., 1992, 'Linking Trade and Productivity: New Research Directions', *World Bank Economic Review* **6**(2), 189–211.

Vivarelli, M., 2004, 'Are All the Potential Entrepreneurs So Good?', *Small Business Economics* **23**(1), 41–49.

Wang, Y. and Y. Yao, 2002, 'Market Reforms, Technological Capabilities and the Performance of Small Enterprises in China', *Small Business Economics* **18**(1–3), 197–211.

Weeks, J., 2003, 'Small Manufacturing Establishments in Developing Countries: An Empirical Analysis', *International Review of Applied Economics* **17**(4), 339–359.

Wiboonchutikula, P., 2002, 'Small and Medium Enterprises in Thailand: Recent Trends', *Small Business Economics* **18**(1–3), 213–226.

Yamawaki, H., 1991, 'The Effects of Business Conditions on Net Entry: Evidence from Japan', in P. A. Geroski and J. Schwalbach (eds.), *Entry and Market Contestability*, Oxford, UK: Basil Blackwell, 168–186.