PATTERNS OF FIRM GROWTH
IN THE TURKISH MANUFACTURING INDUSTRY

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# ABSTRACT

PATTERNS OF FIRM GROWTH
IN THE TURKISH MANUFACTURING INDUSTRY

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The main objectives of this dissertation are five-fold: First, to examine the relationship between employment generation and firm growth; second, to explore the impacts of firm and sector specific factors on firm growth by using conventional techniques; third, to discover the patterns of firm growth by using a novel statistical approach; fourth, to analyze the determinants of patterns of firm growth; and finally, to investigate the pattern-specific determinants of firm growth by taking into account the pattern selectivity. The main contributions of the thesis are to explore all possible empirical patterns of firm growth, to capture the significant factors that affect the patterns of firm growth and to examine the firm growth process based on the pattern selection and to investigate how the determinants affect firm growth with respect to different patterns.

The results show that despite the fact that it is difficult to classify firms into those patterns through observable variables, patterns of firm growth exist and can be identified by statistical techniques. Dynamics of growth differ across patterns because the pattern selection matters for firm growth. Moreover, the growth process may differ by patterns, and theories of firm growth need to be tested according to the patterns of firm growth. In other words, predictions of a given theory may hold for only some specific patterns, nor for all firms. Our analysis shows that the analysis of growth patterns provides better insights to understand the dynamics of growth. This implies that policy-makers should pay attention to the growth patterns and life-cycles of firms.

Keywords: Firm growth, Patterns of firm growth, Employment generation, Manufacturing, Turkey.

ÖZ

TÜRKİYE İMALAT SANAYİİNDE FİRMA BÜYÜME ÖRÜNTÜLERİ

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Bu tezin temel amaçları; firma büyümesi ve istihdam katkısı bağını incelemek, firma, sektör ve bölge özelliklerinin firma büyümesi üzerindeki etkisini geleneksel yaklaşımlarla analiz etmek, firma büyüme örüntülerini ve bunları belirleyen etmenleri saptamak ve son olarak örüntü seçim yanlılığını düzelten iki aşamalı bir model yardımıyla firma büyümesini belirleyen örüntü-temelli etmenleri ortaya çıkarmaktır. Bu tezde katkı olarak; büyüme dinamikleri bağlamında mümkün olan tüm ampirik örüntüler özgün bir yöntemle ilk kez ortaya konmakta, büyüme örüntülerini belirleyen etmenler incelenmekte ve büyüme örüntülerinden kaynaklanan seçim yanlılığı sorununu düzelten bir tahmin tekniğiyle firma büyüme süreci her bir örüntüye göre farklı şekilde ele alınmaktadır.

Sadece gözlenebilen etmenler çerçevesinde ele alınsa bile firma büyüme örüntüleri vardır ve tespit edilebilir. Örüntü seçimi etkisinden dolayı firmaların büyüme dinamikleri örüntüler arasında farklılık göstermektedir. Firma büyüme örüntülerinde varolan bu heterojen yapının hesaba katılması ve dolayısıyla politika yapıcıların bu örüntüleri ve firmaların yaşam döngülerini dikkate alması gerekmektedir.

Anahtar Kelimeler: Firma büyümesi, Firma büyüme örüntüleri, İstihdam katkıları, İmalat sanayi, Türkiye.

In memory of my sister, Firuze Töngür

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CHAPTER 1

INTRODUCTION

Growth of firms has always been a popular research topic in economics as it is strongly linked with economic growth and employment generation. There has been a proliferation of empirical studies on firm growth in the last couple of decades thanks to the availability of firm-level longitudinal datasets. Econometric studies are mainly focused on testing Gibrat's (1931) law, which claims that growth rate and size of a firm are independent (see Santarelli et al., 2006 for a detailed survey). Most studies try to identify the determinants of growth rates by estimating growth rate equations (see Coad, 2009 for a detailed survey).

One major problem with those studies is the fact that they assume all firms are drawn from the same distribution and their objectives are all the same, i.e., all firms grow in the same way conditional on a set of control variables. However, this assumption is likely to be invalid because the entrepreneurs do not share the same objective and they are faced with different sets of opportunities and constraints.

The pattern of firm growth is critically important. Although there are few studies identifying and analyzing the patterns of firm growth, they have focused on growing firms alone. Moreover, most of them have tried to group or cluster the firms by their 'growth rates' (e.g., Delmar et al., 2003 and Garnsey et al., 2006).

Inherently, a firm can grow, decline or remain steady in size. Starting from this standpoint, our methodology is an attempt to identify the patterns of new firm growth for all firms, including the declining ones. In order to uncover different growth dynamics over time, we use all information available on the growth rates of firms over their life-cycles, and classify firms into various patterns by using statistical techniques.

We suggest that it would be more informative and productive to address directly the problem of heterogeneity and, hence, to focus on the *patterns* of growth instead of *rates* of growth. Some firms are likely to grow continuously by entering into different sub-markets. While the size of some firms is likely to converge to a certain level that is determined by technological and market conditions, some firms are likely to remain at the entry level due to the entrepreneurs' preference. Identification of patterns of growth and their determinants have also significant policy implications, because if firms are destined to different patterns of growth, public policy should take into account those differences, and different policies should be adopted for different types of firms.

The main objectives of this dissertation that covers the Turkish manufacturing sector for the period 1980-2001 are five-fold: First, to examine the relationship between employment generation and firm growth; second, to explore the impacts of firm and sector specific factors on firm growth by using conventional approaches to firm growth; third, to discover the patterns of firm growth in relation with the entry size and sectors; fourth, to analyze the determinants of patterns of firm growth; and finally, to investigate the pattern-specific determinants of firms growth by taking into account the pattern selectivity in this process.

To the best of our knowledge, firm growth process has not been analyzed from the perspective of all possible empirical patterns of firm growth on the one hand, and that of firm's growth rate equation with selection bias correction for those patterns on the other hand. In particular, we take into account significant heterogeneity of firms and their growth processes. The first contribution of this dissertation is to explore all possible empirical patterns of firm growth in line with all growth dynamics of the firms (i.e., not only for growing firms) for all available years for the firms. We suggest an original strategy to identify the patterns of firm growth by using some particular statistical tools for the first time. The second contribution of the study is to capture the significant factors that affect the patterns of firm growth. The final contribution of this dissertation is to examine the firm growth process based on the pattern selection and to investigate how the determinants affect the firm growth with respect to different patterns.

This dissertation is composed of seven chapters. Following this introductory chapter, Chapter 2 provides the theoretical and empirical literature review of firm growth.

Chapter 3 deals with the relationship between employment generation and firm growth for Turkish manufacturing. The chapter highlights the stylized facts so as to uncover the sources of employment generation in line with age, size, and survival of the firms. This chapter also examines the connection between firm size distributions, employment generation, and growth.

The main firm-specific determinants of firm growth are firm size, age, productivity, and capital intensity, as shown by the related literature on firm growth. Chapter 4 investigates those effects as well as sectoral and regional ones using conventional empirical techniques to firm growth in the case of Turkish manufacturing. This chapter utilizes diverse methods to clarify the effects of determinants on firm growth. In addition, the effects in question with respect to all age cohorts are analyzed in order to elicit whether or not “age” matters in firm growth process.

On the basis of unsatisfactory knowledge on the heterogeneity of firms and their growth processes from the previous studies, Chapter 5 explores all possible empirical patterns of firm growth in line with all growth dynamics of firms by suggesting an original strategy to identify patterns of firm growth. Besides, the links of these patterns to initial size and specific industries are examined. By using the discovered patterns, this chapter goes one step further to capture significant factors affecting the patterns of firm growth in Turkish manufacturing with special attention to successful strategic choices of the firm.

Chapter 6 investigates the pattern-specific determinants of firm growth based on the existence of selectivity in growth process by exploiting a more appropriate methodology. Regressions based on the selection correction are conducted to examine the effects of the firm-specific, sector-specific, and regional variables on firm growth in the Turkish manufacturing sector. Specifically, this chapter deals with how the existence of patterns affects the firm growth dynamics with a particular focus on selectivity bias.

Chapter 7 provides the overall summary, conclusions and suggestions for further research.

CHAPTER 2

FIRM GROWTH: A LITERATURE REVIEW

2.1 Introduction

In the fast-globalizing world economy, firms constitute the cornerstone of the economic growth and development of countries. Although there is a large amount of studies in the empirical literature on firm growth over the last decades, there is no unique theory that covers all dimensions of firm growth process. Focusing on specific aspects, the conceptual frameworks have attempted to capture some characteristics of firm growth. Rather than categorizing these, we highlight their main assumptions and mechanisms.

Particularly, we review six theories of firm growth that belong to neoclassic view, stochastic approach, life-cycle models, resource-based view, evolutionary approach, and learning models in the following section. Then, we review the empirical literature of firm growth with special attention to subsequent chapters of thesis.

2.2 Theories of Firm Growth

2.2.1 Neoclassical Approach

Neoclassical theory assumes that a representative firm behaves to achieve profit-maximizing level of production. Using economies of scale, the firm decreases its cost till ‘optimal size’, i.e., minimum point of the long run average cost curve (Viner, 1932). Thus it grows. However, a rational firm has no incentive to grow more than that it has succeeded in attaining minimum efficient scale within the industry in which it operates. This implies that the process of firm growth ends at optimal size of the industry. Therefore, neoclassical approach focuses on optimal size of an industry, and it does not have a particular interest on firm growth per se. Hence, it asserts that once firms achieve the optimal size, they are assumed not to grow any longer (Coad, 2009: 100).

The transaction cost theory (Coase, 1937) and their linkages to firm growth have also been discussed in the context of neoclassical view with special attention to acquisition (e.g., Kay, 2000) and cross-country differences (e.g., You, 1995). In addition, neoclassical economists have analyzed the relationship between firm size and post-entry performance of firms via static and dynamic approaches (Mazzucato, 2000). Specifically, the static approach refers to the framework of structure-conduct-performance in which there is one-way linear direction from structure to conduct to performance within microeconomic theory. On the other hand, the dynamic approach takes into account the feedback from performance to structure. Imperfect market theory, and technical, pecuniary, external, dynamic economies of scale have also been discussed within the context of neoclassical approach (Hart, 2000).

The main shortcoming of the neoclassical approach is that firm growth is always limited by the optimum size within the industry. Thus, it has less realistic assumptions about the linkages between firm growth and market structure and suffers from lack of real evidence (Storey and Greene, 2010: 236).

2.2.2 Stochastic Approach

Stochastic approach originated by the seminal study of Gibrat (1931), which set a baseline for most of empirical studies on firm growth since then. Gibrat suggested that the growth rate of a firm and its size are independent, so-called ‘Gibrat law of proportionate effect’. Then, the small and large firms have the same probabilities of succeeding any specific growth rate in any period. Sutton (1997) summarizes the main result of Gibrat’s Law as follows: There is no optimum size within the industry that firms converge on; the probability of growth is independent of initial firm size, thus expected growth and its variance are the same for all firms; over time and within the industry, past growth does not affect current growth because of lack of correlation between them; firm size distribution rises in time, thus market concentration is higher when the number of firms does not change; variability of growth rates is the same for all sizes, implying the equality of variance of firm growth rates between small and large firms. In sum, Gibrat's Law asserted that "probability that the next opportunity is taken up by any particular active firm is proportional to the current size of the firm" (Sutton, 1997: 43).

Gibrat's law is an argument for stochastic behavior of firm growth. Hence, the law implies that some firms are lucky and they grow while other firms are unlucky and they decline (or remain the same size). In this sense, Scherer (1970: 128) highlighted some determinants of firm growth that are stochastic as follows:

> (…) the hiring of key executives, research and new product development decisions, legal disputes involving critical patents, the choice of an advertising campaign theme, or a thousand and one other decisions among attractive but uncertain alternative courses of action. Given the operation of chance in these elemental decisions, high or low sales growth follows in a more traditionally deterministic manner (Scherer, 1970: 128).

Gibrat's 'law of proportionate effect', in fact, asserted that there are numerous factors affecting firm growth but those do not favor any theory (McMahon, 1998). The law accepts that none of the causes underlying the growth process has a major impact on growth over time alone. This implies that each variable can explain only a very small portion of the proportionate growth of the firm. One can criticize the law of proportionate effect on the basis of its lack of a theoretical base. Although it predicts testable arguments, the relevant literature has strong doubts about the validity of Gibrat's law (Santarelli et al., 2006).

2.2.3 Life-Cycle Models

Life-cycle models (sometimes called stages of growth), assume that the firm growth process is an evolution from birth to maturity (or death). This implies that a firm grows through successive sequential stages. Probably the most popular model in this sense is Grenier's model. Grenier (1972) presented a life-cycle model of firm, which includes five separate stages of sequential development. A firm progresses through episodes of evolution and revolution, referring to growth stages. In the context of episodes of evolution, the firm grows through creativity, direction, delegation, coordination, and collaboration. Corresponding revolution episodes for those are crises of leadership, autonomy, control, red tape, respectively. Every stage is an effect of previous stage, and also the cause for the next stage. Specifically, according to this model, a small young firm is a creative enterprise and has to cope with a crisis of leadership if it grows. If the management in the firm achieves capability, the firm moves into a period of growth characterized as the direction stage. Then, the crisis of autonomy will be solved if the firm grows through delegation. As the firm decentralizes its organizational structure, the crisis of control of top management may emerge. So the firm steps into the coordination phase and grows. The red tape crisis implies the existence of bureaucratic problems, and team work or capable managers can succeed in moving the firm into the collaboration stage. Note that Greiner assumed that there is one more crisis, called as unknown.

Churchill and Lewis (1983) also introduce a five-stage model from a different perspective. Their stages are called as ‘existence, survival, success, take-off and resource maturity. The life-cycle approach literature has several other examples of stage models with five stages (e.g., Thompson, 1976) or more (e.g., Parks, 1977).

The life-cycle models have a prescriptive nature and highlight the structural transformations as well as the firm growth. Thus they provide some important insights to the firms in the context of transition between stages (Hofer and Charan, 1984).

Firms encounter crucial problems and obstacles and do not instinctively progress from one stage to another. However, life-cycle models do not have detailed explanations and mechanisms to explain how those transitions may be achieved (Coad, 2009: 141-142). In addition, some other criticisms of these models arise from the existence of one-size-fits-all approach and too deterministic perspectives in these models (Whetten, 1987; Penrose, 2009; Storey and Greene, 2010). Finally, Levie and Lichtenstein (2010) have concluded that the stages model of entrepreneurial growth do not provide clear evidence of firm growth and development. Having reviewed the literature of the last 40 years, they pointed out that there is no consensus on defining the stages and that the literature lacks proper evidence about the reasons behind the transitions.

2.2.4 Resource-Based View

Resource-based view treats on the firm as a bundle of resources (Rumelt, 1984), and assumes that the firm operates based upon its resources. It this sense, this view deals with resources, talents, boundaries, and thus competitive advantage of the firm. This approach was introduced by the seminal book of Penrose (1959), *The Theory of the Growth of the Firm*. Penrose (1959) is the first comprehensive analysis of the firm growth process. Her theory grounds on Schumpeter's theory of development. Schumpeter (1934) identifies an entrepreneur that exploits the competitive advantage by understanding the new opportunities within the industry. In this sense, the entrepreneurial firm has to configure its operations to use alternative available resources. Penrose takes this hypothesis of Schumpeter as the starting point in her theory of firm growth. She asserted that changing productive opportunity and restrictions to growth should be explained in firm growth process in the context of resource accumulation process in time. Therefore, the heterogeneity in those resources and different combinations of them have led Penrose to claim that the firm is composed of idiosyncratic configurations of resources rather than a production function.

Penrose focused on her concept of 'economies of growth'. By learning by doing, managers of the firm become more productive over time since the problems encountered become routinized while they were hard to cope with initially. Specifically, as managers gain more and more experience, problem solving requires less energy. Also, excessive managerial capabilities are used to create values for growth opportunities. Firms will have strong incentive to grow since "the knowledge possessed by a firm's personnel tends to increase automatically with experience" (Penrose, 1959: 76). Inevitably, this process takes time and effort. However, once this process is over, the firm grows so as to create new resources. Penrose claimed that "managerial services are the only resource firms should make use of" (Penrose, 1959: 48). Thus the main resources underlying the firm growth process are managerial ones, which have a crucial role and they lead to expansion of firm and their absence restrains the expansion process. As expected, the resources exploited by the firm must be valuable, rare, imperfectly imitable and non-substitutable for the firm to succeed in the growth process (Dierickx and Cool, 1989; Barney and Zajac, 1994; Eisenhardt and Martin, 2000; Storey and Greene, 2010). Note that Winter (1995) made an analogy between evolutionary concept of organizational routines and Penrosian notion of resources, and he claimed that the routines can be considered as resources.

Briefly, the resource based approach underlines the importance of knowledge within a firm. It considers the firm growth process that originate from internal and endogenous creation and accumulation process of specific resources to achieve competitive advantage (Penrose, 1959; Chandler, 1962).

Resource-based view on firm growth suffers from a number of shortcomings. One of the criticism stems from the uniqueness of resources as a basic growth driver. The interactions within the firm and industry are important and cannot be isolated from the firm growth process (Henderson and Mitchell, 1997). Also, which one of the tangible and intangible resources (or assets) is more important is unclear. Finally, the resource based view seems more applicable to the large-sized firm's strategic management practices than small entrepreneurial firms (Storey and Greene, 2010). However, note that some authors have analyzed the early periods of new firms' (or young firms') growth by using the Penrosian concepts (e.g., Garnsey, 1998; Hugo and Garnsey, 2005; Garnsey et al., 2006).

2.2.5 Evolutionary Approach

Evolutionary economic theory is based on the vision of Schumpeter. His concepts are process of creative destruction and diversity creation and selection within the dynamic economic environment. The contemporary economy is characterized by technical change and surging competition. Dynamic view of competitive advantage can provide more appropriate understanding for industrial economics than the concepts of mainstream economics.

Within the path-dependent characteristics of the industry, evolutionary mechanism of selection asserts that 'fitter' firms survive and grow while the others decline and exit the industry Alchian (1950). Downie (1958) presented an industrial development model in which firms grow by reinvesting their returns and raise their profits and thus grow again. Having set a turbulent competition in the market, Nelson and Winter (1982) introduce a micro-simulation model in which firms can increase their competitive advantage via exploring innovations or imitating the best practice in the industry. Similar to Downie's model, more profitable firms grow and less successful firms lose their market share. Moreover, agent-based simulation models have extensively been used in evolutionary economics (inter alia, Dosi et al., 1995; Marsili, 2001; and Dosi et al., 2006).

Evolutionary paradigms intrinsically imply 'growth of the fitter'. However, Coad (2009) claimed that it is better to assume that selection works only by elimination of the weaker with or without growth. In this sense, with a simulation model, Van Dijk and Nomaler (2000) asserted the importance of survival of the fitter, rather than growth of the fitter.

2.2.6 Learning Models

Learning models deal with the firm growth phenomenon in the context of productivity and survival. Jovanovic (1982) introduced a 'passive learning model', by describing a chaotic process (so–called noisy selection) for small firms. His model is based on productivity level of the firm. Specifically, every firm has a firm-specific productivity level. Although a firm does not entirely know its productivity level upon entry, it can learn its relative productivity after entry. The survival prospects and growth of the firms are bound by their productivity levels because firms tend to produce inefficient output levels. As the firm operates more and gains more knowledge about its efficiency and performance, the decisions of the firm will be affected. In a sense, this model attaches a particular importance to the age of the firm so as to understand the effect of the ability of a firm to learn its efficiency level. Consequently, passive learning model asserts that efficient firms will grow and survive while those that are inefficient will decline and exit the industry. This implies that small firms encounter either faster growth or face failure risk. According to this model, if small firms are characterized by an inferior size relative to the minimum efficient scale, they will increase their size, i.e., they grow. Thus, Gibrat's law does not hold in this case. However, Gibrat's law would be accepted for the firms that operate above the minimum efficient size. Therefore, passive learning model take into account heterogeneity of firm growth according to firm size and efficiency levels.

On the other hand, Ericson and Pakes (1995) and Pakes and Ericson (1998) highlight the crucial role of 'active learning process'. In this case, firms also explore their environment and invest to raise their capability so as to gain more efficiency faced with competition both within and outside the industry. Some factors such as ability to innovate, entrepreneur characteristics, and structure of the industry will affect the decision of the firm to remain in business depending on a favorable evolution of the industry. The firm grows if it is successful while declines or fails otherwise.

To sum up, learning models recognize heterogeneity of firms, dynamics of firms and their efficiency level that determine their survival chances and growth. Also, this approach emphasizes firm's ability to learn the environment and use the correct strategies to grow.

2.3 Empirical Studies on Firm Growth

2.3.1 Employment Generation and Firm Growth

Firm growth is of importance in terms of employment generation as well as resource allocation, competitive pressure and market structure.

Recent decades have witnessed a rapid increase in research on high growth firms, the so-called *gazelles*, a term introduced by Birch (1981), and their employment generation. Coad et al. (2014) emphasize the importance of high growth firms in the economy:

> On safari, tourists' cameras are focused on gazelles, waiting for a sudden spurt of photogenic action. But the ecologist's eye is drawn to the beauty of the humble dung beetle and how its machinations help maintain the health of a complex ecosystem. Why then would economists want to focus on economic gazelles, the small percentage of high-growth firms (HGFs) in the economy, given the complexity of modern industrial ecosystems? (Coad et al., 2014: 92).

The answer to the 'why' question above must surely be connected to employment generation and industrial policy. Thus, in this sense, the quotation from Dennis (2011) may give the intuition behind this high interest on employment generation of small firms: "(…) the basic issue for policymakers is jobs. Policymakers need jobs; smaller firms produce jobs; so small business remains a central focus for many policymakers" (Dennis, 2011: 92).

Birch's (1979) seminal study, has presented the evidence that small firms are more important than their large counterparts in job creation although large firms have the largest share of employment at any point in time. He has also claimed that significant employment destruction originated by large firms causes a dynamic process within an industry, ending up with employment creation of small firms, as well as job destruction of large firms. Birch (1981) and Birch et al. (1995) have continued to make the same argument.

However, among others, Brown et al. (1990) and Davis et al. (1996) have criticized Birch's findings and claimed that the relationship between firm size and job creation are ambiguous. Moreover, Neumark et al. (2011) and Haltiwanger et al. (2013) have asserted that there is no systematic association between firm size and employment generation when the age of the firm is controlled for. One implication of these studies is that it is the young firms that create significant amount of jobs, whether they are small or not.

Also, having reviewed the empirical literature on the economic contribution of both small and young firms, Van Praag and Versloot (2008) have reached the conclusion: "entrepreneurs create more employment than their counterparts, relative to their size. This result is unambiguous. Small and young firms are required to boost employment".

On the other hand, there is a clear stylized fact from the empirical literature, which implies that small firms either do not grow or they just grow slowly. Thus, a few high growth firms become vitally important because employment generation within an economy stems from small number of (high growth) firms or from a small percentage of all firms (inter alia, Storey, 1994; Brüderl and Preisendörfer, 2000; Davidsson and Henrekson, 2002; Delmar et al., 2003; Littunen and Tohmo, 2003; Halabisky et al., 2006; Acs and Mueller, 2008; Acs, 2011). For instance, Storey (1994) found that only four percent of all firms create fifty percent of the jobs.

Besides, some studies have compared the employment share of gazelles for different countries (e.g., Schreyer, 2000; Bravo-Biosca, 2010). More recently, the determinants of being a gazelle have also been investigated (among others, Lopez-Garcia and Puente, 2012; Hölzl, 2013; Segarra and Teruel, 2014; Daunfelt et al., 2014; Brenner and Schimke, 2014).

To sum up, the literature indicates that employment generation (in manufacturing industry) is largely originated by a small number of high growth firms; i.e., gazelles are significantly crucial for job creation. In this sense, Henrekson and Johansson (2010) have highlighted the importance of them especially during the times of recession when gazelles continue to grow. Moreover, from the point of view of 'age' the literature suggests that young (or younger) firms create particular employment. In case of the size effect, the results are rather ambiguous. Henrekson and Johansson (2010) and Coad et al. (2014) have underlined the fact that although small firms are overrepresented, gazelles can be of any size and large-sized gazelles are also crucial for employment generation.

A recent branch in the literature examines the behavior of firm size distribution. The conventional view of independency between firm size and firm growth, which was put forward by Gibrat (1931), implies that firm size distribution is approximately log normal and stable over time. However, Dunne et al. (1989), by analyzing firm growth together with size, age, and survival as a deterministic outcome of firm characteristics concluded that Gibrat law fails to hold for small firms. Within the concept of noisy selection and learning after entry, Jovanovic (1982); Hopenhayn (1992), and Ericson and Pakes (1995) have focused on firm turnover in young firms within the industry. Moreover, some studies from recent literature have also criticized the Gibrat law (e.g., Sutton, 1997; Lotti and Santarelli, 2004). On the other hand, with the support of empirical evidence, Cabral and Mata (2003) have asserted an evolutionary view to firm size distribution and claimed that the size distribution of young firms is very right-skewed and thus small firms account for the most of the mass. However, they stated that the skewness reflects a tendency to decrease monotonically with firm age. This implies that the size distribution of older firms is more symmetric than their younger counterparts. Note that the findings of Cabral and Mata (2003) have also been backed up by more recent studies (e.g., Angelini and Generale, 2008).

There are some previous studies that examine the structure of firms' employment generation in the Turkish manufacturing sector. For instance, Taymaz and Voyvoda (2009) and Taymaz (2010) have analyzed employment-growth link, employment generation and productivity in the Turkish manufacturing industry for the post-2001 period.

Using plant level data of TurkStat for the different sub-periods of 1980-2001, some studies have analyzed the employment generation process in Turkish manufacturing with special attention to trade liberalization, productivity, competition, FDI and technology spillovers (Özler et al. 2004; Taymaz, 1998, 2001), labor demand and wage (Taymaz, 2006, 2007).

Finally, La Turco and Maggioni (2013) have used micro-level databases of TurkStat for the period 2003-2008. They have analyzed the effects of importing, exporting, and two-way trading on firm labor demand by using the sample of 8,500 firms in Turkish manufacturing. Having used multiple propensity score matching algorithms, the authors found that a positive effect of internationalization on firm employment. They have also underlined that the employment generation impact of firm internationalization implies its significant positive impact on firm production scale.

2.3.2 Conventional Analysis of Firm Growth Regressions

The phenomenon of firm growth has been studied from diverse theoretical perspectives such as the neoclassical view, stochastic approach, resource based view, and learning models that are reviewed in section 2.2. However, as opposed to theory based view of firm growth, the data-driven approaches dominate the firm growth literature. In this sense, the following quotation can give more insights: "(...) it is probably the case that every theoretically reasonable suggestion for a growth determinant has been shown to have the predicted impact in some context" (Davidsson et al., 2005: 2).

Why some firms grow more than others? A huge amount of empirical literature over the last decades tries to answer this question. Within this context, the firm growth issue is crucial on account of creative destruction and resource allocation, competitive pressure and market structure, and employment generation. The recent empirical literature has studied the determinants of firm growth in several disciplines, such as economics, firm strategy, entrepreneurship research, and network theory. For example, the focus on the relationships between firm growth and both size and age is more common in economics. Besides, the strategy view deals with the association between growth, business strategy, and environment. The entrepreneurship research concentrates on the behavior of the entrepreneur as well. Hence, the literature on firm growth is quite fragmented and there is no holistic style to examine firm growth (Davidsson and Wiklund, 2006; Wiklund et al., 2009).

Although the large body of empirical literature on firm growth has been deprived of a solid knowledge (Storey, 1994; Davidsson et al., 2005; Gilbert et al., 2006; Davidsson et al., 2007; Wiklund et al., 2009; Shepherd and Wiklund, 2009; Coad 2009; Kiviluoto et al., 2011 and Davidsson and Wiklund, 2013), some of the main determinants of firm growth may be distilled from the empirical literature. In this sense, Storey and Greene (2010) provide a useful survey of diverse characteristics of firm growth. They categorize the determinants of firm growth into three groups: pre start-up characteristics of the entrepreneur (age, gender, ethnicity, education, specific sectoral experience, prior managerial experience, family, partners, unemployment, and personality), at start-up factors of the firm (initial size, legal form, sector and location), and post start-up characteristics (formal business plans, workforce training, entrepreneurial skills, strategy, external environment, source of finance, and innovation).

On the other hand, regarding the variables used in this study, we can categorize the determinants of firm growth into three broad categories: entrepreneurial characteristics, environmental factors, and firm attributes.

Entrepreneur’s individual features, experience, and intention to grow are the most important determinants of firm growth on account of entrepreneurial characteristics (Baum et al., 2001; Delmar, 1996; Shane et. al., 2003).

The main environment characteristics of firm growth studied in the empirical literature are sector-specific attributes, competitive structure of the market, dynamism, growth opportunities, and spatial dimensions (Audretsch and Mahmood, 1994; Baldwin and Gellatly, 2003; Samundsson and Dahlstrand, 2005; Wiklund et al., 2009)

Firm's own attributes as the determinant of firm growth deserve more attention. First of all, one of the main determinants of growth is firm size. The growth-size nexus has been studied extensively in the literature since Gibrat's seminal study, Gibrat (1931). Gibrat suggested that the growth rate of a firm and its size are independent, the so-called Gibrat law (of proportionate effect). Then, the small and large firms have the same probabilities of achieving any certain growth rate in any period. This means an argument for stochastic behavior of firm growth. Hence, the law implies that some firms are lucky and they grow whereas other firms are unlucky and they decline (or remain the same size).

Earlier studies, which were focused on large firms in general, found either no or positive relationship between firm size and firm growth (Hart and Prais, 1956; Singh and Whittington, 1975). On the other hand, a significant number of more recent studies indicate that growth rate tends to be negatively associated with firm size (Evans, 1987a, 1987b; Hall, 1987; Dunne et al, 1989; Reid, 1995; Audretsch et al., 1999; Almus and Nerlinger, 2000). That is, the results of these studies have implied that small firms grow faster.

Consequently, Gibrat law has been tested in a large number of empirical studies yielding rather mixed results. Having examined many previous studies that tested the Gibrat law, Santarelli et al. (2006) have underlined the fact that one cannot reach a clear conclusion: Neither the law generally holds, nor is it systematically rejected. Nonetheless, the law of proportionate effect has still a central position regarding the empirical regularity on firm growth (Sutton, 1998; Brock, 1999; Cabral and Mata, 2003).

Firm's age is another important determinant of firm growth. Jovanovic's (1982) model predicted a negative relationship between age and growth. Evans (1987a, 1987b) showed that firm growth decreases with age, thus implying that the firm's age is a crucial determinant in explaining firm growth. This finding has also been revealed in several empirical studies such as Dunne et al. (1989), Dunne and

Hughes (1994), Geroski (1995), Sutton (1997), Becchetti and Trovato (2002), and Yasuda (2005).

There is a vast literature on the analysis of the relation between firm's performance and its growth (see Coad, 2009 and Storey and Greene, 2010 for detailed surveys). Theoretical approach suggests that firms with relatively higher performance have relatively higher growth rates compared to those with low performance. Empirically, firm performance can be measured via profits or productivity. The results of the empirical research vary depending on the variables used. For example, Robson and Bennett (2000) find a statistically significant positive relationship between level of profits and firm growth if they use "sales growth" as an indicator of firm growth. However, when they repeat their analysis by using "employment growth" as an indicator of firm growth, they reveal that this relationship becomes statistically insignificant. On the other hand, Guariglia (2008) divides the firms as higher profitable firms and lower profitable firms. Then he has analyzed the relationship between profits and firm growth for those groups separately. He has found a positive relationship for the first group but a negative relationship for the second group.

Firm growth may be linked to the evolution of industry (Nelson and Winter, 1982; Jovanovic, 1982; Ericson and Pakes, 1995; Pakes and Ericson, 1998). These authors have emphasized the crucial role of uncertainty, learning and selection process. The firms do not know their own levels of capability and productivity before the entry; they can observe their performance after entry. If they experience lower performance than a certain level, they exit (Jovanovic, 1982). On the other hand, Ericson and Pakes (1995) and Pakes and Ericson (1998) put forward an active learning model. If the firm observes that its productivity level is high it then has a particularly higher probability to survive, and thus grow.

Note that the firm growth is an outcome of the combination of firm-specific resources, capabilities, and routines from the perspective of evolutionary view (Nelson and Winter, 1982). In this context, Coad (2009) has also claimed that the opportunities of a firm's growth are closely related to the production activities of the firm. Therefore, path-dependency is an important issue in explaining firm growth. The relationship between firm growth and either productivity or profitability implies the allocation of scarce resources among heterogeneous firms within an industry (Baily and Farrell, 2006). Also, there is some empirical support for the positive effect of productivity on firm growth (Coad, 2009).

There are several studies that examine the determinants of firm growth in Turkey based on small-sample surveys. However, their samples are not representative of Turkey. For instance, Baştürk and Ödül (2008) use a sample of 30 firms, which is obtained from ICI-500 dataset[1]. Karaöz and Demirgil (2009) examine 60 manufacturing firms that operate in Burdur and Isparta. Özmen et al. (2010) use a sample of 127 firms from ICI-1000 data. Gürbüz and Akyol (2009) examine 221 small manufacturing firms in İstanbul. Kozan et al. 2006 use a sample of 526 entrepreneurial firms from 14 major cities in Turkey. Finally, Şeker and Correa (2010) analyze approximately 1000 Turkish firms from the World Bank's Enterprise Surveys.

Although Özar et al. (2008) do not use TurkStat's micro-level databases, it is worth to mention their study here. The authors use a cross-sectional sample of about 4,000 micro and small enterprises from 19 provinces in Turkey based on a survey that was conducted in 2001. They have analyzed the growth of firms during two separate periods, namely the pre-crisis period and the time of the crisis. The authors found negative effects of size and age on firm growth. They, on the other hand, highlighted detrimental effects of the crisis on micro and small firms. The study has also pointed out that the several factors that contributed to the growth of the firms immediately lost their influence at the time of the crisis. Moreover, it has been

[1] ICI-500 refers the top 500 manufacturing firms of Turkey announced by Istanbul Chamber of Industry as well as ICI-1000 denotes the top 1000 manufacturing firms of Turkey.

shown that the positive impact of some factors turn out to be negative at the time of crisis in the study.

The number of empirical studies on firm growth that utilize TurkStat's micro-level databases and that are significantly representative of Turkish manufacturing is low. In this sense, Taymaz (1997) is the first study that dealt with firm growth regression in Turkish manufacturing. In a comprehensive manner, this study has analyzed SMEs in Turkish manufacturing with respect to employment, production structure, technological structure, efficiency, entry, survival and growth. He has used a longitudinal sample of 1,010 firms for the period 1986-1992 in Turkish manufacturing within the context of firm growth regressions. He has used several explanatory variables so as to capture their effects on firm growth. Some of them can be listed as follows: size (employment) of the firm, share of technical personnel, relative productivity, relative wage rate, profit margin, advertisement intensity, R&D intensity, communication intensity, ownership dummies, sectoral entry rate, concentration, and sectoral growth rate. The author has found that the effects of relative productivity, R&D intensity, corporation and public dummies are significant and positive on growth rates of firms.

Secondly, Özler and Taymaz (2004) have concentrated on the relationships between foreign ownership, survival and growth in the Turkish manufacturing sector for the period 1984-1995. They have estimated firm growth regression using the Tobit model for a longitudinal sample of 7,346 firms. The authors found that the effects of firm's age, subcontracting output and interest intensity are negative on firms' growth rates. Besides, foreign ownership, capital intensity, advertisement intensity, subcontracting intensity, profit margin, wage rate, export intensity, R&D intensity, shared of imported machinery, and sectoral growth rates positively affect firm growth. On the other hand, they found that employment size has positive or no effect on growth of firm.

And most recently, Taymaz and Yılmaz (2014) analyzed foreign ownership, survival and growth dynamics in Turkish manufacturing for the periods 1984-2001 and 2003-2009, separately. Although they have mainly focused on the effects of foreign spillovers on survival and the growth of firms, a significant number of explanatory variables in that study are the same with those used in this dissertation (e.g., size in terms of employment, age of the firm, capital intensity, subcontracting input and output intensities, ownership of the firm, 4-digit industrial variables of entry size, concentration, minimum efficient scale, and sectoral growth). They utilized Heckman model and GMM-system technique to estimate firm growth equation for the Turkish manufacturing sector. Having used a longitudinal sample of approximately 18,000 firms for the period 1984-2001, the authors found negative effects of size, age, subcontracting output, and concentration on firm growth as well as positive impacts of capital intensity, subcontracting input, foreign ownership, sectoral entry rate, and minimum efficient scale.

2.3.3 Patterns of Firm Growth

In the context of growth process of the firm, probably the most popular theoretical approach is the life-cycle model, sometimes called stage model, which assumes that firms encounter diverse stages as they grow. From the life-cycle approach literature, various scholars have suggested some sequences of stages over time (e.g., Greiner, 1972; Churchill and Lewis, 1983; Hanks and Chandler, 1995). However, these approaches have been criticized on account of inconsistent growth measure and being too deterministic (e.g., Whetten, 1987; Storey, 1994; Penrose, 2009).

In case of the literature on empirical patterns of growth, previous studies have focused on growing or fast-growing firms, only. Moreover, most of them have tried to group or cluster firms by their ‘growth rates’. One of the earliest studies in this context is McMahon (2001). He has examined 871 SMEs in Australian manufacturing for the period 1994-1998 using a clustering analysis based on employment, sales, and assets. He has determined three development pathways, namely low, moderate, and high growth. Using a cluster analysis McKelvie and Chandler (2002) have analyzed 3938 firms in Sweden for the period between 1994 and 2000, and revealed the following eight patterns: small start, moderate start, plateau, low initial growth, start small and grow rapidly, start relatively large and grows at a more moderate rate, up and down. Considering 1501 high growth firms in Sweden for the years 1987-1996, Delmar et al. (2003) have identified the following seven growth patterns: super absolute growers, steady sales growers, acquisition growers, super relative growers, erratic one-shot growers, employment growers, and steady overall growers, based on employment, sales and acquisition. Garnsey et al. (2006) have analyzed a total of 398 firms from UK, Germany, and Netherlands for the period 1995-2000. The authors have identified four paths, namely continuous growth, growth setback, early growth and/or plateau, delayed take-off and growth, using a sequence analysis based on employment. Using the data of 5187 firms from Australia and Sweden for the period 1995 and 2000, Davidsson et al. (2009) have set five patterns as poor, middle, growth, profit, and star, based on sales and profit. For the years 2007-2008, Cowling and Liu (2011) have examined 3506 firms in UK, and identified four patterns based on past employment growth and future growth ambitions as follows: no growth, new growth, contained growth, sustained growth. Diambeidou and Gailly (2011) have analyzed 1220 firms in Belgium for the period 1992 to 2002. The authors identified four trajectories of growth, called as question marks, seed, boutique, and star, based on principal component analysis that makes use of employment, sales, assets, and financial variables.

Consequently, the previous literature that is concerned with the empirical patterns of growth points out the heterogeneity of the determinants describing firm growth process. The results of those empirical studies cannot be compared directly due to their different coverage in terms of methods, growth measures, time period, etc. However, they provide strong evidence for the existence of distinct growth patterns.

Almost all previous studies have focused on high growth firms (or so-called gazelles) to analyze the determinants of firm growth with special attention to some growth categories. There are three streams in this empirical literature in terms of regression methods. The first one is to use bivariate dependent variable to clarify the determinants of being high growth firms. The other two methods are multivariate regression techniques, with ordered or multinomial dependent variable.

First of all, logit or probit regressions are commonly used for bivariate dependent variable with maximum likelihood estimation so as to determine the probability of being high growth firms. A number of studies have used bivariate categories of firm growth in the literature; here we mention some of those studies. One of the first studies in this context is Littunen and Tohmo (2003). The authors examined 200 start-up firms from the Finnish manufacturing and services sectors for the period 1990-1997. They have aimed to compare the firms in the top high growth category, whose sales more than doubled in real terms over the period of 1990–1997, with the other surviving companies. The authors have found that internal networks create competitive advantage, innovation and efficiency; cooperation with other firms and external personal networks contributed to the high rates of growth; and high growth firms are characterized by productivity increase as they were generating employment.

Similarly, Littunen and Virtanen (2006, 2009) have used the same data to investigate the determinants of probability of being high growth firms. The latter studies have found that the human capital and environmental factors do not explain the growth. Besides experience, training and motivation have significant effects to differentiate growing ventures from non-growth firms.

For the period 1996-2003, 1411 firms from Spain were examined by Lopez-Garcia and Puente (2012). They have used a combined indicator for employment growth based on Birch et al. (1995) and Schreyer (2000) so as to classify the firms as high growing. Lopez-Garcia and Puente (2012) have found that the past extreme growth episodes and skilled labor increase the probability of current fast growth. Also, newness and access to credit have been found significant for firm growth, but not for fast employment growth. Moreover, the authors have claimed that the determinants of fast growth should not be the same as the determinants of normal growth, which reflects the existence of nonlinearities in the growth process of firms.

Hölzl (2013) has analyzed the survival, persistence, and growth of fast-growing firms after their fast-growth period, using a dataset of more than 10,000 Austrian firms for the period between 1985 and 2007. He used two definitions for high growth firms. The first one of these identifies high growth firms as firms with at least 10 employees in the starting year, and an annualized employment growth exceeding 20% during a 3-year period (Eurostat-OECD definition). The other one is the product of absolute and relative growth (Birch Index). On the basis of logistic regression, he used propensity score algorithm to match high growth firms with the other firms (control group). He investigated both the determinants of survival and growth for the comparison between them. The author found that high growth firms have much higher growth rates than their control counterparts. On the other hand, endogenous structure of firm growth was emphasized in the study.

Arrighetti and Lasagni (2013) used the data of more than 700 firms from Italy for the period 1998-2003. They investigated the internal and external characteristics of these firms on the probability of being a high growth firm. Having defined top 10% of the fastest-growing firms, they used two different measures of firm growth, according to employment and sales, separately. They concluded that high growth firms were characterized by high productivity and high quality of human capital; besides most of them were young.

Brenner and Schimke (2014) ascertained whether firm characteristics are related to firm growth and the development paths of firms, controlling for innovation and export behavior of the firms by using a panel data on 178 German firms over the period 1992 to 2007. They consider four, five, and six time steps out of seven times for growth period, respectively. Moreover, based upon employment, they identified several alternative cut-offs for mainly four growth-paths: growth, stagnation, decline, and mixed. Then, they conducted bivariate estimation for each sub-path. Main finding of their study is that determinants of growth paths are not the same as the determinants of firm growth at one point in time. Moreover, the authors underlined that smaller firms have higher probability to have growth paths, but larger firms are more likely to have stagnation or declining paths.

Daunfelt et al. (2014) dealt with more than 5,000 firms from Sweden for the period 1997-2010. The authors used relative, absolute and composite definitions for employment, sales, productivity, and value added; ending up with 27 different groups of high growth firms in their study. They reached that high growth firms based on employment are not same as those in terms of productivity, and their contributions to the economy differ significantly. However, they emphasized that young firms were more likely to be high growth firms, irrespective of the definition.

The second approach in using categorical dependent variable exploits ordered probit or ordered logit regression techniques, which allows use of multivariate dependent variables. In this case, growth categories of the firms are defined for ordinal levels of growth. By using this approach, Foreman-Peck et al. (2006) analyzed more than 1600 Welsh SMEs for the period between 1998 and 2001. They defined three ordinal growth categories based on sales and employment: no and low growth, medium growth, and high growth. The authors found that the characteristics of the firms related to innovation, marketing plan, and being in the finance sector have strongly positive effect on growth.

For the period 2000-2001, 582 SMEs from Argentina, Brazil, Mexico and Peru were examined by Capelleras and Rabetino (2008). They identified the firms' growth categories based on employment; called as high, medium, low and non-growth firms. The authors reached the conclusion that growth significantly depends on the characteristics of the entrepreneur, firm-specific factors, and national environment. Moreover, they highlighted that firm growth is to a particular extent externally determined, but the entrepreneurial and firm-related factors affect the growth of new firms directly.

Krasniqi (2012) analyzed the effects of entrepreneur and human capital factors, firm-specific factors, strategy, and external environment on the growth of small firms in Kosovo for the period 2002-2004 by using the data of 451 growing firms. He described three levels of growth in terms of employment: low, moderate, high. The author reached that small firms grow faster than larger firms. Also, the firms that are located at the capital city or had two or more plants experienced higher growth than other firms. Moreover, he claimed that education of owner and training activities for managers have particular impact on growth.

Schmit and Hall (2013) examined the determinants of growth categories of 348 food processing firms from New York for the years 2008-2009. They aggregated growth categories based on sales into five categories: strongly negative, moderately negative, zero, moderately positive, and strongly positive. The authors concluded that younger firms had higher annual revenue growth rates than older firms; and large firms had higher rates of growth due to economies of scale. Moreover, collaboration with other firms helped the firms to grow faster.

The relative performances of 58,211 Italian firms for the period between 2004 and 2012 were analyzed by Bruni et al. (2014). They have grouped the firms into three ordinal categories based on sales and return on equity: improving firms, stable firms, and shrinking firms. In order to see the effect of crisis, they compare firms' sizes between two periods, 2004-2007 and 2008-2012. Their analysis has shown that Italian firms performed relatively better if they were younger, and had a higher current liquidity ratio.

Another approach using multivariate dependent variable is to conduct multinomial logit estimation. Growth categories of the firms are defined for different types of growth in this approach. One of the earliest studies that used multinomial logit is Cooper et al. (1994). The authors examined a longitudinal data of 2994 new ventures from United States for the period between 1985 and 1987. They investigated the determinants of three growth categories based on employment, namely, failure, marginal survival (survived with low or no growth), and high growth. They included several variables concerning human capital, management know-how, industry-specific know-how, and financial capital. The study found that entrepreneur characteristics, industry-specific know how, and capital-intensive strategies contributed to survival and growth. Besides, they underlined more limited effect of management know-how variables on survival and growth.

Following Cooper et al. (1994), Dahlqvist et al. (2000) analyzed approximately 7000 new firms for the period 1995-1998 from Sweden. Moreover, they used also sales and profitability as alternative bases to classify growth categories. The findings of Cooper et al. (1994) were confirmed by the results in Dahlqvist et al. (2000).

871 small and medium sized firms from Australia for the period between 1994 and 1998 were examined by McMahon (2000). He defined low growth, medium growth, and high growth categories based on employment and sales. However, he pointed out the limited success of the specification of multinomial logit model for distinguishing high growth SMEs from other categories, and for the separation between low growth and moderate growth.

Parker et al. (2010) examined the data of 121 British medium-sized firms for the period 1996-2001. They used five growth categories based on sales turnover. The three of them referred to different growth classes, i.e., small, medium, large. The remaining categories were liquidation and acquisition firms. They underlined the importance of dynamic rather than static management strategies for British gazelles.

Levratto et al. (2010) investigated the structural and strategic determinants of firm growth for 12811 French manufacturing firms with employees between 10 and 250, which were active from 1997 to 2007. They defined four growth paths based on employment that can be considered as declining, more or less steady, slow growth, and fast growth. They pointed out that firm growth is not only a random process. Moreover, they found that size, legal structure, market share and localization are significant characteristics on the development of the individual growth path.

Finally, Khan and Siddiqi (2012) defined positive growth, negative growth and no growth categories based on employment. The determinants of growth categories of 237 electric fans producing (small) firms of Gujarat District for the period 2008-2010 were analyzed in this study. The authors found that entrepreneurial characteristics of the firms are of importance for growth in terms of employment generational activities.

To sum up, the previous literature related to the determinants of growth categories highlighted the heterogeneous structure in firm growth process in line with different growth categories or patterns. However, one can claim that those studies have diverse and arbitrary definitions to identify firm growth categories such as sample coverage, different cut-offs for categories, various growth measures, and different time intervals. Therefore, we cannot compare those results directly and we are not able to clarify the determinants of distinct growth patterns.

CHAPTER 3

EMPLOYMENT GENERATION AND FIRM GROWTH IN TURKISH MANUFACTURING

3.1 Introduction

In order to assess the production potential and industrial development of an economy, one needs to focus on the manufacturing industry. The employment share of SMEs in manufacturing is of particular importance because SMEs are an important source of employment generation in manufacturing industries. Moreover, new firms, that are assumed to be the source of new ideas, are small firms, and the entry and exit processes play an important role in the process of economic development. In this sense, the firm growth-employment generation nexus is crucial in terms of creative destruction, resource allocation, competitive pressure and market structure.

In this chapter, we examine the sources of employment generation process in Turkish manufacturing by addressing its relation to the growth of firms. We compare the distribution of total employment by age brackets to clarify the contributions of young and older firms to the overall employment generation in manufacturing industry. Job creation effects of firms at each entry year are investigated controlling for the survival effect. Next, we focus on employment dynamics of the new firms surviving for 10 years or more. In this way, we attempt to measure the contribution of high growth firms to job creation. We also examine the generation and destruction of employment by size class and survival. Decomposition of employment changes with respect to size, continuing (existing) firms, and entry and exit firms is provided in this chapter. Moreover, we analyze the relationship between firm growth, employment generation and size distributions. Lastly, we provide some stylized facts from the Turkish manufacturing industry, relating to year, age, sector, ownership, and survival structure.

The next section provides a very broad overview of the Turkish economy since 1980. The following section analyzes the employment generation-firm growth nexus. Finally, we give firm size distributions by cohorts so as to provide a link to employment generation and firm growth.

3.2 Turkish Economy since 1980

1980 was a cornerstone in Turkish economy. Before 1980, Turkish economy was mainly characterized by development strategy depending on import substitution, protectionist foreign trade policies, domestic oriented growth policies and crucial role of the state in the economy in the context of 5-year development plans. However, the new economic policy, which was first declared in January 24, 1980, had a completely different view. One of the main objectives of the new economic policy-making was to turn into export-oriented industrialization policy instead of import substitution, and thus support for exports by means of tax refunds and subsidies increased. Concomitantly, imports were liberalized, to pave the way for the dominance of market price mechanisms within the economy. Privatization, minimization of government interventions to the economy so as to bring market economy into force, and to decrease inflation were also elements of the new policy environment. In the financial system, there were particular decisions for liberalization of interest rates (1981), exchange rates (1984), and financial account (1989)[2].

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[2] There was a political instability due to the military coup in September 12, 1980, and therefore, the new economic policy started to be implemented by the military government for the period 1980-1983.

The growth path of the economy between 1980 and 2001, especially in 1990s, showed an unstable behavior, which was shaped by frequent boom-bust cycles, and rapid growth processes were ending up with severe economic crises (Şenses, 2003).

During the turmoil of the 1994 crisis, government declared a new program supported by the IMF. The aim included decreasing inflation sharply, supporting exports, performing structural reforms for economic stability, and reducing the share of the public sector within the economy. After the implementation of the program, some improvements on the ground of export increase, foreign capital inflows, and economic growth could be observed. However, because of the quite fragile characteristics of the economy, the improving effects of the program were temporary and did not solve the structural problems of the economy (Şenses, 2003, Boratav and Yeldan, 2006).

Following the crises of Asia (1997) and Russia (1998), another stabilization program was implemented at the end of 1999 so as to decrease inflation and real interest rates, and attain the economic recovery. Yet, a drastic capital outflow caused the liquidity crisis in November 2000, followed by the crisis in February 2001.

Transition to the Strong Economy Program was declared in May 2001. This program was actually some compilation of previous programs and coordinated with the IMF and the World Bank. It had quite comprehensive arrangements such as ensuring the autonomy of the Central Bank, removing duty losses of public banks, rearrangements of public borrowing and providing transparency of government budget, and enabling more efficient and competitive structure for some industries.

To sum up, the economic policies implemented in the period 1980-2001 has focused on export oriented growth instead of import substitution strategy, controlling the inflation and enabling the macroeconomic stability. However, one cannot claim a satisfactory performance for the Turkish economy for the period 1980-2001. The average (real) growth rate in this period was lower (3.5 percent) compared to that of the period 1960-1979 (5.1 percent) (TurkStat, 2014). Especially during 1990s, Turkish economy was exposed to high and chronic inflation, very high interest rates, and high public sector deficit (Boratav and Yeldan, 2006). Moreover, when most developing countries which had approximately similar levels of GDP per capita in 1980 succeeded to increase their GDP per capita by more than doubled for the period 1980-2001, Turkey showed a poorer performance (Taymaz et al., 2008).

Looking at selected indicators (from TurkStat, 2014) could provide some insight about the period 1980-2001 for the Turkish economy. Export promotions induced a significant increase in total exports. Exports were 7.1, 18.1, and 31.3 billion dollars in 1984, 1994 and 2001, respectively, whereas they were 2.9 billion dollars in 1980. The export shares in GNP were 4.2 and 22.0 percent in 1980 and 2001. The share of manufacturing in exports was 36.6 percent in 1980, and it reached 92.0 percent in 2001. Agricultural sector had 6.3 percent share in exports in 2001, whereas it had 56.0 percent in 1980. On the other hand, the share of imports in GNP was 11.4 percent and 28.6 percent in 1980 and 2001, respectively.

Sectoral distribution of national income for Turkey, that opened her markets to the global competition in 1980s, also changed significantly. The share of agriculture in GNP decreased sharply from 25.0 percent in 1980 to 12.5 in 2001. Industry’s share in GNP increased from 19.5 percent in 1980 to 27.5 percent in 2001. Therefore, regarding the contributions of different sectors to national output, one can observe a structural change that is in favor of industry and service sectors during the period 1980-2001. However, note that the share of industry was quite steady between 1986 and 2001 (TurkStat, 2014).

The share of private sector in manufacturing value added and employment increased drastically in this period, parallel to the policies implemented. Concomitantly, the share of public sector decreased from 40.5 percent in 1980 to 20.0 percent in 2001. Similarly, employment share of the public sector decreased to 10.0 percent in 2001, whereas it was 36.0 percent in 1980 (TurkStat, 2014).

During the same period, concentration ratios within the manufacturing sector decreased for labor intensive and scale intensive industries, while there was a slight increase for science based industries. The share of fixed capital investment of manufacturing in total investment decreased to 18.5 percent in 2001, while it was more than 30.0 percent before 1980. Also, the share of investment of manufacturing in GNP decreased from 7.9 percent in 1980 to 3.9 percent in 2001. Although manufacturing sector played an important role to increase the exports, note that overall production structure of manufacturing was not able to transform in this period due to the dominance of low value added industries (Şenses and Taymaz, 2003; Saygılı et al., 2005).

3.3 Sources of Employment Generation

This section provides a picture of employment generation in Turkish manufacturing by age, size class, sector, and survival characteristics. We also investigate the sources of job creation and job losses in this context.

Unless otherwise stated, throughout this dissertation, we use the micro-level databases of the Turkish manufacturing industry for the period 1980-2001, which are obtained from the Turkish Statistical Institute (TurkStat). We used a sample, which matches establishments from *Annual Surveys of Manufacturing Industries* and *Census of Industry and Business Establishments*. The sample used in the analyses includes 31,176 firms and 219,236 firm-year observations correspondingly. Overall, 22,536 firms were established from 1981 onwards, corresponding to 123,002 firm-year observations. So, we have 22,536 new firms and we can observe their characteristics every year since their start-ups. Note that the sample covers all public establishments, and all private establishments with 10 or more employees for the period 1980-2001 (see Data Appendix).

In order to examine employment generation of new firms, first we compute the total employment of age cohorts for each year. The total employment and total number of firms in the Turkish manufacturing sector by age interval and year, for the firms established since 1981 (new firms) are presented in Figure 3.1. Right panels of Figure 3.1 show the percentage distributions; the firm numbers are presented in the left hand side. First of all, note that the share of the youngest firms is more or less 40.0 percent for each year (except 1991). Also, the high share of young firms dominates the manufacturing sector. On the other hand, the employment share of them is not as high as their share in numbers. However, young firms provide a significant amount of employment. It is clear that the youngest firms provide 20.0 percent of total employment in manufacturing. Moreover, we observe that these firms significantly increase their shares in the next five years. Therefore, on average, entrants make up for 38.0 percent of total employment in manufacturing within ten years. Finally, they succeed to increase their employment share more than 50.0 percent in the first 15 years, although the rate of employment generation decreases slightly in their later years. Hence, we need to emphasize that the employment contribution of young firms is of vitally importance in manufacturing.

To check the employment dynamics by age according to each (entry year) cohort can help us to observe some stylized findings. The first panel of Figure 3.2 represents the total employment for entrants that belongs to each entry year by age for all new firms. We generally observe a declining pattern for cohorts; only a few of them increase their employment in some early years, and then decline. Note that 1985 and 1992 are the census years, in which data covers a larger number of new firms due to the concerted effort by TurkStat to include all establishments in the census years. Therefore, we can see higher total employment for census years as expected.

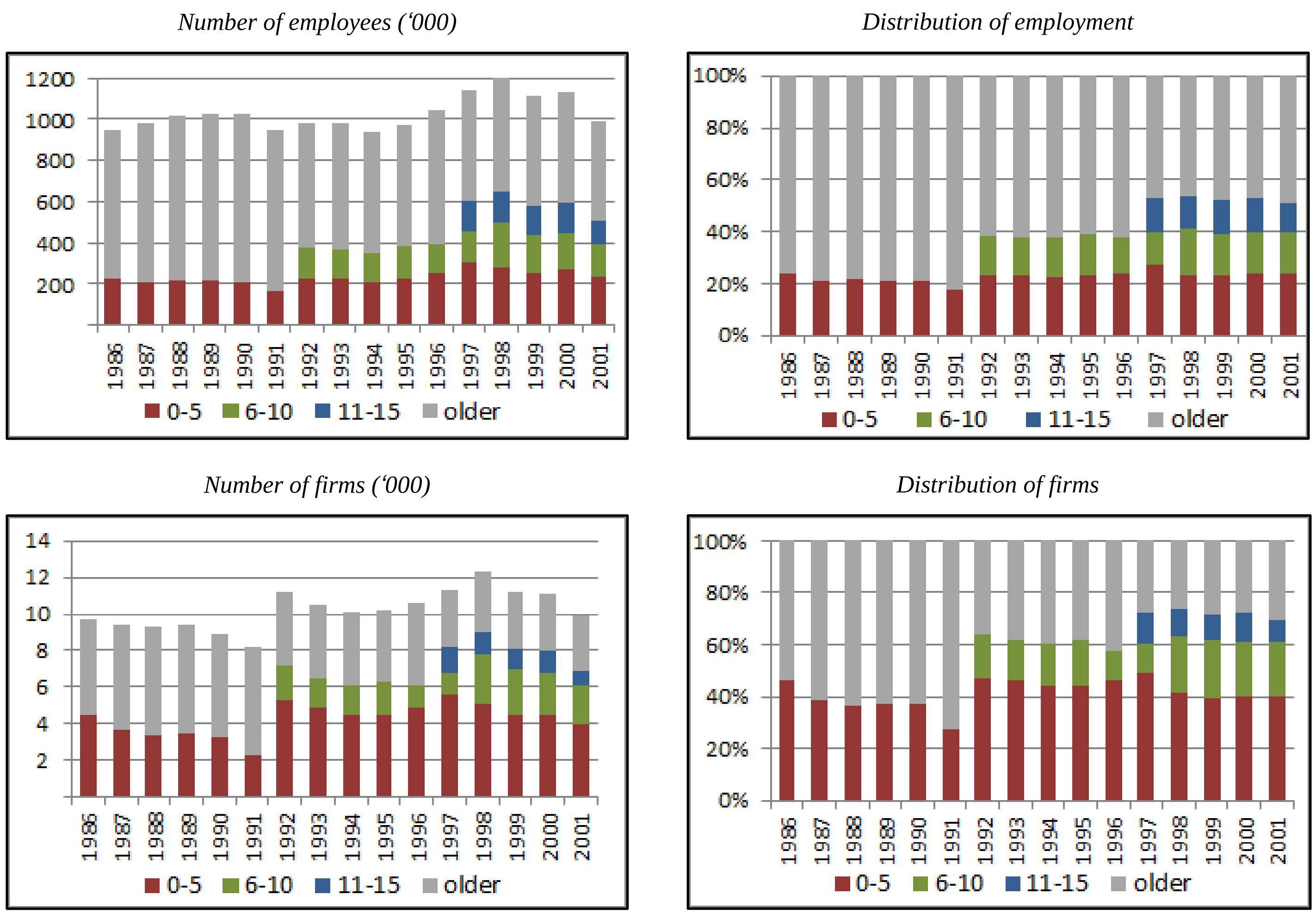
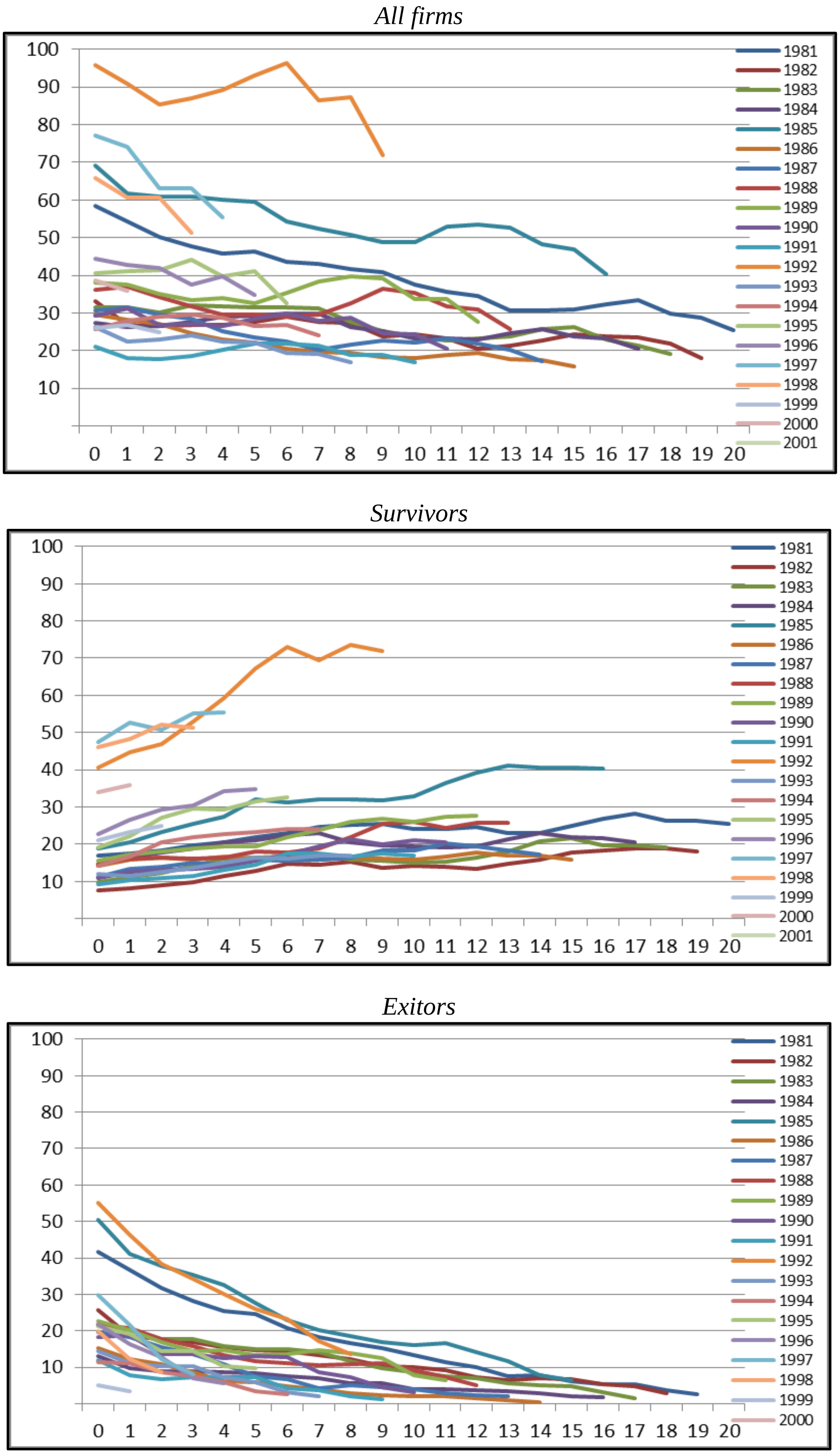


Figure 3.1: Total employment by age class for new firms



Note: Vertical axis shows total employment, horizontal axis shows age of the firms.

Figure 3.2: Employment by age and entry year
(New firms, 1000 employees)

The substantial effect of survival for the whole period can be clearly observed from the second panel of Figure 3.2. For all cohorts, total employment of the survivors is increasing with age. This indicates that entrants start small, but employment or size of them increases significantly over time. Also, it is clearly observable that surviving new firms grow really quite fast (and most probably reach the sector average). The prominent evidence for the employment generation of the survivor firms is supported by the decreasing total employment for the firms that exited the industry which is in the last panel of Figure 3.2. Moreover, it is apparent that the total employment of exitors does not increase after entry and the exitors tend to become smaller and smaller preceding their exit. The figure also shows that the smaller the entry size, the shorter the duration of survival. Also, it can be observed that survivors and exitors start up at almost the same size. Then, we can claim that if a firm grows above a certain threshold, it is more likely to survive. Besides, a firm can easily exit if its size declines. Hence, we can say that the size of the surviving firms most probably converges towards the sector average. This implies that new firms, if they survive, eliminate their size disadvantages in a relatively short time after entry.

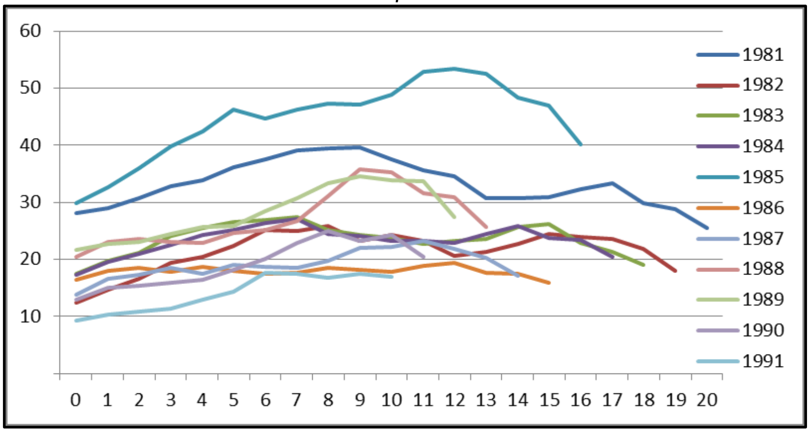
For the new firms surviving 10 years or more, which are amount to 2,986 firms in total, a check similar to the above analysis could give some insights about the survival effects for relatively old firms. The results are given in Figure 3.3. We clearly observe from the second panel of the figure that total employment for such survivor entrants increase significantly. Also, when we compare the effect of survival on employment growth in this case with the case in Figure 3.2 above, we can see the significant effect of both survival and being relatively mature firm on employment growth. The survivors grow faster than any other firms from age 10 onwards. On the other hand, the firms that exit from age 10 onwards also increase their employment until age 10; a phenomenon which can be observed from the last panel of Figure 3.3. Perhaps, the main reason for this observation is the need for growth for surviving at least 10 years; even when the firm becomes an exitor in any age after 10 years. Finally, Figure 3.3 also depicts that the survivors from age 10 onwards start with larger size than their exitor counterparts. Therefore, the entry size has a crucial role for both survival and for employment growth.

Table 3.1 provides the employment shares, employment generation, and growth within 10-year period for the new firms surviving 10 years or more. Employment share (out of total employment of all manufacturing in the corresponding year) of such firms increases for all cohorts. Note that the share of employment increases from 2.0 percent to 3.0 percent on average. Employment creation is the difference between employment at age 10 and at entry. On average 10,000 employees are created by each cohort. Therefore, total employment generation of ten cohorts is approximately 100,000 employees. This contribution is remarkable as compared to the average annual total employment in manufacturing, which is about 1,000,000. Finally, we observe that for each cohort, the new firms surviving 10 years or more grow more than 60.0 percent on average.

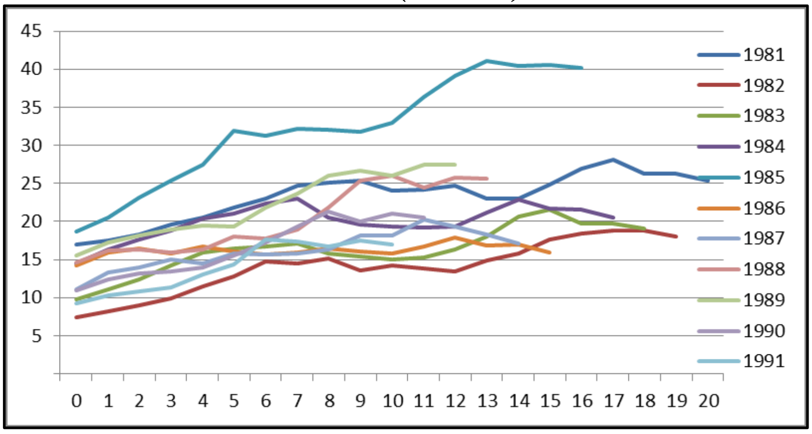
When it comes to the discussion for the top 200 firms, which have the highest employment generation, we can point out from Table 3.1 that the share of employment of top 200 firms increases from 0.35 percent to 1.00 percent on average. Total employment generation for ten cohorts of top 200 is approximately 80,000 employees, corresponding 8,000 employees on average for each cohort. This means that the most of the contribution to the manufacturing employment of all firms surviving 10 years or more originates from only 200 firms. We note that for each cohort, top 200 firms grow at a rate more than 250.0 percent on average.

Alternatively, we compute the employment shares, employment generation, and growth for top 200 firms that have the highest employment growth on account of 10-year growth instead of the creation of employment. Similar results are observed for employment generation; whereas for each cohort those top 200 firms grow at a rate more than 800.0 percent on average. Results for this group of top 200 firms are presented in Table B.1 of Appendix B.

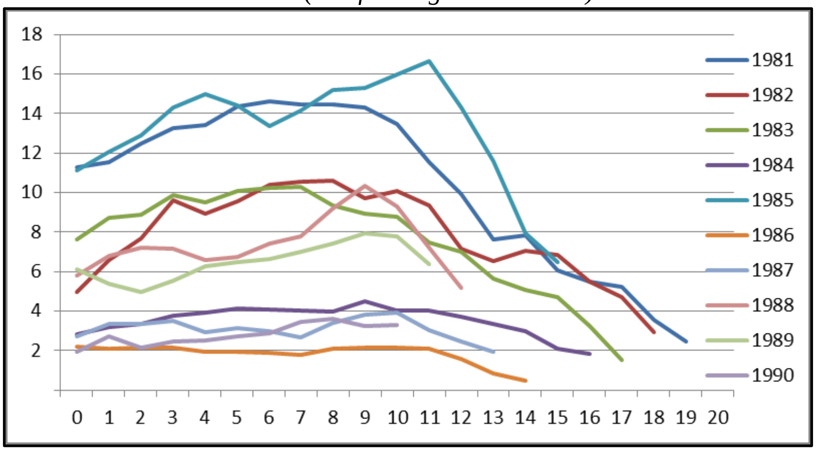
All firms



Survivors (never exit)



Exitors (exit from age 10 onwards)



Note: Vertical axis shows total employment, horizontal axis shows age of the firms.

Figure 3.3: Employment by age and entry year
(New firms surviving 10 years or more, 1000 employees)

The distribution of top 200 firms by sectors is presented in Table 3.2. Half of them perform in labor intensive industries, while 48 of them are in resource intensive industries. Besides, the remaining firms belong to scale intensive, specialized supplier and science based sectors. The annual average numbers of firms in labor intensive, resource intensive, scale intensive, and specialized suppliers and science based sectors are 3576, 3228, 1934, and 1228, respectively. The relative share of the fastest growing firms in labor intensive sector is still the highest, approximately 3.0 percent. On the other hand, those are lower than 2.0 percent for other sectors.

Table 3.1: Employment share, creation and growth
(New firms surviving 10 years or more)

		Emp. share (%)			
Entry	**Age 10**	**At entry**	**At age10**	**Creation**	**10-year growth (%)**
		All firms (2986 firms)			
1981	1991	3.20	3.97	11797	45.82
1982	1992	1.39	2.47	12643	108.34
1983	1993	1.89	2.43	7328	44.50
1984	1994	1.90	2.49	6243	36.58
1985	1995	2.98	5.03	21041	75.49
1986	1996	1.69	1.73	1861	11.59
1987	1997	1.26	1.94	9826	79.95
1988	1998	2.00	2.93	15053	74.34
1989	1999	2.08	3.04	12492	58.66
1990	2000	1.25	2.16	11504	89.38
		Top 200 new firms for employment generation			
1981	1991	0.34	1.02	6877	248.45
1982	1992	0.31	1.20	9229	359.11
1983	1993	0.29	0.84	5686	228.35
1984	1994	0.34	1.07	7006	229.93
1985	1995	0.67	1.83	11509	183.88
1986	1996	0.13	0.37	2675	223.48
1987	1997	0.15	0.69	6441	450.42
1988	1998	0.40	1.37	12450	307.33
1989	1999	0.50	1.16	7781	152.66
1990	2000	0.36	1.17	9492	255.85

Note: Employment share is out of total employment in all manufacturing. Employment creation is defined as the difference in employment at age 10 and at entry, measures by the number of employees. 10-year growth is calculated as (log) growth.

It is reported that one fourth of the top 200 firms have exited the industry from their age 10 onwards in Table 3.3. Also, we can see a significant adverse impact of the economic crisis (during the period 2000-2001), which made 17 firms that have very high employment potential to leave the industry. On the other hand, resource intensive industries had the lowest exit rate of 16.0 percent, while those were 25.0 percent or higher for the other industries.

Table 3.2: Top 200 firms by sectors

Entry	Age 10	LI	RI	SI	SS	Total
1981	1991	7	7	5	4	23
1982	1992	10	5	8	2	25
1983	1993	9	5	1		15
1984	1994	7	5	1	3	16
1985	1995	19	2	4	3	28
1986	1996	5	2		1	8
1987	1997	13	2	3	1	19
1988	1998	11	7	3	3	24
1989	1999	11	8	1	1	21
1990	2000	11	5	3	2	21
	Total	103	48	29	20	200

Note: LI: labor -intensive; RI: resource-intensive; SI: scale-intensive;
SS: specialized supplier and science-based. See Data Appendix.

Table 3.3: 49 firms exiting out of top 200 firms by exit years, sectors and ages

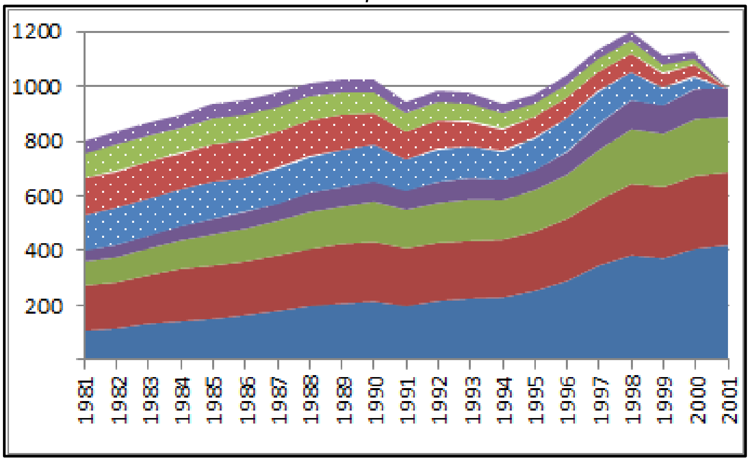
Exit year	Total	LI	RI	SI	SS	10	11	12	13	14	15	16	17	18	19
1991															
1992															
1993															
1994	2		1	1			1	1							
1995	4	3			1			1	2	1					
1996	4	4					1	2		1					
1997	8	4	2	2		2	1	2			2	1			
1998	6	5		1				1	3		1	1			
1999	8	5	2	1		1	1	1		1		2	1	1	
2000	17	5	3	4	5	4	2	3	1		3	1		2	1
Total	49	26	8	9	6	7	6	11	6	3	6	5	1	3	1

Employment dynamics of sectors by year are illustrated in Figure 3.4 for all, new and top 200 firms, respectively. The figure also depicts the employment share of exitor firms that exit the industry at any moment. Employment contribution of new firms increases sharply, and the share of new firms increases sharply, and the share of new firms reaches 60.0 percent of total employment in manufacturing. Regarding the employment dynamics of top 200 firms, we point out the substantial contribution of such firms to the total employment over time. Just 200 firms have a 10.0 percent share of total employment in manufacturing.

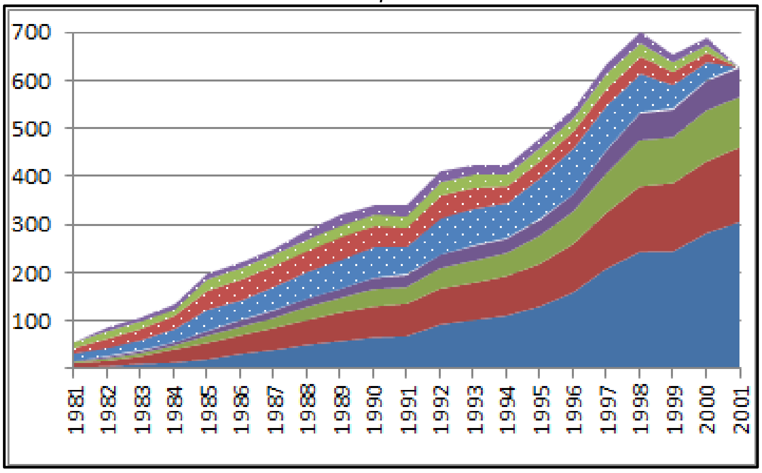
Figure 3.5 shows the employment dynamics with respect to the size groups for all and top 200 firms, respectively; as well as those for exitor firms. One can see the largest share of employment belongs to the largest size. Also, we can clearly see the positive survival and size effects on employment growth. Hence, Figure 3.5 presents that the size has a crucial role for both survival and employment growth.

In order to see the effect of size class on employment generation and/or destruction, decomposition of employment change may give some insights over the period 1980-2001. To this end, we decompose the change in employment in the last 5 years by size group. The results are depicted in Figure 3.6. First panel of the figure shows the net effect of continuing firms that can grow and/or decline, and turbulence firms that can be an entrant or an exitor, by size class. Net effects of small and medium sized firms on total employment in manufacturing are always positive, although they fluctuate over time. However, net effect of large firms starts positive and remains positive till 1991, then declines sharply and becomes negative, then recovers but still negative. Moreover, the destruction effects of large sized firms for the periods 1991-1995 and 1999-2001 cause the net change in total manufacturing employment to be negative. Although the adverse effects of crises on total employment can be seen for each size class, the large sized firms are exposed to the significantly larger shocks.

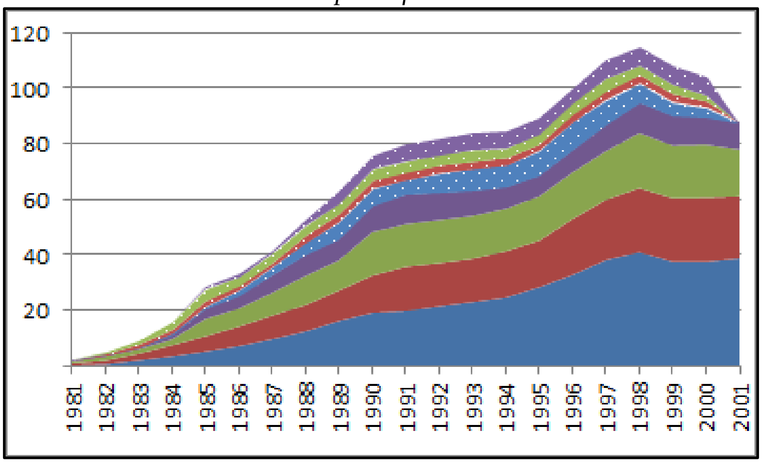
All firms



New firms



Top 200 firms

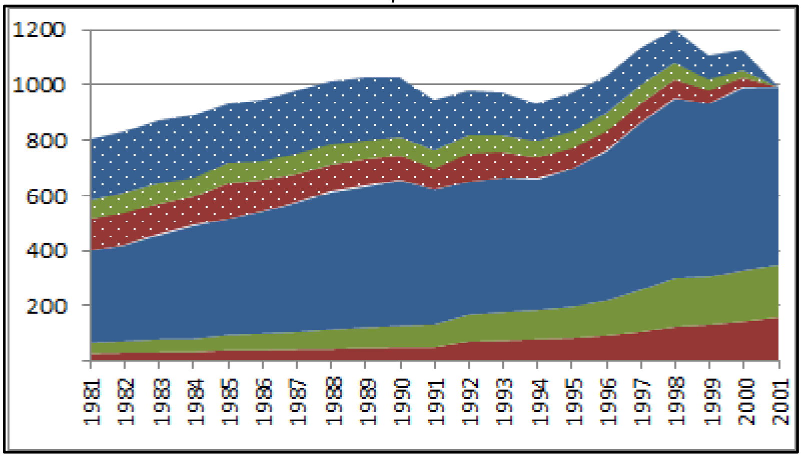


Labor Int. Resource Int. Scale Int. Spec.Supp.-Sci.based

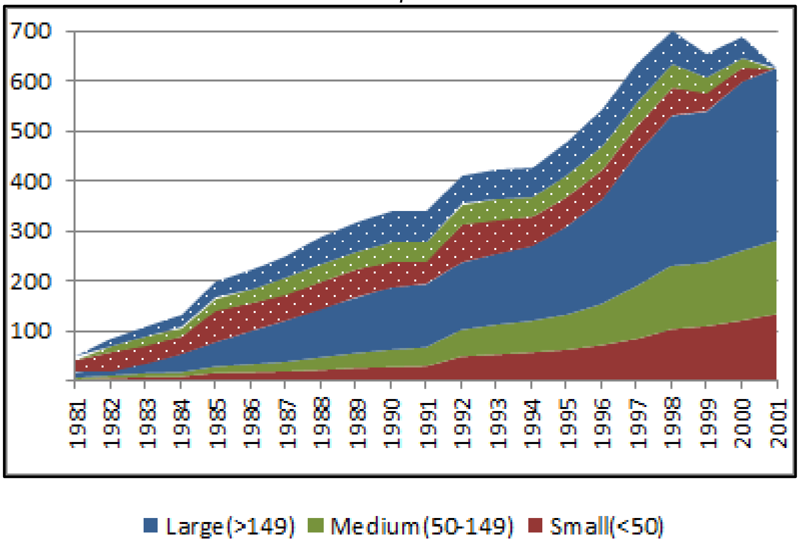
Dotted areas indicate the employment levels of the firms that exit at any moment.

Figure 3.4: Total employment by sector and survival (1000 employees)

All firms



New firms

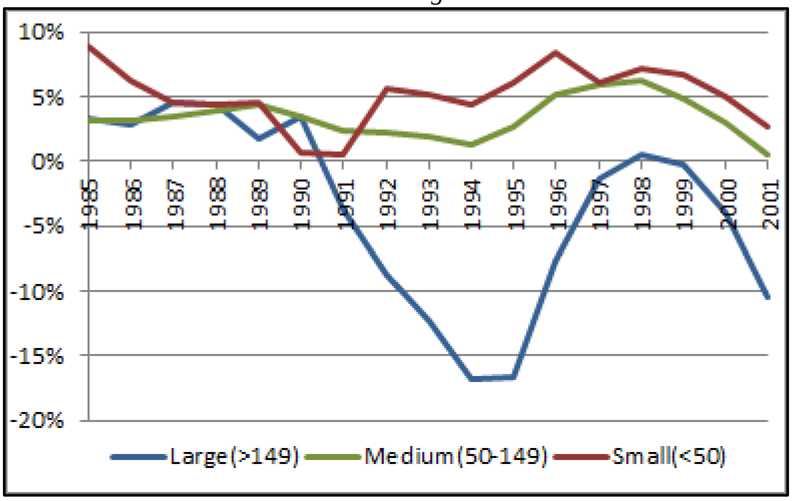


Dotted areas indicate the employment levels of the firms that exit at any moment.

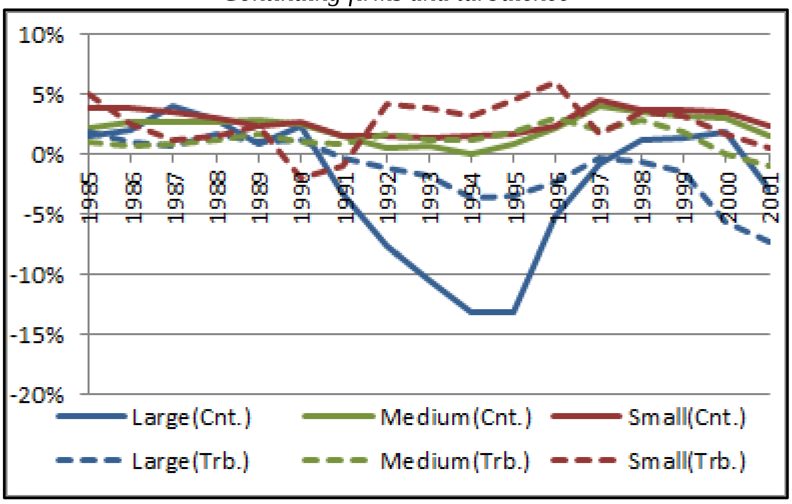
Figure 3.5: Total employment by size class and survival (1000 employees)

On the other hand, we decompose the change by size according to continuing firms and turbulence firms (entry and exit) in the second panel of Figure 3.6. The figure shows that the employment destruction stems from large turbulence (entry and exit) and large continuing firms, while the latter has the strongest negative effect on employment. Therefore, the source of employment destruction is large continuing firms. This finding is of importance because it may present the evidence that economic crises break the resistance ability of large firms in hard times. Note that the net effects of continuing firms and turbulence firms belong to small and medium sized firms never present the destruction on total employment (except turbulence firms of small sized in 1990 and medium sized in 2001). Moreover, we also compute the same figures by changing size class thresholds, allowing six different classes (i.e., 10-24, 25-49, 50-99, 100-149, 150-249, >249) and more detail, so as to check whether the cut-off criteria matters or not. Nevertheless, the results remain significantly similar.

Net change



Continuing firms and turbulence



Note: Cnt. denotes the net effect of continuing firms in the last 5 years.
Trb. denotes the net effect of turbulence (entry and exit) in the last 5 years.

Figure 3.6: Decomposition of employment change in the last 5 years by size class

The aforementioned patterns in decomposition of employment change are also usually verified for each sector. However, dynamics of each cohort may differ slightly across sectors. The decomposition of employment change for each sector, i.e., labor intensive, resource intensive, scale intensive, specialized supplier and science based, provided in Appendix B (Figure B.1).

Finally, we decompose the employment change for each distinct cohort, i.e., growing, declining, entry and exit effects for each size class. One can observe that the dynamics of each cohort differ over time and within particular years, in quite scattered ways (see Figure B.2 in Appendix B).

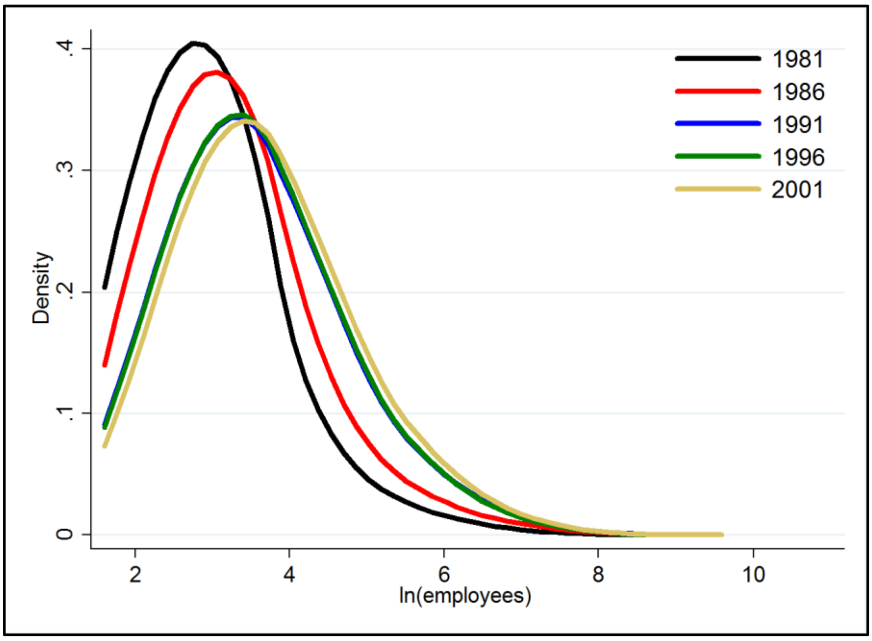
3.4 Firm Size Distributions and Firm Growth

We examine firm size distribution according to year, age, sector, ownership and survival characteristics in this section to link the firm size distribution to firm growth and employment generation.

We plot the kernel density estimates of the firm size distribution for all new firms which are established since 1981 and surviving 10 or more years, by year. Note that size is measured as the logarithm of number of firm’s employees.

From Figure 3.7, we can see the right-skewed behavior of firm size distribution for each year. Such a result confirms the finding of Cabral and Mata (2003). Also, the size distribution¬ clearly shifts to the right in both panels, meaning that the size of the firms in Turkish manufacturing increases over time. We can observe two other reflections from the figure. The first one is that for all new firms, there is no difference in size distributions of firms between 1991 and 1996, and the highest increase occurred from 1986 to 1991; one can observe from the first panel of Figure 3.7. On the other hand, the second panel of Figure 3.7 exhibits a consistent increase in firm size for each year, and the firms surviving 10 or more years have larger size. This implies that the age and survival effects on firm size, and the employment generation originated from these firms is crucial.

New Firms



New firms surviving 10 or more years

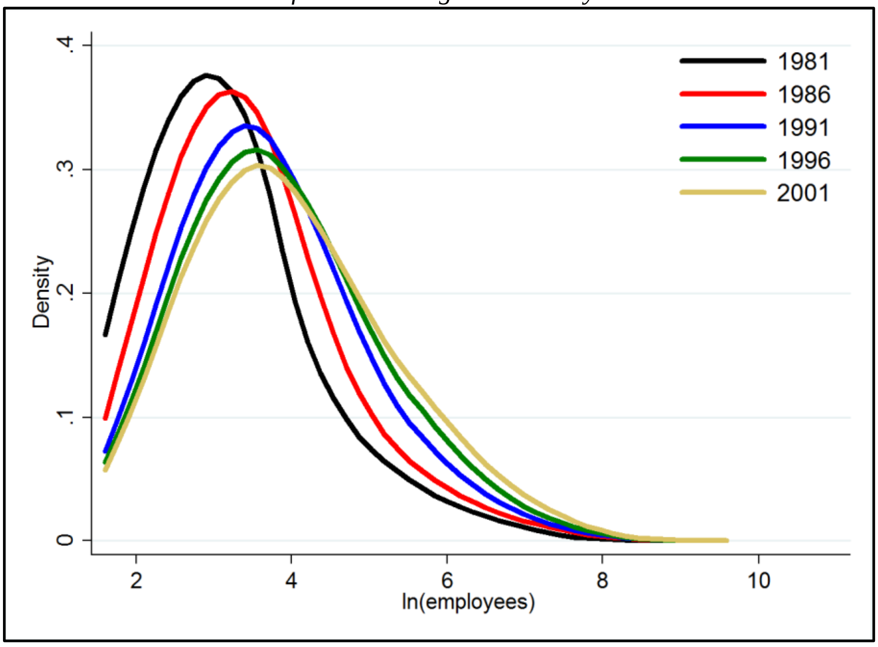


Figure 3.7: Size distributions of new firms by year

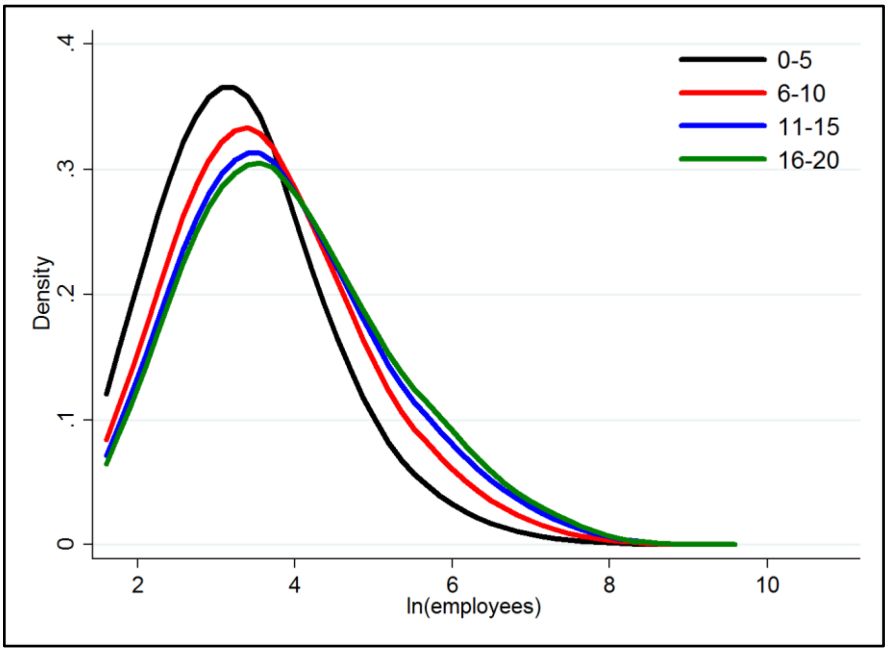
Figure 3.8 depicts firm size distribution according to age. Both panels show that the size distribution shifts to the right as firms grow older. However, one can claim that the size distribution of the firms surviving 10 or more years differ slightly over time than those of all new firms, although the firm size increases with age. The main reason for this may be the heterogeneous structure for all new firms in terms of firm growth-age nexus.

Kernel density estimates of the firm size distribution for each sector are provided in Appendix B (Figure B.3). Firms that operate in labor intensive industries have higher sizes than the others, i.e., all new firms and the firms surviving 10 or more years. Another observation is that the firms in resource intensive industries have significantly larger sizes in the right-tail although they have smaller sizes in the left-tail of the distribution.

Figure B.4 in Appendix B shows firm size distribution according to ownership status. It is clear that public firms have quite big sizes than the private firms. Right-skewed behavior of firm size distribution disappears for public firms. This implies that the size distribution of public firms is very similar to log normal, and thus the right-skewed behavior observed in all firms stems from the private firms.

The survival effect on firm size distribution is presented in Figure 3.9. The first finding is that survivors have larger sizes than exitors. Also, despite the fact that right-skewed behavior of the size distribution is valid for both survivors and exitors, the kurtosis structures of them are quite different. In other words, firm size distributions of exitors are characterized by high and narrow peaks. This figure also displays a prominent detail that the firms mostly grow in their early five years although firm size consistently increases with age.

New Firms



New firms surviving 10 or more years

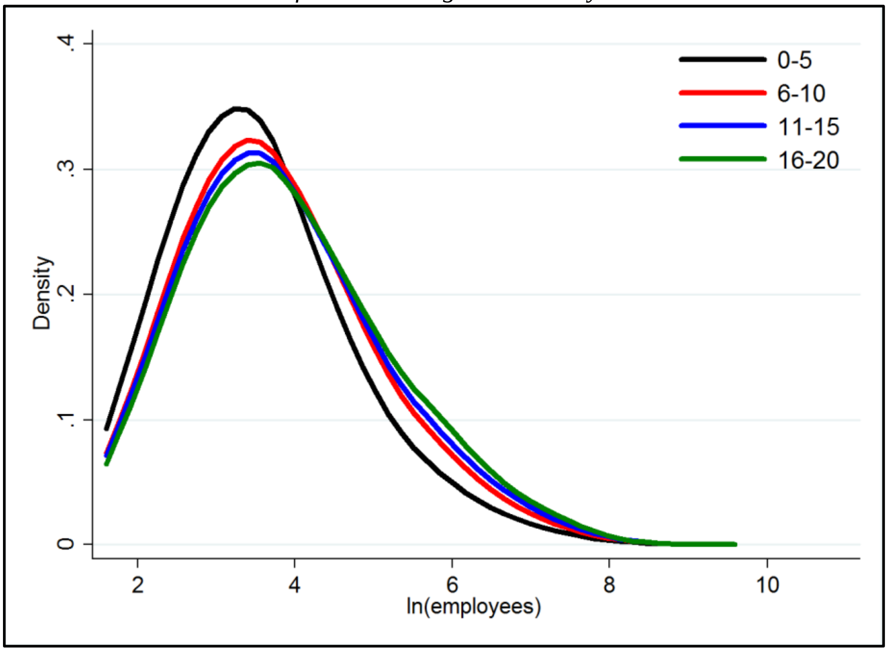
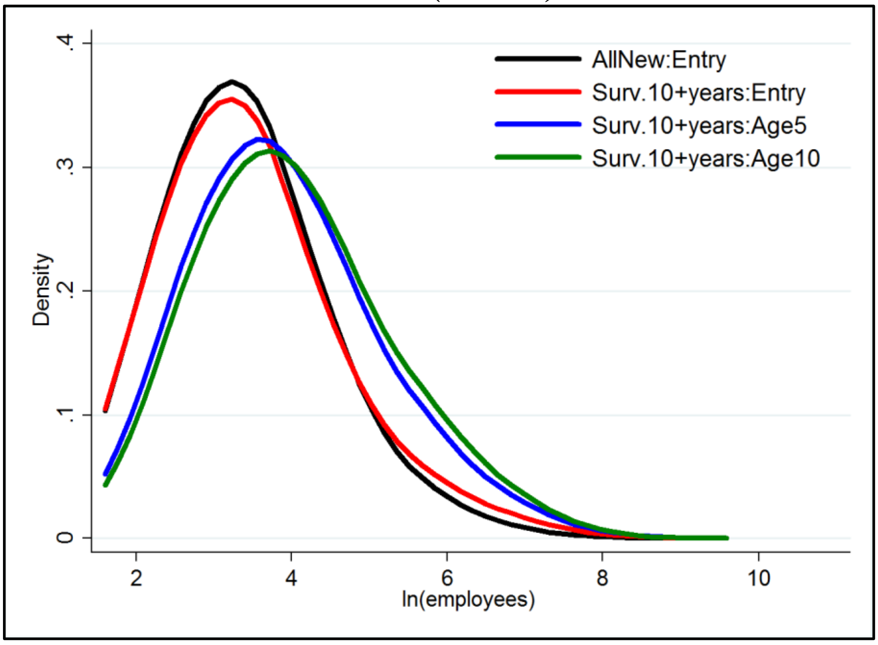
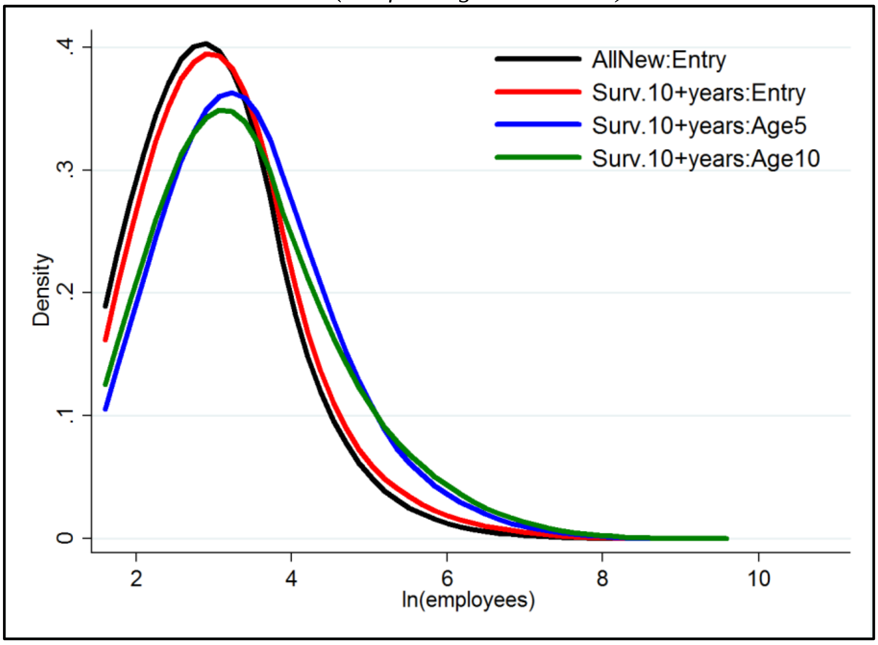


Figure 3.8: Size distributions of new firms by age interval

Survivors (never exit)



Exitors (exit from age 10 onwards)



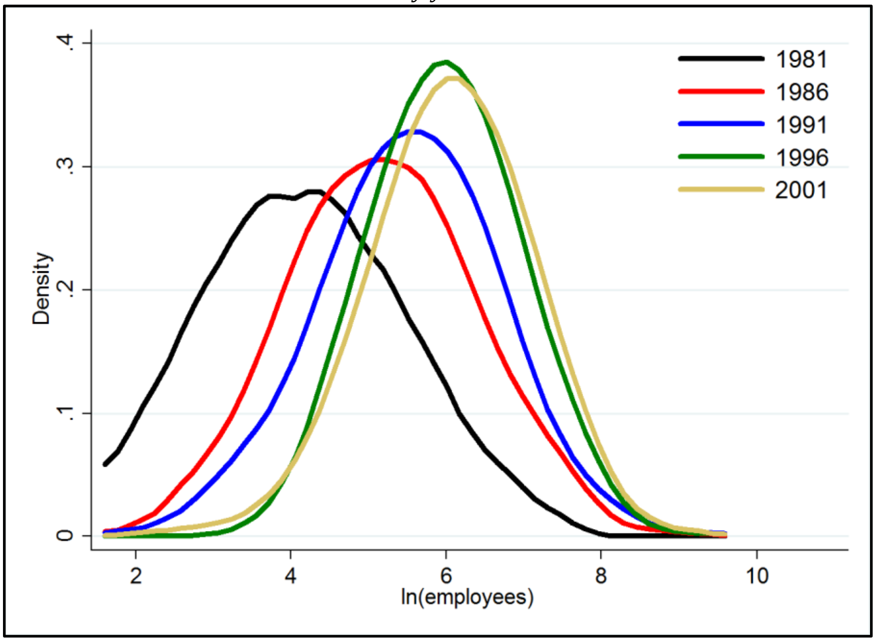
Note: Exitors are the firms exited industry at any moment, and those exited from age 10 onwards for the firms surviving 10 or more years.

Figure 3.9: Size distributions of new firms by survival

In the case of top 200 firms, the firm size distributions according to year and age can be seen from Figure 3.10. The right-shift of the size distribution exists for both year and age. The largest increase in size of top 200 firms is observed at the age interval 0-5 and to that of 6-10. Also, kurtosis behavior of the size distribution changes from the youngest ages onwards. Another finding is the decline of skewness with age. Then, this result is also consistent with the findings of Cabral and Mata (2003), which imply that the size distribution of older firms is more symmetric than their young counterparts.

For the top 200 firms, we plot the kernel density estimates of the firm size distribution for each sector (Figure 3.11). Despite the fact that the firms in labor intensive industries have higher size among all the new firms and among the firms which survive ten or more years, the picture is quite different for the top 200 firms. Specifically, the largest size belongs to specialized suppliers and science based industries, followed by scale intensive industries. The main reason behind this fact is probably the need for being large-scaled so as to benefit from scale economies in those industries in the context of influential growth success. In addition, one can see the effect of age on the size distribution of top 200 firms. Particularly, the distribution is quite similar to log normal due to the age effect. This is because it reflects the survival effect for the top 200 firms as well. Cabral and Mata (2003) underlined this point that "as time advances some economic force is pushing the distribution of firm size within industries towards log normality in surviving firms".

By year



By age

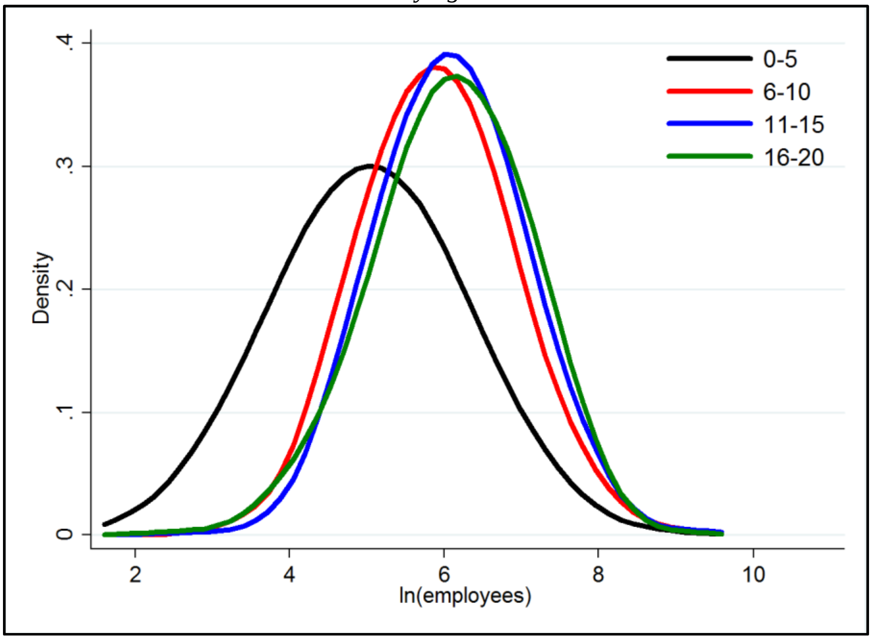
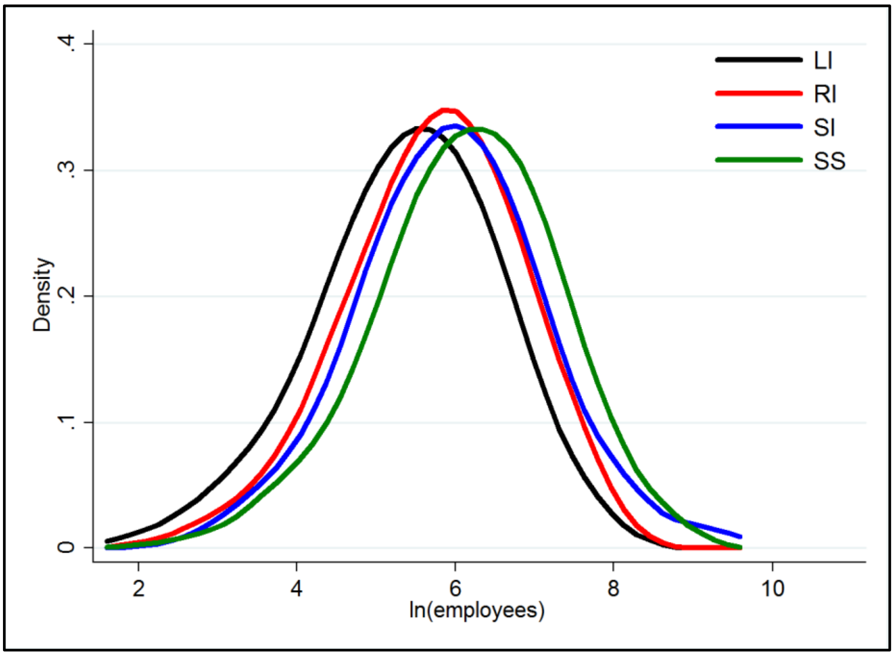


Figure 3.10: Size distributions of top 200 firms by year and age interval

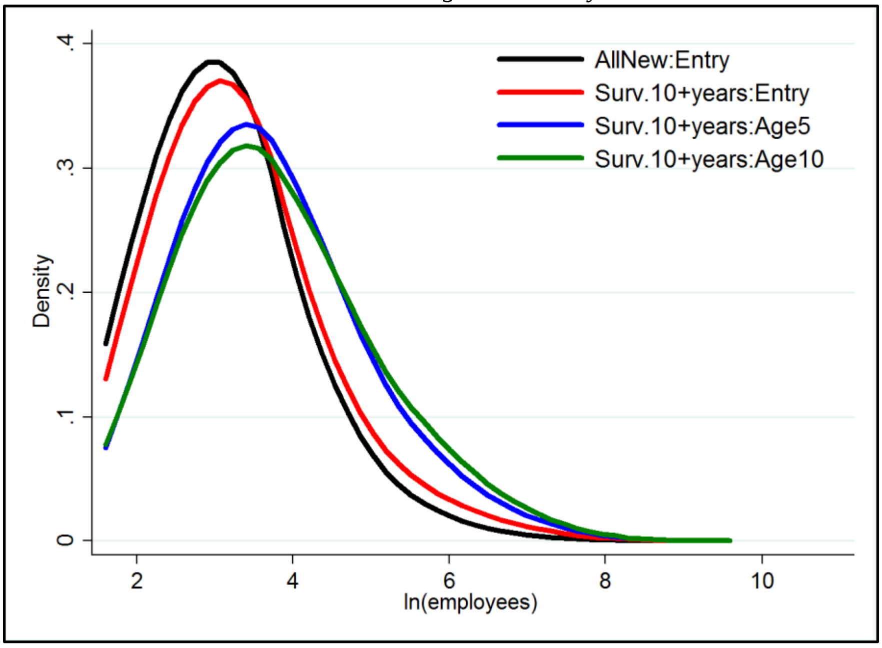


Note: LI: labor -intensive; RI: resource-intensive; SI: scale-intensive;
SS: specialized supplier and science-based. See Data Appendix.

Figure 3.11: Size distributions of top 200 firms by sector

Figure 3.12 provides the comparison of firm size distributions by different cohorts. One can easily see the right-skewed property of them, the size increases with age for the firms surviving ten or more years (first panel of Figure 3.12). Also, entry size is crucially important for the firms so as to survive and grow. On the other hand, the right-skewed behavior of the size distribution disappears for the top 200 firms. Note that top 200 firms succeed in high growth and thus employment generation over time significantly.

All new vs. surviving 10 or more years



Surviving 10 or more years vs. Top 200

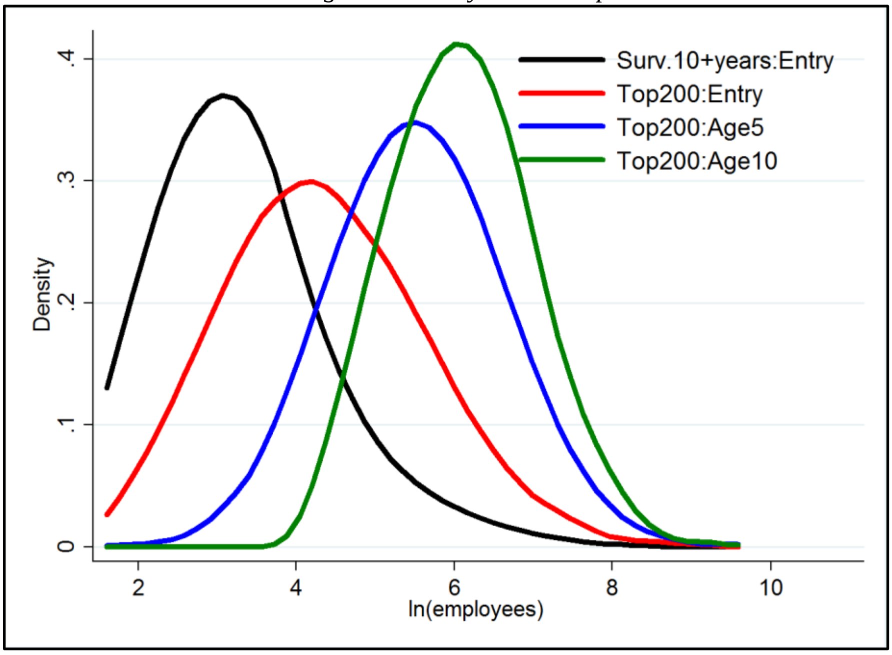


Figure 3.12: Size distributions of new firms by some cohorts

Finally, Figure B.5 in Appendix B shows firm size distribution according to ownership status for the top 200 firms. Again, it is illustrated that public firms have rather large sizes than the private firms. However, as opposed to the cases for all new firms or the firms surviving 10 years or more, size distribution of private firms is very similar to log normal, i.e., it is more symmetric than that of public firms. The main reason for this observation is the fewness of number of public firms in top 200, counted as just 12. Also, this finding stems from the fact that the private firms in top 200 constitute a size distribution that is so similar to log normal, implying they may become a more homogenous group.

CHAPTER 4

CONVENTIONAL ANALYSIS OF FIRM GROWTH REGRESSIONS

4.1 Introduction

The conventional empirical analysis of firm growth is based on estimating growth regressions. This approach assumes that all firms are drawn from the same distribution, and, thus, ignores the heterogeneity of firms' objectives, capabilities, and opportunities. In this chapter, we will use the conventional analysis to set the ground for the research questions investigated in subsequent chapters. In addition, we examine the effects of the firm characteristics on the growth rate with respect to all age cohorts. In a sense, the main contribution of this chapter is to investigate whether or not firm age matters for the effects of the explanatory variables on firm growth in Turkish manufacturing.

After summarizing the methodology of conventional approach, we introduce the data and variables used in estimations in the third sub-section. We present and interpret the estimation results obtained by using different techniques. In addition, we mention the sensitivity of our results in robustness check section. Finally, we discuss the limitations of the conventional analysis to explain why we need a new approach.

4.2 Methodology

A standard model for the firm growth can be defined as

$$\ln growth_{\mathrm{it+1}} = \mathrm{X}_{\mathrm{it}}\beta \tag{4.1}$$

where $\ln growth_{\mathrm{it+1}}$ is the growth rate of firm i from time t to $\mathrm{t}+1$, and X is a vector of covariates and β is the vector of parameters. The growth rate can be described by the following logarithmic form:

$$\ln growth_{\mathrm{it+1}} = \ln(\mathrm{S}_{\mathrm{t+1}}/\mathrm{S}_{\mathrm{t}}) = \ln(\mathrm{S}_{\mathrm{t+1}}) - \ln(\mathrm{S}_{\mathrm{t}}) \tag{4.2}$$

where S is the size variable. There are various alternatives for size measure in the empirical literature such as employment, sales/revenue, value added, profits, and financial measures (Storey and Greene, 2010: 210-211). Size is measured by the number of employees in our study. It should be noted that any nominal variable needs to be properly deflated since they make overstate the size of the firm but price changes over time may make comparisons difficult. On the other hand, employment is easy to measure and to use it as size measure decreases measurement problems (Shepherd and Wiklund, 2009; Coad, 2009). Moreover, employment is more important for policy makers because they focus on job creation of firms. Hence, employment is chosen to measure size of the firm in this dissertation.

One of the main variables within the growth equation is the current size of the firm. The coefficient of the size variable in the firm growth Equation (4.3) should be zero to satisfy Gibrat's law (i.e., the growth rate of a firm and its size are independent). Then, our growth model includes the current size so as to check the impact of current size on the growth rate.

$$\ln growth_{\mathrm{it+1}} = \ln(\mathrm{S}_{\mathrm{t+1}}) - \ln(\mathrm{S}_{\mathrm{t}}) = \beta_0 \ln(\mathrm{S}_{\mathrm{t}}) + \mathrm{X}_{\mathrm{it}}\beta \tag{4.3}$$

This model is the same as the following equation:

$$\ln(\mathrm{S}_{\mathrm{t+1}}) = \alpha_0 \ln(\mathrm{S}_{\mathrm{t}}) + \mathrm{X}_{\mathrm{it}}\beta \tag{4.4}$$

where $\alpha_0 = (1 + \beta_0)$.

The growth Equation (4.4) can be estimated by various methods. In this chapter, we estimate this equation via pooled OLS, fixed effects (FE), GMM-system (Blundell and Bond, 1998; Bond, 2002), and Heckman selection model (Heckman, 1979). Fixed effects consider unobserved fixed effects of the firms. GMM-system method takes into account of unobserved firm specific effects and endogeneity of the lagged dependent variable in the growth equation. However, Heckman model is a two-stage estimation method and it controls for the survival selection of the firms. First step is the survival selection model, and second one is the firm growth model that contains a selectivity bias correction derived from the estimates of the first step.

4.3 Data and Variables

We use the micro-level databases of the Turkish manufacturing industry for the period 1980-2001, which are obtained from the Turkish Statistical Institute (TurkStat). Specifically, our sample matches establishments from *Annual Surveys of Manufacturing Industries* and *Census of Industry and Business Establishments* (see Data Appendix).

It should be noted that the data is at the plant-level, not the firm-level. However, we treat plants as firms. This is because the number of multi plant firms is very few in Turkish manufacturing, and “plants” have a certain level of decision making autonomy. Therefore, we believe that plant-level data does not cause any bias in our estimations for the firm growth.

All real variables in the data are calculated by deflating nominal values by relevant product price indices measured at the ISIC Rev.2. 4-digit level. Thus, we rely on the deflators that can control the industry level demand shocks and inflation (see Griliches and Mairesse, 1998 for the discussion of the problems of using the same price index for all firms).

Our resulting sample includes 31,176 firms and 219,236 firm-year observations. 22,536 firms were established from 1981 onwards, corresponding to 123,002 firm-year observations. There are 22,536 new firms established after 1980, and these firms are observed until either they exit from the market or until 2002. Thus, we are able to observe the life-cycle of new firms. The dataset we use covers the plants with 10 or more employees for the period 1980-2001. The dataset is unbalanced because some firms exit from the market, and new firms enter to the database. Yet, entry and exit movements composed just a small percentage of the total number of firms in each year.

The data is very rich and well suited for the purposes of this dissertation since it is able to reflect the diverse characteristics of the firms.

Table 4.1: Variables used in growth regressions

Variable		Description
Firm growth	*growth*	(log) employment growth
Firm size	*size*	(log) of firm size in terms of employment
Age of the firm	*age*	(log) age of the firm
Relative labor productivity	*rlp*	(log) ratio of real output to labor (relative to 4-digit sector average)
Capital intensity	*kl*	(log) ratio of real capital to labor
Subcontracted input intensity	*subinp*	Share of expenses for subcontracted inputs in the value of total inputs
Subcontracted output intensity	*suboutp*	Share of revenue from subcontracted output in the value of total output
Advertisement intensity	*adverint*	Share of advertisement and marketing expenditures in the value of total output
Interest intensity	*interest*	Share of interest payments in the value of total output
Public firm dummy	*pub*	for public firms whose ownership share is larger than 10 %
FDI firm dummy	*fdi*	for foreign firms whose ownership share is larger than 10 %
Entry rate	*entrate*	Employment share of entrants in total employment (4-digit)
Herfindahl-Hirschman Index	*hhi*	Sum of squared market shares (in terms of output) (4-digit)
Minimum efficient scale	*mes*	Sectoral median (log) of firm size in terms of employment (4-digit)
Sectoral growth	*sectgr*	(annual) sectoral growth rate (4-digit)
Provincial growth	*provgr*	(annual) provincial growth rate
Sector dummies		2/3/4 digits (ISIC Rev2)
Region dummies		12 regions (NUTS: TR1-TRC)
Year dummies		Year dummies (1981-2001)

In this chapter, we analyze the determinants of the firm's growth rates. The variables used in growth regressions are defined in Table 4.1. Descriptive statistics of the variables used in the growth regressions in this chapter can be seen in Table 4.2. Our dependent variable is the annual growth rate of the firm.

Table 4.2: Descriptive statistics of the variables

	All firms		**New firms**	
variable	mean	(st.dev.)	mean	(st.dev.)
growth	0.013	(0.284)	0.025	(0.301)
size	3.654	(1.121)	3.479	(0.976)
age	1.585	(0.919)	1.354	(0.872)
rlp	0.000	(0.907)	-0.032	(0.928)
kl	2.485	(1.619)	2.629	(1.574)
subinp	0.027	(0.086)	0.031	(0.096)
suboutp	0.049	(0.189)	0.060	(0.211)
adverint	0.002	(0.010)	0.002	(0.010)
interest	0.018	(0.036)	0.016	(0.033)
pub	0.046	(0.210)	0.022	(0.148)
fdi	0.024	(0.153)	0.024	(0.152)
entrate	0.053	(0.055)	0.058	(0.059)
hhi	0.055	(0.058)	0.052	(0.058)
mes	3.454	(0.501)	3.469	(0.433)
sectgr	0.023	(0.107)	0.025	(0.116)
provgr	0.016	(0.087)	0.013	(0.093)
relsize	0.000	(1.024)	-0.182	(0.911)

Our explanatory variables can be categorized into firm-specific, industry-specific, and regional factors in line with previous empirical studies. Size (*size*), age of the firm (*age*), relative labor productivity (*rlp*), and capital intensity (*kl*) are the main firm-specific variables. The other firm-specific variables included in our model are subcontracted input and output intensities (*subinp*, *suboutp*), advertisement intensity (*adverint*), interest intensity (*interest*), and two dummies for public and FDI firms (*pub*, *fdi*). Furthermore, we use several sector-specific variables at 4-digit level in our models. The first one is entry rate (*entrate*). The second one is Herfindahl-

Hirschman index (*hhi*) for the concentration of industry. The other one is the minimum efficient scale of the industry (*mes*). The last one is the sectoral employment growth (*sectgr*). Also, all models include industry dummies. In order to control for regional effects, we include provincial employment growth variable (*provgr*) and region dummies. Note that our model includes year dummies to control for the time-specific effects. More detailed explanations of the data are provided in Data Appendix.

4.4 Estimation Results

We analyze the determinants of new firm growth for the Turkish manufacturing industry by using four alternative estimation techniques, OLS, FE, GMM, Heckman models, respectively. In this section, we specify the models with the main set of explanatory variables defined in Table 4.1 for each estimation technique. Also, we estimate another model by adding the age squared variable (*age2*) so as to check whether the existence of a nonlinear effect of age matters with regards to the effects of the other variables on the growth rate. The estimation results are reported in Table 4.3 and Table 4.4.

First of all, note that in order to understand the effect of size on firm growth; the coefficient of the size variable in the growth Equation (4.4) should be interpreted carefully. The reason is that, by definition, the effect of size equals zero if its coefficient is one in Equation (4.4). We thus test whether the coefficient of size variable is one or not. Then, we calculate the revised coefficient for the size variable by subtracting one from the estimated coefficient and report it in the estimation results with corresponding significance levels.

Table 4.3: Growth rate regressions for new firms: Model 1

				HECKMAN	
	OLS	FE	GMM	growth	survival
size	-0.049***	-0.343***	-0.315***	-0.039***	
	[0.001]	[0.003]	[0.040]	[0.002]	
age	-0.025***	-0.029***	-0.009	-0.024***	0.009*
	[0.001]	[0.003]	[0.019]	[0.001]	[0.005]
rlp	0.050***	0.073***	1.530***	0.055***	0.121***
	[0.001]	[0.002]	[0.092]	[0.002]	[0.005]
kl	0.021***	0.030***	0.030	0.020***	-0.017***
	[0.001]	[0.001]	[0.063]	[0.001]	[0.003]
subinp	0.012	-0.015	0.268	0.011	-0.065
	[0.011]	[0.014]	[1.626]	[0.012]	[0.045]
suboutp	0.054***	0.034***	0.652	0.052***	-0.030
	[0.005]	[0.009]	[0.817]	[0.006]	[0.022]
adverint	0.454***	0.387***	-3.112	0.487***	1.032**
	[0.098]	[0.123]	[14.829]	[0.104]	[0.479]
interest	-0.194***	-0.169***	-4.032	-0.211***	-0.348**
	[0.029]	[0.035]	[2.720]	[0.033]	[0.141]
pub	0.047***	0.019	-1.567	0.052***	0.184***
	[0.007]	[0.019]	[1.018]	[0.007]	[0.036]
fdi	0.018***	0.043***	-0.395	0.013*	-0.127***
	[0.006]	[0.014]	[1.180]	[0.007]	[0.031]
entrate	-0.056**	-0.067**	-0.492**	-0.152***	-2.516***
	[0.028]	[0.031]	[0.198]	[0.029]	[0.110]
hhi	-0.008	-0.129**	0.712	-0.034*	-0.402***
	[0.019]	[0.052]	[0.499]	[0.018]	[0.094]
mes	0.023***	0.025***	0.242*	0.019***	0.136***
	[0.003]	[0.008]	[0.133]	[0.003]	[0.013]
sectgr	0.060***	0.023	-0.161**	0.136***	1.899***
	[0.014]	[0.015]	[0.078]	[0.015]	[0.055]
provgr	0.038**	0.019	0.034	0.126***	2.566***
	[0.015]	[0.016]	[0.083]	[0.018]	[0.063]
relsize					0.304***
					[0.006]
Cons.	0.124***	1.105***	0.232	0.005	0.480***
	[0.011]	[0.031]	[0.339]	[0.013]	[0.047]
R^2	0.914	0.472			
Log Lik.	-16378	2099		-72296	
Firms	17340	17340	14010	21831	
Obs.	92259	92259	74377	117695	

Fixed effects and GMM models include year dummies.
OLS and Heckman models include year and sector dummies.
Standard errors are reported in brackets, *** p<0.01, ** p<0.05, * p<0.1.

Table 4.4: Growth rate regressions for new firms: Model 2

				HECKMAN	
	OLS	FE	GMM	growth	survival
size	-0.050***	-0.343***	-0.306***	-0.040***	
	[0.001]	[0.003]	[0.040]	[0.002]	
age	-0.057***	-0.044***	-0.185**	-0.044***	0.316***
	[0.004]	[0.005]	[0.073]	[0.004]	[0.016]
age2	0.013***	0.022***	0.062**	0.008***	-0.117***
	[0.001]	[0.005]	[0.025]	[0.001]	[0.006]
rlp	0.050***	0.073***	1.562***	0.054***	0.119***
	[0.001]	[0.002]	[0.093]	[0.002]	[0.005]
kl	0.021***	0.030***	0.023	0.020***	-0.016***
	[0.001]	[0.001]	[0.063]	[0.001]	[0.003]
subinp	0.013	-0.015	-0.168	0.012	-0.070
	[0.011]	[0.014]	[1.635]	[0.012]	[0.045]
suboutp	0.055***	0.035***	0.669	0.053***	-0.037*
	[0.005]	[0.009]	[0.817]	[0.006]	[0.022]
adverint	0.453***	0.384***	5.123	0.485***	1.063**
	[0.097]	[0.123]	[15.183]	[0.104]	[0.483]
interest	-0.193***	-0.169***	-3.851	-0.210***	-0.377***
	[0.029]	[0.035]	[2.720]	[0.033]	[0.141]
pub	0.045***	0.019	-1.495	0.050***	0.188***
	[0.007]	[0.019]	[1.018]	[0.007]	[0.037]
fdi	0.018***	0.044***	-0.772	0.014*	-0.135***
	[0.006]	[0.014]	[1.189]	[0.007]	[0.031]
entrate	-0.067**	-0.071**	-0.469**	-0.147***	-2.236***
	[0.028]	[0.031]	[0.198]	[0.029]	[0.110]
hhi	-0.010	-0.128**	0.601	-0.034*	-0.389***
	[0.019]	[0.052]	[0.501]	[0.018]	[0.094]
mes	0.023***	0.025***	0.244*	0.019***	0.149***
	[0.003]	[0.008]	[0.133]	[0.003]	[0.013]
sectgr	0.060***	0.024	-0.163**	0.131***	1.857***
	[0.014]	[0.015]	[0.078]	[0.015]	[0.054]
provgr	0.031**	0.015	0.033	0.118***	2.610***
	[0.015]	[0.016]	[0.083]	[0.018]	[0.063]
relsize					0.306***
					[0.006]
Cons.	0.142***	1.006***	0.301	0.011	0.300***
	[0.012]	[0.039]	[0.340]	[0.013]	[0.048]
R^2	0.914	0.472			
Log Lik.	-16338	2109		-72060	
Firms	17340	17340	14010	21831	
Obs.	92259	92259	74377	117695	

Fixed effects and GMM models include year dummies.
OLS and Heckman models include year and sector dummies.
Standard errors are reported in brackets, *** p<0.01, ** p<0.05, * p<0.1.

The fact that the coefficient of size variable is negative implies that small firms have higher growth rates than large firms. This means that Gibrat Law does not hold, confirming most of the previous empirical studies. This finding holds across all regression models we have estimated. Note also that the magnitude of the effect is larger in static and dynamic panel data models. Also, the size effect on growth is less when the survival selection is controlled for.

It can be observed from Table 4.3 that there are statistically significant negative coefficients for age in model 1. This finding indicates that young firms grow faster than mature ones. Effect of age on survival is positive indicating that young firms have a higher exit probability than older firms.

On the other hand, in model 2, we add the square of age variable into the regressions to capture a possible nonlinear relationship between age and growth or survival. The results of estimating model 2 confirm very similar effects of age and other variables on firm growth compared to model 1. Moreover, the square of age variable has a statistically significant positive coefficient for all growth specifications, as well as it is negative in the survival equation. Therefore, we have found a U-shaped relationship between age and growth, and an inverse U-shaped one between age and survival, which indicate nonlinear relationships between age and both growth and survival. However, an estimate of the age value where the firm growth reaches its minimum can be calculated by using the estimated coefficients of age and age2 variables. The age where the firm growth is minimized is calculated to be 9, 3, 4, and 15 for OLS, FE, GMM, and Heckman models, respectively. Given that the mean age of the firm in our sample is 4, it is seen that most of the firms in our data have exited the industry before the minimum point of the U-shaped curve. That is, they exit where the firm growth decreases with age. The probability of firm survival, on the other hand, increases with age and then it reaches a maximum. The age at which the probability of survival is maximized is 4. Consequently, the relationships between age and both firm growth and survival are nonlinear and exhibit U-shaped and inverse U-shaped patterns, respectively. However, we found that most of the firms in our data have exited the industry where the firm growth decreases with age. Hence, we can claim that our results confirm previous studies (e.g., Evans, 1987a, 1987b). Moreover, this finding implies the validity of learning models, in which small entrants encounter either faster growth or face failure risk (Jovanovic, 1982; Ericson and Pakes, 1995).

Relative labor productivity has a significant positive impact on firm growth rate, indicating that more productive firms grow faster than those are less productive compared to the industry average. Also, relative labor productivity significantly increases the survival probability of firms. Therefore, our estimation results support both active and passive learning models (Jovanovic, 1982; Ericson and Pakes, 1995). The firms with higher productivity grow faster and tend to survive, as well as decline or fail otherwise.

Capital intensity increases firm growth in all cases. In the survival equation, on the other hand, it has a significant negative coefficient. This implies that the capital-intensive firms are less likely to survive. Thus, initial capital cost is very important for the capital intensive firms, indicating that such firms do not have the flexibility to substitute labor for capital.

We found that the coefficient of subcontracting input intensity is not significant. The coefficient of subcontracting output intensity, on the other hand, is positive and significant in all but one model. However, the effect of subcontracting output intensity on survival is found to be significant and negative in model 2.

Advertisement intensity increases firm's growth rate. Moreover, this effect is stronger when the survival selection is controlled for. It is also seen that the effect of advertisement intensity is much stronger on the survival selection. This means that advertisement leads to a higher probability for the firms to survive.

The interest intensity decreases firm's growth rate in all but GMM model. This is possibly because of financial constraints of the firms. Moreover, financial constraints make firms more difficult to survive, confirming the discussion in Coad (2009).

Most of the models suggest that public firms and foreign firms have higher growth rates than private firms. It has been also found that the public firms survive more and foreign firms survive less than the other firms. However, this fact may stem from the acquisitions of some foreign firms during the period under investigation. Then, those firms may be surviving as in the form of another firm.

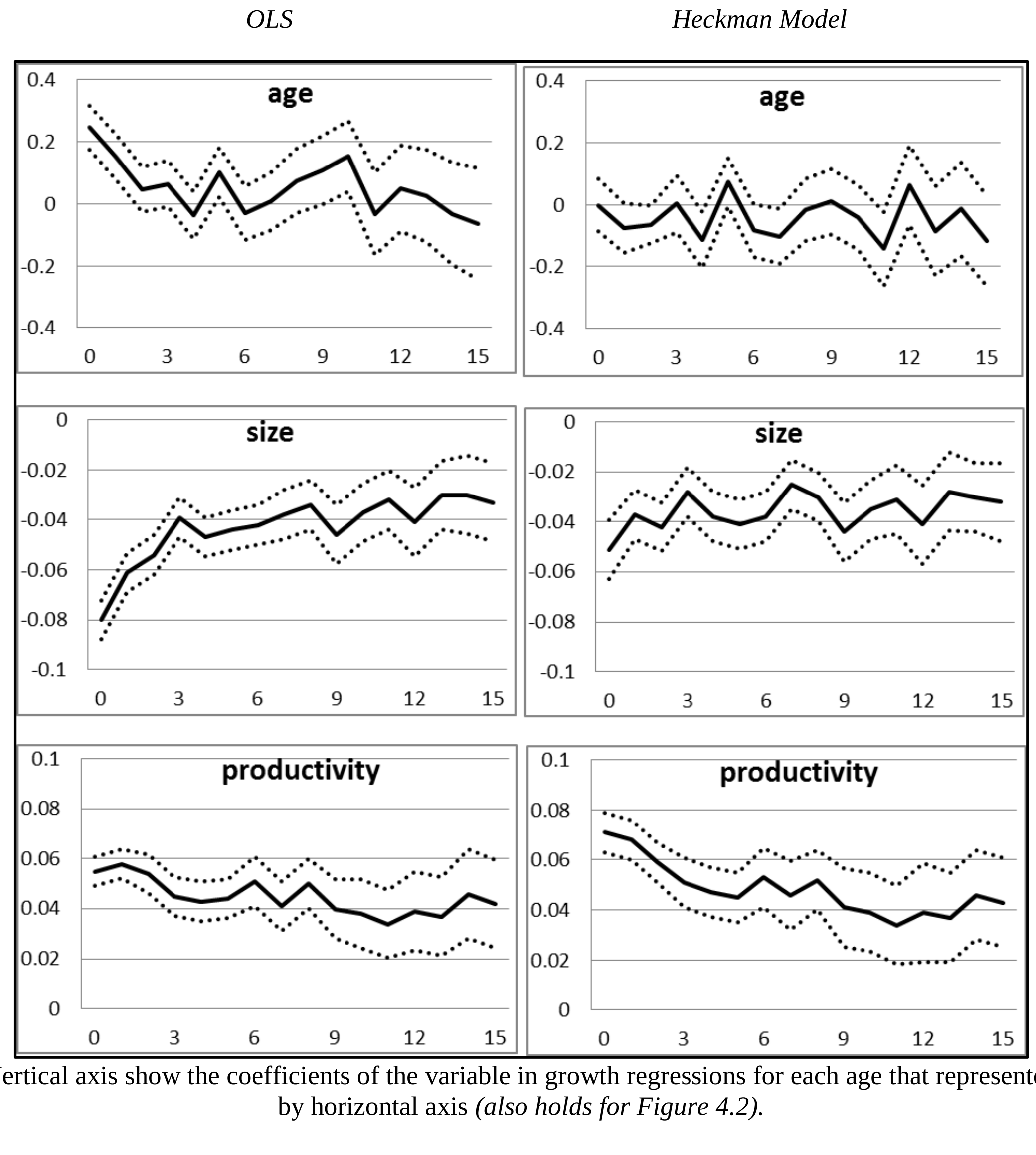
The coefficients of entry rate and concentration are negative, indicating that firms' growth rates are higher in less concentrated industries, and in those with lower entry rates. On the other hand, firms grow faster in sectors that are described by high minimum efficient scale. Moreover, the effects of these sectoral variables have the same direction on firm survival but their impacts on survival are stronger than those on growth.

Estimation results of all models except the GMM model show that the firms operating in sectors with high employment growth rates grow more. It is also observed that the firms operating in provinces with higher employment growth rates grow faster. This effect is stronger when the survival is controlled for. Finally, the impact of the regional growth variable is much stronger than that one the firm growth.

We have also estimated the OLS and Heckman models with respect to all age cohorts observed in our sample since we claim the age could matter in this sense. Although we have conducted separate regressions for each age, we present the results for ages up to 15 for the sake of simplicity. The effects of firm specific variables in the growth rate regressions by age can be seen in Figures 4.1 and 4.2. The figures include the coefficients of the firm-specific variables with their 95 % confidence interval estimated.

First of all, OLS estimation results exhibit a decreasing pattern for firm growth in age. This means that the firms tend to grow faster in their early years. However, age and growth relationship disappears after age 1 when the survival selection is controlled for. Therefore, we underlined that survival selection is particularly important to clarify age effect on firm growth.

The negative effect of size variable on growth rate holds for all age cohorts, but its impact is decreasing with age. The size effect is larger in their early years. Moreover, the effect of size variable according to age cohorts is decreasing slightly when survival selection is controlled for.



Vertical axis show the coefficients of the variable in growth regressions for each age that represented by horizontal axis *(also holds for Figure 4.2).*

Figure 4.1: The effects of age, size and productivity in the growth regressions by age

OLS *Heckman Model*

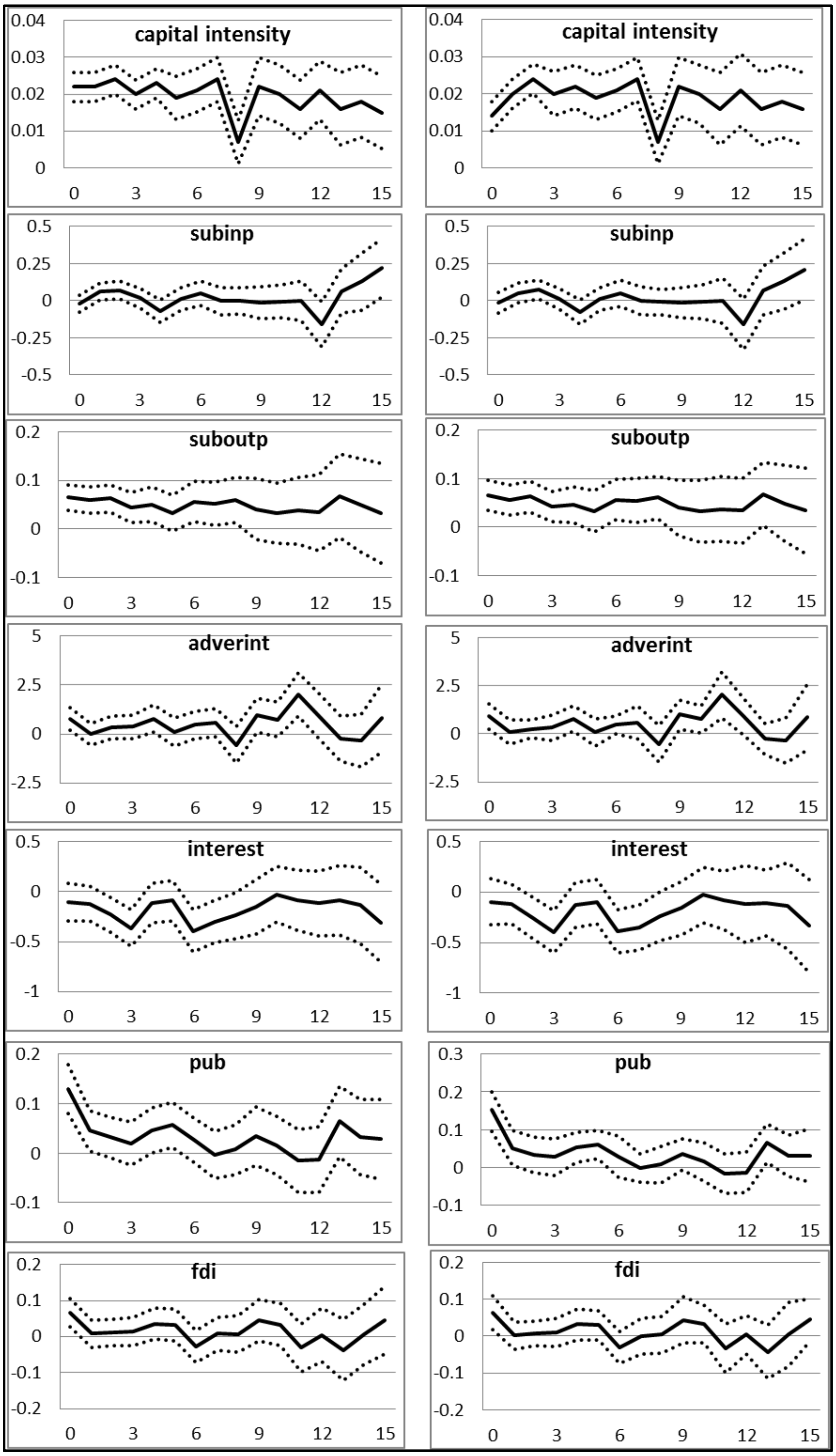


Figure 4.2: The effects of other firm-specific variables in the growth regressions by age

Regarding the relative labor productivity, the strong positive effect of this variable on growth is decreasing in age. The productivity effect on firm growth is more important in their early years. Also, this strong evidence becomes more prominent when survival selection is controlled for. This means that young firms need to be more productive to grow as they survive.

The positive impact of capital intensity on growth is decreasing with age. However, its effect is mitigated when survival selection is controlled for. The effects of subcontracted input and output intensities on growth seem to be positive and they remain steady with age. Whether or not controlling for the survival selection, the impacts of advertisement intensity, public and FDI dummies are positive and decrease with age in the early two years in general. Besides, the adverse effect of interest intensity on growth is more important in the early years of the firms.

4.5 Robustness Check

In order to control the validity of results, we have re-estimated all growth regressions presented in this section by defining relative explanatory variables, extending the models with some other variables, using the 5-year growth of the firm as an alternative dependent variable instead of the annual growth rate, controlling industries with alternative sets of dummies, and finally restricting the sample in favor of only growing firms.

Almost all variables have very similar effect in all alternative regressions. The regressions with relative explanatory variables leave our main results intact. In the extended models, we have found the positive impacts of export and R&D dummies on both growth and survival. On the other hand, relative product differentiation makes the firms to survive more but to grow less. However, product differentiation growth causes higher firm growth but lower probability of survival. This finding might mean that the firms need more product differentiation than the industry average in order to survive. Then, an increase in the number of products in their portfolios contributes their growth while they survive. The extension of the models does not distort the effects of other variables in the model, and produces results in line with the main findings of this section.

In estimations with the alternative dependent variable, the coefficient of size variable is again negative, indicating that small firms have higher growth rates than large firms, as before. However, the most prominent finding is the existence of quite larger effect of size in 5-year growth regressions. This means that the size-growth nexus comes to light substantially for some early periods of the firm, or in the relatively long run. Regarding the effects of other variables in the regressions of 5-year growth, most of the variables remain significant, and their impacts become much stronger.

We have also conducted all regressions with alternative dummy sets of industries/sectors for both main equations and for those defined in robustness check issues. Particularly, all growth regressions are estimated with all possible sets of industry dummies, i.e., for the levels of 2, 3, or 4-digit. Finally, we have checked the results with aggregated sectors; labor-intensive, resource-intensive, scale-intensive, and specialized suppliers and science based. All alternative dummy sets of industries provide similar results for the effects of explanatory variables on growth rate.

In addition, we have re-estimated all growth regressions of this section including those specified for robustness checks by restricting the sample with only growing firms. Again, almost all variables have remained significant and shown similar effects leaving our main results unaltered. The results for the sample of growing firms may deserve a bit more attention. In terms of the impact of the explanatory variables on growth for the sample of only growing firms, the results could be listed as follows: the effects of size and capital intensity are moderated; although the capital-intensive firms are less likely to survive, capital intensity increases the probability of being a growing firm; the productivity become more important for some growth models, and it substantially increases the probability of survival and being a growing firm; the coefficients of subcontracting input intensity turns out to be significant and positive; the positive effect of advertisement intensity is much stronger in the case of only growing firms when being a growing firm selection is controlled for; the adverse impact of financial constraints on firm growth and survival is disappears implying that growing firms can overcome financial barriers to growth; finally, positive impact of sectoral and provincial employment growth on the firm growth become stronger when the selection for survival and being a growing firm are controlled for.

To sum up, the main findings from our base model are confirmed by the robustness checks including relative explanatory variables, model extensions, 5-year growth of the firm as an alternative dependent variable, and alternative controls for industries. On the other hand, although similar results have been obtained for the sample of only growing firms, the directions and magnitudes of the coefficients of some firm-specific variables have changed. Most probably, this is because there is a particular heterogeneity between samples of all new firms, and growing (new) firms.

4.6 Discussion

Despite the fact that there is a substantial number of empirical studies on firm growth, the empirical research does not provide unambiguous understanding about the determinants of firm growth. Some limitations of the conventional growth regressions can be listed as follows: they assume that the firms and their growth rates are drawn from the same distribution; the impacts of the determinants (of firm growth) may change by age; most of the (small) firms do not grow. These shortcomings could be the reason of the ambiguous results found in previous studies.

We analyzed the determinants of new firm growth via several estimation techniques, controlling unobserved heterogeneity, endogeneity and survival behavior. The results indicate that there is a negative relationship between firm size and growth (i.e., small firms grow faster than their large counterparts). However, the size effect is moderated when survival selection is controlled for although the negative impact of size on growth remains. We found that young firms have a higher exit probability than older firms, but the firm growth decreases with age. This implies that young firms grow faster if they survive. Firm growth and survival selection are positively affected by relative labor productivity. Although the capital-intensive firms are less likely to survive probably due to the critical importance of initial capital cost, capital intensity has a positive impact on firm growth for the surviving firms. The results of estimating the standard growth regressions by age cohorts revealed that firm growth decreases with age. However, this finding disappeared when the survival is controlled for. We found that productivity is more critical especially in the early years of firms, and young firms have to be more productive in order to survive and grow. The effect of capital intensity effect on growth decreases with age, and this effect becomes much stronger when survival is controlled for.

We controlled the unobserved heterogeneity in the estimations based on FE and GMM, and also endogeneity in the latter. Furthermore, the survival (selection) was controlled by Heckman models for the growth regressions. In addition, one should provide a more direct control for age in the firm growth process, rather than viewing it as just an independent variable in the estimation equation. To this end, we examined and showed the importance of age effect by using a better strategy that is different from the standard approach to firm growth modelling.

Nevertheless, there is a whole lot more work to be done. Specifically, some other critical factors should be controlled for in the firm growth process. For instance, the characteristics of the firm and those of entrepreneur are of importance. The aims of firms may not be the same in terms of growth. Growth intentions of entrepreneurs matter in growth behavior of firms. Consequently, we need to focus on overall process of firm growth and identify the patterns of firm growth for each firm in order to investigate the importance of characteristics of the firm. This is because some determinants may be peculiar to certain patterns. The majority of previous studies did not succeed to set a proper way in order to test firm growth theories, partly because of the fact that each one of these theories emphasizes particular aspects of the growth process, and makes some predictions depending on their assumptions. Hence, the growth process may differ by patterns, and theories need to be tested according to the patterns of firm growth. In other words, the theoretical predictions a given theory may hold only for a particular pattern, not for all firms. In the subsequent chapters, we will deal with the patterns of firm growth and their role in growth process.

CHAPTER 5

EMPIRICAL PATTERNS OF FIRM GROWTH

5.1 Introduction

New and small firm growth has attracted a considerable attention over the past decades from researchers and policy makers. Although there is a sizeable empirical literature on firm growth rates, the mechanisms underlying the growth process are still unclear. The most important shortcoming of empirical studies on growth is the lack of attention paid to the sources of heterogeneity of firms. The empirical tools such as regression models used extensively in the firm growth literature implicitly assume that different types of firms and their growth rates are drawn from the same distribution. In this sense, Davidsson et al. (2007) points out that “more fruitful way forward is to conduct theory-driven studies of growth within more homogeneous samples of firms”. The second issue that needs to be considered carefully is the fact that the impact of the determinants (of firm growth) may change by age (Evans, 1987a and 1987b). Third, firm growth behavior is inevitably affected by survival selection and thus learning and selection process within the industry (Jovanovic, 1982; Ericson and Pakes, 1995). Fourth, that the dominant empirical approach used to analyze small firm growth ignores the extreme heterogeneity of small firms in every sense. For instance, the aims of entrepreneurs are not the same. There are plenty of evidence that suggest that growth is not necessarily the common goal for all entrepreneurs. The intention to grow is of special importance in this sense. Finally, there is an important stylized fact in the empirical literature of firm growth: the most of the (small) firms do not grow. From this point of view, Davidsson et al. (2005) note that the firms start small, live small, and die small.

Although the literature that concern with the empirical patterns of growth points out the heterogeneity of the determinants describing firm growth process - as we have discussed in Chapter 2, the results of those empirical studies cannot be compared directly because of the differences in their coverage, methods, growth measures, time period, etc. moreover, we should underline the stylized fact that emerged from the empirical literature on firm growth that the majority of the firms do not grow due to limited resources and growth opportunities. Considering this fact and keeping in mind that the growth rate focus of the previous studies regarding growth patterns, we need to point out that the main difficulty is to designate the distinct rule for the growth rate and/or the patterns of the growth.

We suggest that focusing on only growth rates cannot ascertain the factors behind the firm growth since the heterogeneity of firms and particularly their growth processes are ignored. Thus, one of the contributions of this chapter is to explore possible empirical patterns of firm growth for all firms, growers as well as decliners by using all the data available. We propose a novel strategy to identify patterns of firm growth by using statistical tools for the first time in the literature, which is another major contribution of this dissertation. Although the current literature related to the determinants of growth categories is of importance, some misleading results have emerged from their identification of growth categories. Considering this issue, we emphasize the need to define growth patterns in a comprehensive way. The last contribution of this chapter is to identify the factors that determine the patterns of firm growth in Turkish manufacturing.

The next section presents the methodological strategies for identifying patterns of firm growth and investigating the determinants of patterns discovered. The data and variables used in estimations are summarized in the following section. The subsequent section provides the identification of patterns of firm growth. Finally, the last section presents and interprets the multinomial logit regression model that has been estimated to capture the factors behind such patterns of growth.

5.2 Methodology

A firm can grow, decline or remain steady. Starting from this standpoint, our methodology is an attempt to discover all possible patterns of new firm growth. In order to identify different growth dynamics over time, we use growth rates of the firms in our pattern specification rather than by classifying the firms with similar together.

In order to identify the patterns of growth, first we assume six functional forms for growth (as a relationship between firm size and time), which are depicted in Figure 5.1. The functional forms are constant, linear, quadratic, one-shot, logistic, and random walk. Since employment has significant advantages in terms of the measure of size of the firm, we use (log) employment as the measure of size (see Section 4.2 for the discussion of alternative measures for size).

In case of the functional form of no growth (or no change), we specify the following equation:

$$S_t = \alpha_{10} + \varepsilon_1 \tag{5.1}$$

If the observations of a firm have a best fit to Equation (5.1) rather than to other functional forms, firms are classified into “no change” pattern.

The following equation specifies the linear functional form:

$$S_t = \alpha_{20} + \beta_2 t + \varepsilon_2 \tag{5.2}$$

Specifically, we consider the firms as linear grower if $\beta_2 > 0$, and linear decliner if $\beta_2 < 0$ for the linear model in Equation (5.2).

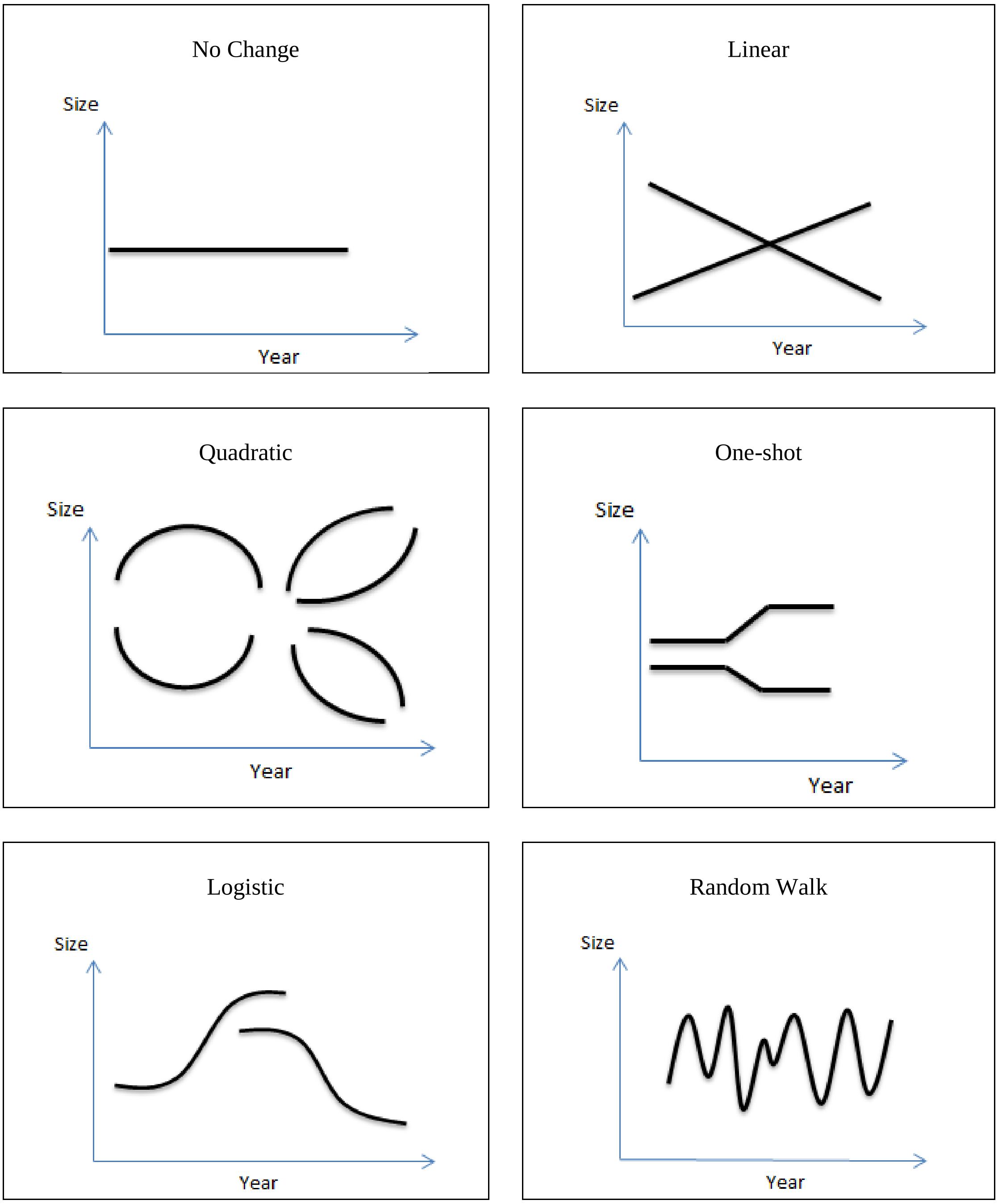


Figure 5.1: Functional forms of growth patterns

A firm has a quadratic growth path, which is described in following equation:

$$S_t = \alpha_{30} + \beta_{31}t^2 + \beta_{32}t + \varepsilon_3 \tag{5.3}$$

Quadratic model is a bit more complex than other forms of growth, and therefore it requires to be clarified in detail. There are two main forms in this model: U-shaped and inverse U-shaped (i.e., $\beta_{31} > 0$ and $\beta_{31} < 0$, respectively, in Equation (5.3)). However, we need to check whether deep or peak times are positive, zero, or negative. We test the value of $(-\beta_{32}/2\beta_{31})$ in order to check the time of extreme point. Also, we need to check whether the estimated trough and/or peak times are before or after the time of entry into the market. There are four sub-cases for the U-shaped form: trough time is negative ($\beta_{32} > 0$), if $\beta_{32} < 0$ and trough time is zero, if $\beta_{32} < 0$ and trough time is positive, and if $\beta_{32} < 0$ and trough time is larger than firm's age. There are four sub-cases for the inverse U-shaped form: peak time is negative ($\beta_{32} < 0$), if $\beta_{32} > 0$ and peak time is zero, if $\beta_{32} > 0$ and peak time is positive, and if $\beta_{32} > 0$ and peak time is larger than firm's age. We pooled the sub-cases of deep time is negative ($\beta_{32} > 0$), ($\beta_{32} < 0$) and deep time is zero, ($\beta_{32} < 0$) and deep time is positive from the U-shaped form; and ($\beta_{32} > 0$) and peak time is larger than firm's age from the inverse U-shaped form and classified into quadratic growers. We pooled the sub-cases of peak time is negative ($\beta_{32} < 0$), ($\beta_{32} > 0$) and peak time is zero, ($\beta_{32} > 0$) and peak time is positive from the inverse U-shaped form; and ($\beta_{32} < 0$) and deep time is larger than firm's age from the U-shaped form and classified into quadratic decliners. Finally, we checked the sign of firm's overall growth and corresponding quadratic pattern for the consistency.

For the one-shot model, the firm has a constant size at least three years. Then the firm jumps up or down once time and remains at that size for the remaining years. This model is specified in the following equation.

$$S_t = \alpha_{40} + \beta_4 OS + \varepsilon_4 \tag{5.4}$$

where OS is the dummy variable that measures the time of jump, and we identify the firms as one-shot grower if $\beta_{34} > 0$, and one-shot decliner if $\beta_{34} < 0$ for the one-shot model in Equation (5.4).

Another nonlinear growth path is the logistic model (sigmoid function, as sometimes called). We consider the following specification for the logistic model.

$$S_t = \alpha_{50} + \beta_5 L + \varepsilon_5 \text{ , where } L = 1/\big(1 + \exp(-(t - d_1))\big) \qquad (5.5)$$

and d_1 is starting point for the firm of the S-curve (sigmoid curve).

Asymptotic size is the summation of the parameters α_{50} and β_5 in Equation (5.5). We defined the difference between asymptotic size and entry size, and identify the firms as logistic grower if the difference is positive and logistic decliner otherwise.

Finally, we assume pure random walk process in order to specify the random walk model. In the case of random walk model, we describe the following equation:

$$S_t = \alpha_{60} + \beta_6 S_{t-1} + \varepsilon_6 \qquad (5.6)$$

Particularly, we tested the condition($\alpha_{60} = 0$) and ($\beta_6 = 1$), jointly for Equation (5.6). If this is the case, firms are classified into random walk pattern.

Consequently, there are two patterns (as grower or decliner) for each functional form, apart from no change and random walk models. Thus, there are 10 patterns of firm growth to be identified.

We take into account each pattern as a distinct growth category for the determinants of firm growth patterns discovered above. Therefore, we introduce the modelling patterns of firm growth as described below.

Following Long (1997), we consider the (latent) dependent variable y with J categorical outcomes.

Assume that $\Pr(y = m|x)$ is the probability of observing pattern m given x and $\Pr(y = m|x)$ is a function of the linear combination $x\beta_m$, where $\beta_m = (\beta_{0m}\ \beta_{1m}\ \ldots\ \beta_{Km})'$. Thus, the coefficient vector differs for each pattern. Taking the exponential of $x\beta_m$ and dividing each probability by the sum of all probabilities in order to ensure nonnegative probabilities and make the probabilities sum to 1, the probability of pattern m is as follows:

$$\Pr(y_i = m|x_i) = \frac{\exp(x_i\beta_m)}{\sum_{j=1}^{J}\exp(x_i\beta_j)} \tag{5.7}$$

We have 10 different patterns other than failure firms (within their first six years). We thus define the failure pattern for the firms failed in their first six years. In other words, total number of patterns of firm growth is 11.

One of the patterns in the dependent variable is described as the comparison category by setting the β_j parameters to zero. The probability of a being the firm in other patterns is compared to the probability of membership in the base category. Specifically, we can state the probability of FAIL pattern, which is our base pattern, as follows:

$$\Pr(y_i = \mathrm{FAIL}|x_i) = \frac{1}{1 + \sum_{j=2}^{11}\exp(x_i\beta_j)} \tag{5.8}$$

The probabilities of each other pattern is described as:

$$\Pr(y_i = m|x_i) = \frac{\exp(x_i\beta_m)}{1 + \sum_{j=2}^{11}\exp(x_i\beta_j)} \quad \text{for } m \neq \mathrm{FAIL} \tag{5.9}$$

The estimation equation is the basis for the maximum likelihood estimator. Particularly, consider $\Pr(y_i = m|x_i, \beta_2, \beta_3 \ldots \beta_J)$ as the probability of observing $y_i = m$ given x_i with parameters from β_2 to β_J. If the observations are independent, and with a probability of observing whatever value of y was actually observed for the ith observation, the likelihood equation becomes

$$L(\beta_2, \dots, \beta_J | y, X) = \prod_{m=1}^{11} \prod_{y_i=m} \frac{\exp(x_i\beta_m)}{\sum_{j=1}^{11} \exp(x_i\beta_j)} \tag{5.10}$$

Taking the log of Equation (5.10), we get the log likelihood equation that can be maximized with numerical methods to estimate parameters. Long (1997) points out that the resulting estimates are consistent, asymptotically normal, and asymptotically efficient.

Therefore, we rely on the multinomial logit technique to capture the factors behind such patterns of firm growth.

5.3 Data and Variables

We use the micro-level databases of the Turkish manufacturing industry for the period 1980-2001, which are obtained from the TurkStat. We restrict our analysis to the firms that were established since 1981 so that we analyze the patterns of growth over the life-cycle of firms. There are 22,536 new firms that were established within that time period. In order to identify the patterns of firm, we select only those firms that are observed at least 6 years to have sufficient number of observations for estimation. Thus, we finally end up with 8,319 firms and 86,559 firm-year observations for identification of patterns (see Data Appendix).

Furthermore, we examine the firms that failed within their first 6 years by classifying them into failure pattern. The number of firms in the failure pattern is 14,217.

The variables used in multinomial logit estimations are defined in Table 5.1. Our dependent variable is categorical, and reflects the patterns of growth. It consists of 11 patterns or alternatively 6 aggregated patterns, which we have identified.

Table 5.1: Variables used in multinomial logit estimations

Variable		Description
Pattern of growth		Categorical variable, which defines 11 patterns (failures within first 6 years, no change, linear grower, quadratic grower, one-shot grower, logistic grower, linear decliner, quadratic decliner, one-shot decliner, logistic decliner, random walk)
Aggregated pattern of growth		Categorical variable, which defines 6 aggregated pattern (failures within first 6 years, no change, grower, asymptotic grower, decliner, asymptotic decliner, random walk)
Firm size	*size*	(log) of firm size in terms of employment
Relative labor productivity	*rlp*	(log) ratio of real output to labor (relative to 4-digit sector average)
Capital intensity	*kl*	(log) ratio of real capital to labor
Subcontracted input intensity	*subinp*	Share of expenses for subcontracted inputs in the value of total inputs
Subcontracted output intensity	*suboutp*	Share of revenue from subcontracted output in the value of total output
Advertisement intensity	*adverint*	Share of advertisement and marketing expenditures in the value of total output
Interest intensity	*interest*	Share of interest payments in the value of total output
Public firm dummy	*pub*	for public firms whose ownership share is larger than 10 %
FDI firm dummy	*fdi*	for foreign firms whose ownership share is larger than 10 %
Entry rate	*entrate*	Employment share of entrants in total employment (4-digit)
Herfindahl-Hirschman Index	*hhi*	Sum of squared market shares (in terms of output) (4-digit)
Minimum efficient scale	*mes*	Sectoral median (log) of firm size in terms of employment (4-digit)
Sector dummies		2/3/4 digits (ISIC Rev2)
Region dummies		12 regions (NUTS: TR1-TRC)

Explanatory variables can be categorized into three groups, namely firm-specific, industry-specific, and regional variables. We use the initial (i.e., at entry) levels of explanatory variables in the multinomial logit model. Entry size (*size*), relative labor productivity (*rlp*), and capital intensity (*kl*) are the main firm-specific variables. Subcontracted input and output intensities (*subinp*, *suboutp*), advertisement intensity (*adverint*), interest intensity (*interest*), and two dummies for public and FDI firms (*pub*, *fdi*) are the other firm-specific variables included in our model.

The sector-specific variables are defined at ISIC Rev.2 4-digit level are the entry rate (*entrate*), industry concentration level as measured by the Herfindahl-Hirschman Index (*hhi*), and minimum efficient scale (*mes*). Sector (at the 3-digit level) and region dummies are included in the regressions so as to control industrial and regional effects. Descriptive statistics of the variables used in the growth regressions are presented in Table 5.2. More detailed information on the data is provided in Data Appendix.

Table 5.2: Mean values of the variables at entry by patterns

Pattern/*variable*	***size***	***rlp***	***kl***	***subinp***	***suboutp***	***adverint***
Failure	3.046	-0.255	2.342	0.035	0.095	0.002
	(0.741)	(1.025)	(1.465)	(0.116)	(0.271)	(0.008)
No Change	3.215	-0.115	2.22	0.022	0.048	0.001
	(0.789)	(0.851)	(1.465)	(0.082)	(0.187)	(0.005)
Lin. Grower	3.421	0.241	2.885	0.035	0.058	0.002
	(0.787)	(0.849)	(1.484)	(0.109)	(0.212)	(0.007)
Quad. Grower	3.453	0.168	2.784	0.035	0.071	0.003
	(0.853)	(0.914)	(1.528)	(0.097)	(0.237)	(0.011)
One-s. Grower	3.198	-0.022	2.483	0.024	0.053	0.002
	(0.823)	(0.875)	(1.575)	(0.094)	(0.201)	(0.011)
Log. Grower	3.486	0.207	2.936	0.038	0.072	0.003
	(0.886)	(0.902)	(1.55)	(0.107)	(0.228)	(0.011)
Lin. Decliner	3.627	-0.192	2.029	0.02	0.089	0.002
	(0.823)	(0.767)	(1.464)	(0.069)	(0.253)	(0.007)
Quad. Decliner	3.554	0.026	2.472	0.03	0.052	0.003
	(0.895)	(0.862)	(1.47)	(0.093)	(0.2)	(0.008)
One-s. Decliner	3.482	-0.096	2.275	0.028	0.054	0.002
	(0.92)	(0.846)	(1.498)	(0.103)	(0.204)	(0.008)
Log. Decliner	3.421	-0.171	2.184	0.028	0.05	0.001
	(0.905)	(0.832)	(1.574)	(0.094)	(0.185)	(0.005)
Random Walk	3.494	0.095	2.522	0.024	0.076	0.002
	(0.921)	(0.91)	(1.522)	(0.069)	(0.24)	(0.008)

Table 5.2: Mean values of the variables at entry by patterns (cont'd)

Pattern/*variable*	***interest***	***pub***	***fdi***	***entrate***	***hhi***	***mes***
Failure	0.012	0.01	0.012	0.055	0.051	3.382
	(0.029)	(0.1)	(0.111)	(0.044)	(0.059)	(0.395)
No Change	0.013	0.018	0.02	0.046	0.055	3.388
	(0.03)	(0.134)	(0.142)	(0.042)	(0.055)	(0.473)
Lin. Grower	0.014	0.008	0.024	0.054	0.052	3.415
	(0.029)	(0.09)	(0.155)	(0.048)	(0.061)	(0.387)
Quad. Grower	0.015	0.017	0.034	0.055	0.051	3.431
	(0.032)	(0.128)	(0.182)	(0.048)	(0.061)	(0.447)
One-s. Grower	0.015	0.015	0.023	0.047	0.056	3.385
	(0.032)	(0.12)	(0.149)	(0.042)	(0.06)	(0.404)
Log. Grower	0.014	0.027	0.034	0.053	0.051	3.488
	(0.031)	(0.161)	(0.181)	(0.047)	(0.06)	(0.451)
Lin. Decliner	0.017	0.048	0.03	0.054	0.05	3.409
	(0.035)	(0.214)	(0.171)	(0.045)	(0.046)	(0.567)
Quad. Decliner	0.014	0.04	0.021	0.053	0.052	3.403
	(0.031)	(0.197)	(0.144)	(0.046)	(0.056)	(0.443)
One-s. Decliner	0.014	0.038	0.015	0.052	0.053	3.379
	(0.032)	(0.19)	(0.12)	(0.051)	(0.05)	(0.518)
Log. Decliner	0.015	0.029	0.032	0.056	0.055	3.347
	(0.035)	(0.167)	(0.176)	(0.048)	(0.053)	(0.565)
Random Walk	0.019	0.024	0.012	0.048	0.052	3.334
	(0.037)	(0.153)	(0.109)	(0.042)	(0.049)	(0.38)

Note: Standard deviations are reported in parentheses.

5.4 Identification of Patterns of Firm Growth

Unlike the previous literature, we claim that using only growth rates of firms does not allow to uncover the factors behind the firm growth. Thus, we identify all possible empirical patterns of firm growth coinciding with all types of growth dynamics that can be observed in the data.

For each firm, we first estimate each one of growth models Equation 5.1 to Equation 5.6. In other words, we estimated 49,914 (8,319 x 6) models. Secondly, we chose the best model for each firm by using Bayesian Information Criterion (BIC). Finally, after the choosing the best model, firms are classified into patterns by using estimated parameter values as discussed in the previous section.

Table 5.3: Patterns of firm growth

	Patterns	*Number of firms*	*%*
NOC	No Change	520	6.25
linG	Linear Grower	388	4.66
quaG	Quadratic Grower	956	11.49
oneG	One-shot Grower	1,200	14.42
log	Logistic Grower	1,559	18.74
linD	Linear Decliner	174	2.09
quaD	Quadratic Decliner	1,142	13.73
oneD	One-shot Decliner	1,279	15.37
logD	Logistic Decliner	615	7.39
RW	Random Walk	486	5.84
	TOTAL	8,319	100.00

In addition, as we noted earlier, the firms that failed within their first 6 years are classified into failure group. The number of firms in the failure group is 14,217. We will use failed firms (those firms that exit from the market in 6 years after their entry) as the base category in multinomial logit specification in the next section. Therefore, the failed firms are included in our analysis as a specific pattern so that there are 11 patterns of growth identified for our analysis.

The results of identification of the patterns of growth are presented in Table 5.3. The number of all growing firms is 4,103, corresponding to almost half of the surviving firms. We can consider linear and quadratic grower firms as continuous growers. The share of consistently growing firms is only 16 %. The logistic patterns show that the firms in those patterns converge towards a constant size over time. Similarly, one-shot and no change patterns have also a constant size in the long run. Therefore, one can suggest that most of the firms (more than 60 % of firms that survived for at least 6 years) do not have any long term growth prospects.

The association between patterns and sectors is significant at one percent level (and the corresponding Chi-square value is 401.06). This implies that the distributions of patterns across sectors are different as depicted in the top panel of Figure 5.2. The largest share of the grower firms appears in chemicals and chemical products sectors, and other manufacturing industries. Besides, the largest share of the decliner firms is observed in food, beverages and tobacco, wood and wood products, and non-metallic mineral products sectors. It should be noted that all sectors are dominated by asymptotic patterns.

Distributions of patterns by entry size classes are particularly different (Chi-square value: 916.43, statistically significant at one percent level) as depicted in Figure 5.2. We can state that firm growth decreases with entry size except for two size classes. Specifically, the largest share of grower firms appears in the smallest size category in our data. The negative relationship between growth and entry size continues until the size class of 100-149. Indeed, we can observe the U-shape behavior between size and growth with the exception of the largest size class.

Looking at the distributions of patterns by survival status, there is a strong difference between grower and decliner patterns, confirmed by significant Chi-square value of 7700.00. The last panel of the figure demonstrates the growth-survival nexus. The most of the survivor (exitor) firms have grower (decliner) patterns.

We found significant difference between patterns and sectors in terms of exit rates (Chi-square value is 186.49). Specifically, exit rates are higher for decliner patterns in all sectors, which are depicted in the top panel of Figure 5.3. On the other hand, firms in continuously grower patterns have lower exit rates in most sectors.

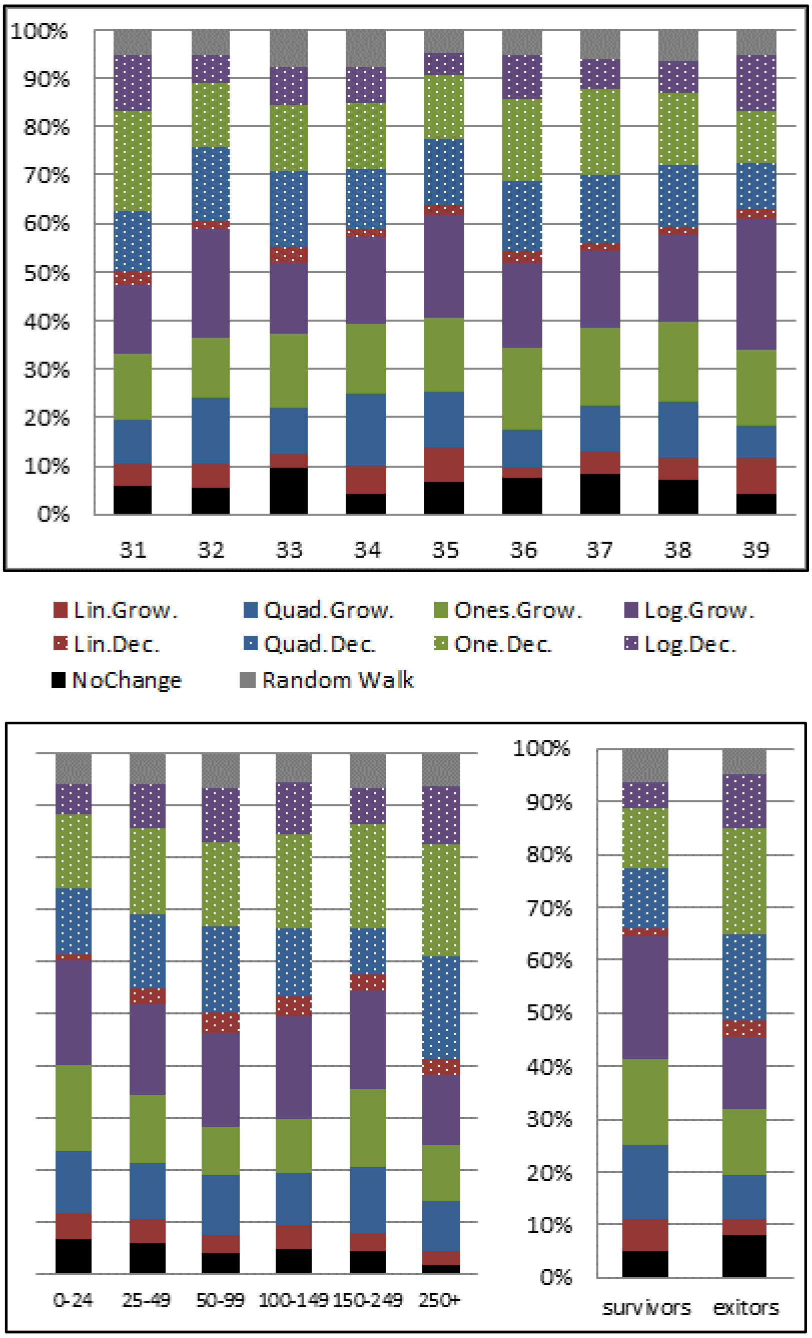


Figure 5.2: Distribution of patterns by sector, size, and survival

We check the association between growth patterns and entry size classes: Chi-square value for the equality of exit rates for growth patterns and entry size classes is found to be 316.37 (statistically significant at one percent level). This means that the distribution of patterns is different according to the size classes. One can state that there are some dominant behaviors for the exit rate-size nexus as demonstrated in Figure 5.3. The prominent evidence is the existence of higher exit rates within decliner patterns as expected, but this finding is mitigated with the size.

The distributions of overall trend growth rate of patterns by sector and size can be seen in Figure 5.4. We suggest that there are particular differences between sectors and size classes in terms of overall trend growth rates of the patterns.

To sum up, empirical patterns of firm growth that we discovered here can reveal the heterogeneous characteristics of firm growth process fairly well. Identification of patterns of firm growth can provide some insights in more detail in the process of firm growth. From this point of view, we investigate the factors behind patterns of firm growth in the next section.

Figure 5.5 demonstrates the distribution of patterns by total employment and survival. It is clearly visible that survivor firms significantly contribute to total employment while exitors (from age 5 onwards) have very limited employment generation. Moreover, the survivors in grower patterns create more jobs over time.

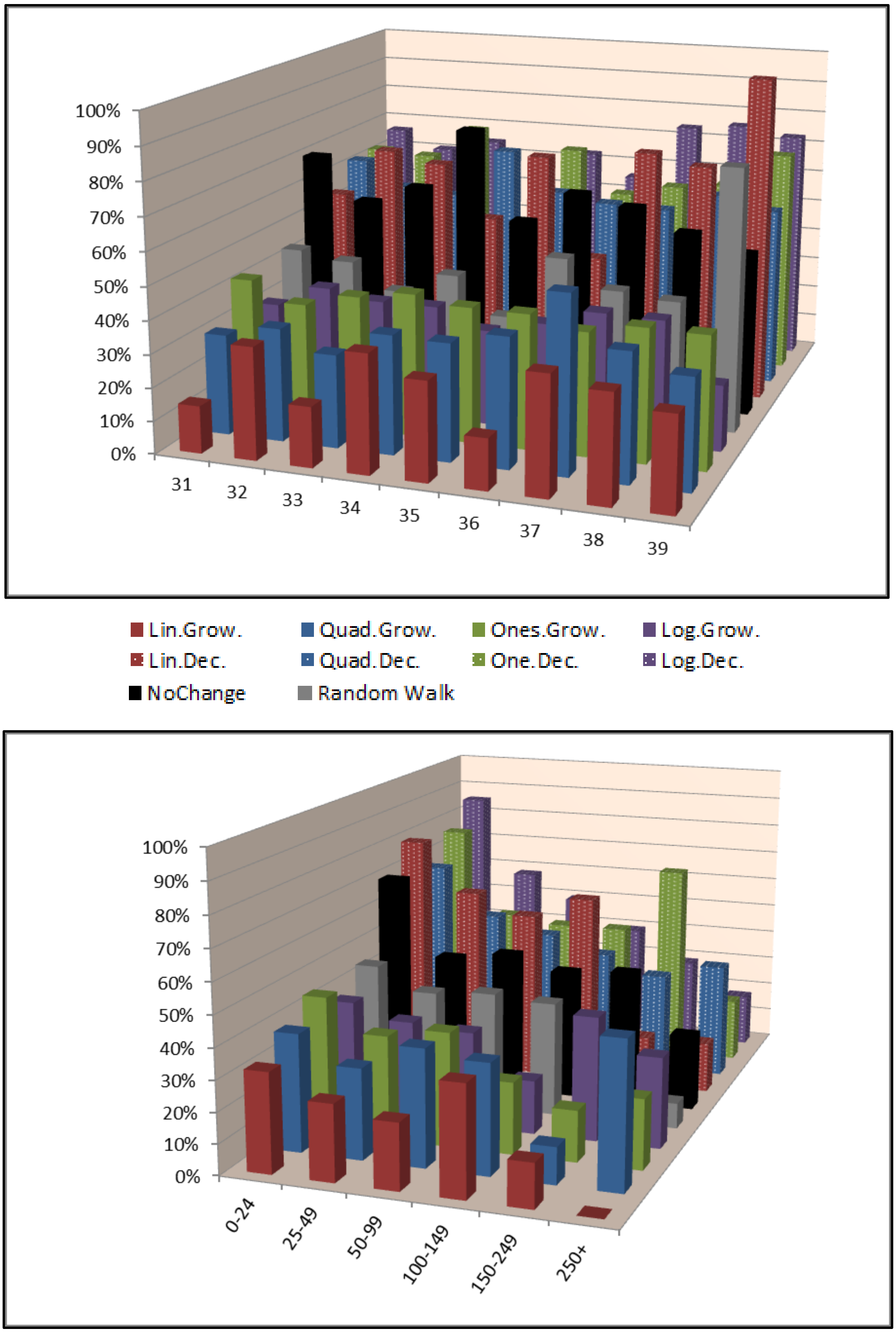


Figure 5.3: Distribution of patterns by sector and size: Exit rates

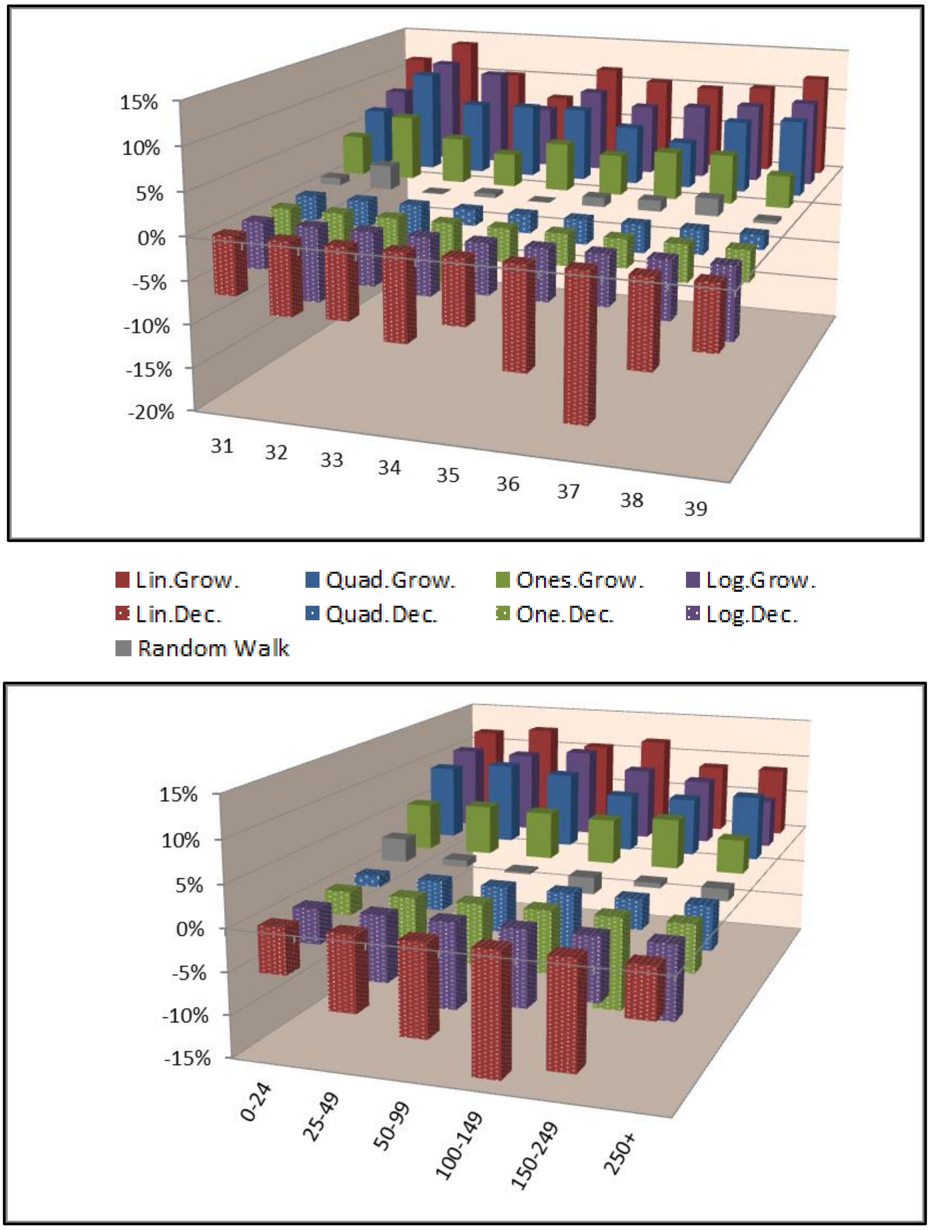
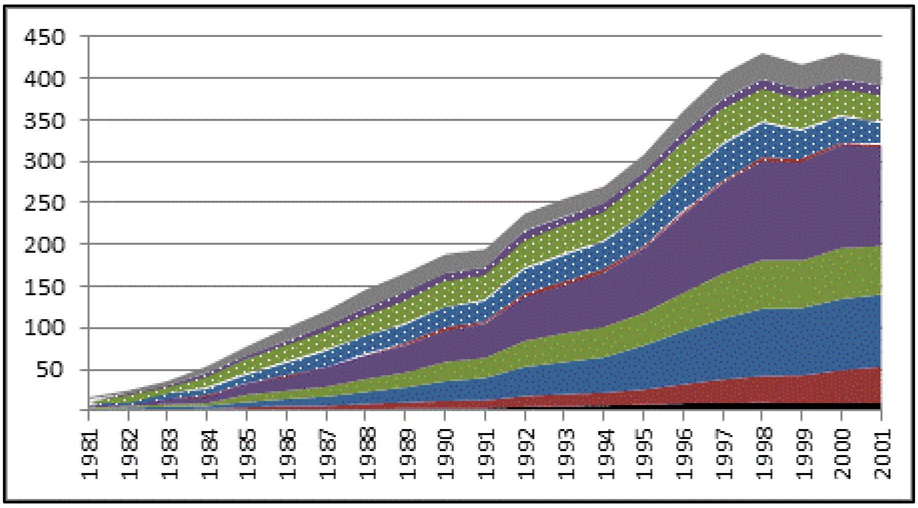


Figure 5.4: Distribution of patterns by sector and size: Overall trend growth rate

Survivors



Exitors

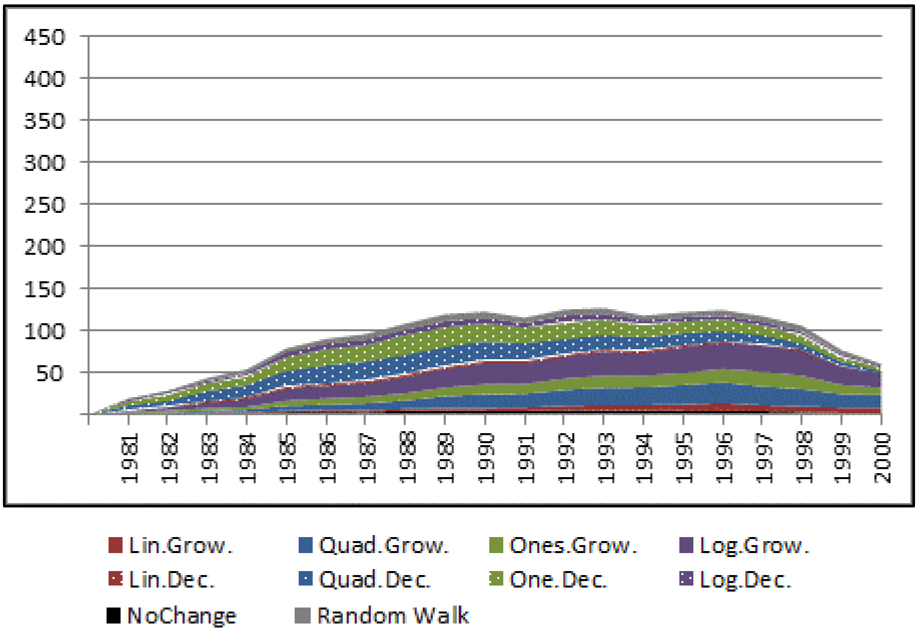


Figure 5.5: Distribution of patterns by total employment and survival (1000 employees)

5.5 Determinants of Patterns of Firm Growth

Davidsson and Wiklund (2006) point out the importance of using latent variables in modelling firm growth, and they emphasize the concept of different growth patterns in the following quotation:

> A promising alternative is the growth modeling of longitudinal data using latent variables. (…) different growth patterns and growth rates can be modeled during different time intervals of the study. (…) the approach accounts for individual differences between firms as well as similarities among groups of firms (Davidsson and Wiklund, 2006: 57).

Apart from the previous literature regarding the determinants of growth categories, we claim that a more comprehensive approach is needed to take into account different patterns of firm growth. From this point of view, we analyze the determinants of patterns of firm growth, which are discovered by using an original methodology. Multinomial logit model is conducted to investigate the effects of the variables for firm-specific and sector-specific variables, including the dummies for both sectors and regions, on patterns of firm growth in Turkish manufacturing.

5.5.1 Estimation Results

Before the interpretations of the estimation results, we look at some diagnostic tests of our multinomial logit estimations. The significant log likelihood ratio tests (2352.33) mean that the parameters estimated demonstrate the impact of explanatory variables on the likelihood of moving into each pattern with respect to the firms that failed within their first six years, the base pattern. Moreover, it should be noted that all categorical outcomes included in the multinomial logit selection model should be distinguishable. Particularly, we can state that if none of the covariates significantly affects the odds of a pattern versus another pattern, these patterns are indistinguishable with respect to the variables in the model. This condition is tested with a Wald test or LR test (Long, 1997: 162-163). The test results presented in Table C.1 and Table C.2 of Appendix C, indicate that the pattern categories are distinguishable from each other.

The multinomial logit coefficients are estimated by maximum likelihood method. A significant variable influences the outcome probabilities of each pattern. It should be noted that these coefficients estimates are up to a scale factor since the coefficients for the base pattern (fail) are set equal to zero.

The interpretation of multinomial logit model may be a bit complex as there are too many possible comparisons ([nx(n-1)/2] where n is the number of distinct patterns including the base pattern).

The formal interpretation of a marginal effect or a partial change on the latent variable (categorical outcome) is as follows: "for a unit increase in x_k , the latent variable are expected to change by β_k, units, holding all other variables constant" (Long, 1997: 128).

Odds ratio (or relative risk ratio of being in a category) is interpreted as: "for a unit change in x_k , the odds of category m versus category n are expected to change by a factor of exp(β_k, m|n), holding all other variables constant" (Long, 1997: 169).

We report and interpret the coefficients considering odds ratios, while marginal effects are presented in the Appendix C (Tables C.7-C.9).

Having any pattern rather than failures indicates that the firms in those patterns did not exit the industry within their first six years, i.e., they survived at least six years. Therefore we can evaluate the results of multinomial logit estimations as the determinants of survival in this respect, and those results reveal the determinants of each pattern as well.

Table 5.4 reports the multinomial logit estimation results for pattern selection, taking the failures as the base category. Size variable has the significant effect on firm growth. The odds of having any pattern relative to failures are greater for a unit increase in entry size, holding other variables constant. This means also entry size increases survival probability for all patterns. Particularly, if any grower firm were to increase its entry size by one unit, the odds for grower patterns relative to failures would be expected to increase by some factors of between 1.41 and 1.92 given other variables in the model held constant. However, the odds of having any decliner pattern relative to failures are 2.25-2.81 times greater for a unit increase in entry size, holding other variables constant. Therefore we can conclude that the entry size effect is strongly larger for decliner patterns than grower patterns. Also, we observe that this effect is larger for random walk pattern with respect to grower patterns and no change pattern.

Figure 5.6 presents the odd ratios of a number of explanatory variables. The vertical axis denotes the odds of our base category (failure), which is equal to one. The bars show that the odds ratio of a pattern relative to the failure for the relevant explanatory variables. For instance, the top panel of Figure 5.6 displays the different impact of size between grower patterns and decliner patterns.

Table 5.4: Pattern selection estimation results

	No Change	**Lin. Grower**	**Quad. Grower**	**One-s. Grower**	**Log. Grower**
size	1.547***	1.892***	1.916***	1.412***	1.838***
	[0.111]	[0.139]	[0.096]	[0.072]	[0.077]
rlp	1.202***	1.620***	1.492***	1.331***	1.520***
	[0.069]	[0.105]	[0.066]	[0.054]	[0.054]
kl	0.863***	1.118***	1.071**	0.969	1.126***
	[0.029]	[0.047]	[0.030]	[0.024]	[0.026]
subinp	0.600	0.894	0.635	0.661	0.833
	[0.365]	[0.496]	[0.237]	[0.260]	[0.240]
suboutp	0.610*	0.954	1.025	0.860	1.050
	[0.169]	[0.277]	[0.184]	[0.156]	[0.151]
adverint	0.007	0.005	40.582	12.330	34.551
	[0.051]	[0.033]	[146.621]	[46.807]	[104.637]
interest	0.087	0.038*	0.065**	0.377	0.022***
	[0.146]	[0.071]	[0.080]	[0.416]	[0.023]
pub	0.796	0.370	0.749	0.877	1.021
	[0.323]	[0.228]	[0.243]	[0.269]	[0.254]
fdi	1.301	0.602	0.945	1.011	0.811
	[0.465]	[0.238]	[0.225]	[0.257]	[0.167]
entrate	0.014***	0.405	0.833	0.031***	0.448
	[0.018]	[0.510]	[0.680]	[0.027]	[0.307]
hhi	0.766	0.966	1.089	1.000	0.826
	[0.697]	[0.975]	[0.747]	[0.624]	[0.458]
mes	0.783*	0.751*	0.842*	0.765***	1.051
	[0.104]	[0.115]	[0.083]	[0.072]	[0.081]
Cons.	0.052***	0.011***	0.023***	0.113***	0.019***
	[0.026]	[0.006]	[0.008]	[0.039]	[0.005]

Table 5.4: Pattern selection estimation results (cont'd)

	Lin. Decliner	Quad. Decliner	One-s. Decliner	Log. Decliner	Random Walk
size	2.807***	2.400***	2.397***	2.252***	2.284***
	[0.268]	[0.109]	[0.106]	[0.134]	[0.152]
rlp	1.082	1.282***	1.146***	1.017	1.495***
	[0.109]	[0.053]	[0.046]	[0.056]	[0.096]
kl	0.775***	0.927***	0.874***	0.857***	0.934*
	[0.040]	[0.023]	[0.020]	[0.027]	[0.036]
subinp	0.186	0.501*	0.745	1.007	0.156***
	[0.209]	[0.191]	[0.269]	[0.499]	[0.107]
suboutp	1.225	0.579***	0.633***	0.549**	1.521*
	[0.461]	[0.107]	[0.112]	[0.139]	[0.369]
adverint	0.001	22.883	0.003	0.000**	0.029
	[0.016]	[80.889]	[0.013]	[0.000]	[0.197]
interest	0.616	0.038***	0.112**	0.792	6.613
	[1.500]	[0.044]	[0.122]	[1.108]	[9.869]
pub	1.224	1.479*	1.281	0.898	1.012
	[0.546]	[0.350]	[0.290]	[0.281]	[0.399]
fdi	1.081	0.664	0.518**	1.356	0.394*
	[0.540]	[0.171]	[0.148]	[0.397]	[0.190]
entrate	1.024	0.225*	0.140**	1.455	0.009***
	[1.872]	[0.176]	[0.110]	[1.442]	[0.012]
hhi	0.066	0.975	0.529	0.800	0.280
	[0.128]	[0.627]	[0.351]	[0.695]	[0.317]
mes	0.753	0.657***	0.647***	0.607***	0.378***
	[0.131]	[0.060]	[0.055]	[0.070]	[0.065]
Cons.	0.003***	0.049***	0.054***	0.032***	0.139***
	[0.002]	[0.016]	[0.017]	[0.013]	[0.085]

Pseudo R^2 : 0.045 LR-Chi2(310): 2352.33*** Log Likelihood: -24782.13
Number of firms: 13674

Note: All models include sector and region dummies. Base category is the failure pattern that includes the firms failed in their first six years. Coefficients in table are relative risk ratios (odds ratios). Standard errors in brackets: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

The odds of having any pattern relative to failure is higher for a unit increase in entry labor productivity, holding other variables constant. However, in this case the effect of relative labor productivity at the entry time is larger for grower patterns than decliner patterns (Figure 5.6, panel 2).

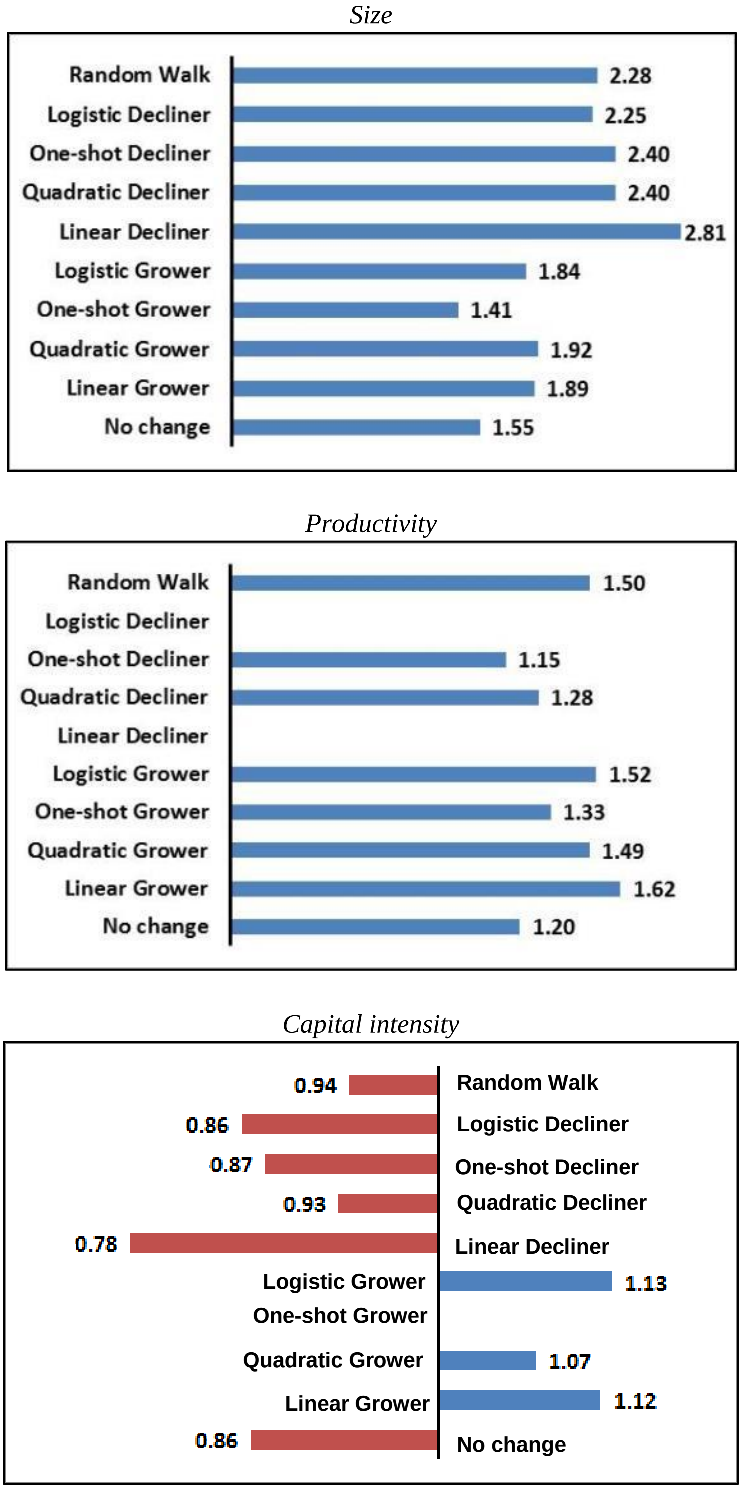
In the case of capital intensity, the direction of the effect on pattern selection is different among grower and decliner patterns. Specifically, if any grower firm was to increase its entry capital intensity by one unit, the odds for grower patterns relative to failures would be expected to increase, given that other variables in the model are held constant. Besides, if any decliner firm was to increase its entry capital intensity by one unit, the odds for decliner patterns relative to failures would be expected to decrease by some factors given that other variables in the model are held constant. The last panel of Figure 5.6 presents this significant difference clearly. The main reason underlying this finding is probably that the capital-intensive firms need more capital in order to survive. Therefore, one can claim that if capital intensive firms are growing in any grower pattern can survive easily, otherwise those which do not have the flexible capital intensity structure had to leave the industry.

The odds of having most patterns relative to failures are lower for a unit increase in interest intensity, holding other variables constant. This means that interest intensity affects the survival negatively. We can point out that the firms with less financial constraints are more likely to survive while the firms that have high interest intensity are more likely to encounter a fail even if they have a grower pattern.

Foreign ownership and public firm dummies are not significant in most patterns. That means that the ownership structure does not matter in explaining the patterns of firm growth in our sample.

Regarding the sector specific variables, if the entry rate or minimum efficient scale in an industry is increased by one unit, the odds for patterns relative to failures would be expected to decrease, given that other variables in the model are held constant.

Consequently, we can observe that the pattern selection model can reveal the determinants of the patterns fairly well. Note that we prefer to report the odds ratios in Table 5.4 taking the failures as the reference category in multinomial logit specification. This is because these results also reflect survival effects. Note that the odds ratios for all alternatives for the base category are reported in Appendix C (Tables C.3-C.6).



Base category is the failure pattern.

Figure 5.6: Odds ratio plots for patterns

We aggregated some patterns to reduce the number of growth patterns to simplify our analysis. We combine linear and quadratic patterns as continuous growth/decline, and one-shot and logistic patterns as asymptotic growth/decline. We keep ‘no change’ and ‘random walk’ patterns as distinct patterns because they behave quite different than others. Aggregated pattern selection estimation results are reported in Table 5.5.

As in the case of detailed pattern selection model, the size variable has a positive and significant effect on firm growth. The odds of having any aggregated pattern relative to failures are greater for a unit increase in entry size, holding other variables constant. If any grower firm were to increase its entry size by one unit, the odds for grower patterns relative to failures would be expected to increase by a factor between 1.66 and 1.90. On the other hand, the odds of having any decliner pattern relative to failures are 2.35-2.45 times greater for a unit increase in entry size, holding other variables constant. Therefore, once again one can conclude that the entry size effect is significantly larger for decliner patterns than grower patterns. This finding is also shown in the top panel of Figure 5.7.

If any grower firm was to increase its entry relative productivity by one unit, the odds for grower patterns relative to failures would be expected to increase by a factor of approximately 1.5. Besides, the odds of having a decliner pattern relative to failures are 1.1 or 1.25 times greater for a unit increase in relative labor productivity at the time of entry. Therefore, the effect of relative labor productivity at the time of entry is larger for grower patterns than decliner patterns. The second panel of Figure 5.7 displays this difference.

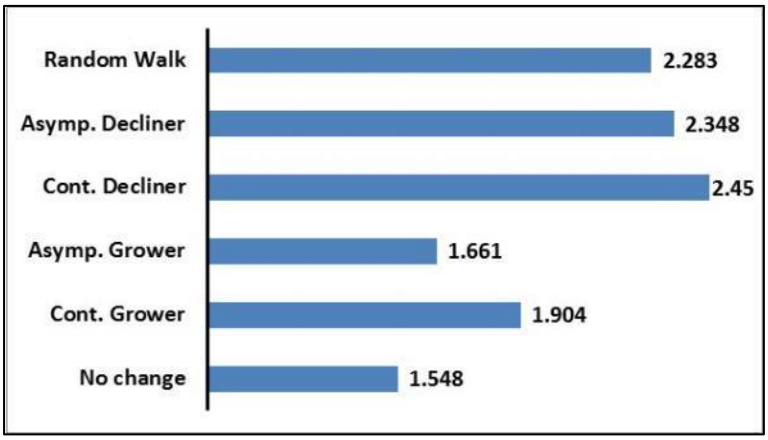
Table 5.5: Aggregated pattern selection estimation results

	No Change	**Cont. Grower**	**Asymp. Grower**	**Cont. Decliner**	**Asymp. Decliner**	**Random Walk**
size	1.548***	1.904***	1.661***	2.451***	2.348***	2.282***
	[0.111]	[0.084]	[0.060]	[0.105]	[0.093]	[0.152]
rlp	1.202***	1.526***	1.437***	1.255***	1.103***	1.495***
	[0.069]	[0.058]	[0.042]	[0.049]	[0.038]	[0.096]
kl	0.864***	1.082***	1.053***	0.902***	0.869***	0.934*
	[0.029]	[0.026]	[0.019]	[0.021]	[0.017]	[0.036]
subinp	0.599	0.699	0.786	0.446**	0.815	0.155***
	[0.365]	[0.225]	[0.195]	[0.163]	[0.250]	[0.107]
suboutp	0.610*	1.008	0.959	0.648***	0.605***	1.519*
	[0.169]	[0.159]	[0.115]	[0.109]	[0.091]	[0.368]
adverint	0.007	5.065	19.973	8.191	0.001**	0.029
	[0.052]	[17.183]	[53.539]	[28.248]	[0.000]	[0.196]
interest	0.086	0.058***	0.076***	0.059***	0.215*	6.791
	[0.144]	[0.063]	[0.063]	[0.064]	[0.200]	[10.126]
pub	0.795	0.629	0.975	1.438	1.146	1.012
	[0.323]	[0.189]	[0.211]	[0.325]	[0.239]	[0.399]
fdi	1.301	0.847	0.891	0.716	0.754	0.395*
	[0.465]	[0.186]	[0.163]	[0.173]	[0.169]	[0.190]
entrate	0.014***	0.669	0.165***	0.267*	0.312*	0.009***
	[0.019]	[0.479]	[0.095]	[0.197]	[0.204]	[0.012]
hhi	0.762	1.049	0.981	0.728	0.611	0.280
	[0.692]	[0.624]	[0.443]	[0.453]	[0.341]	[0.317]
mes	0.782*	0.813**	0.927	0.673***	0.632***	0.378***
	[0.104]	[0.071]	[0.061]	[0.057]	[0.047]	[0.065]
Cons.	0.052***	0.035***	0.078***	0.049***	0.087***	0.139***
	[0.026]	[0.011]	[0.019]	[0.015]	[0.023]	[0.085]

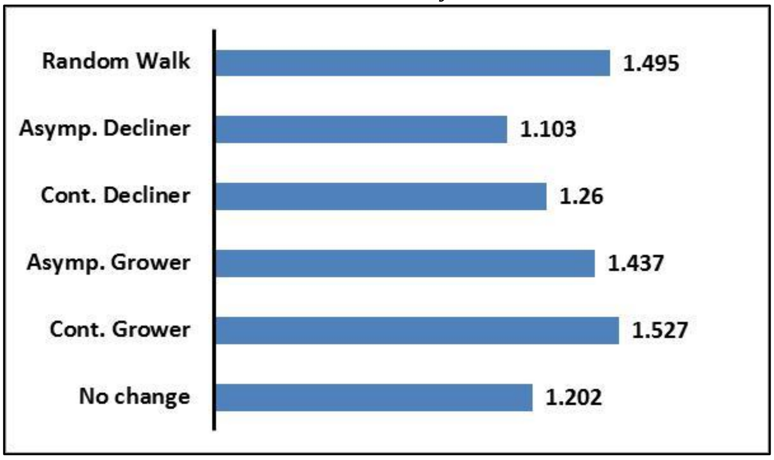
Pseudo R^2 : 0.046   LR-Chi2(186): 2031.75***   Log Likelihood: -20846.68
Number of firms: 13674

Note: All models include sector and region dummies. Base category is the failure pattern that includes the firms failed in their first six years. Coefficients in table are relative risk ratios (odds ratios). Standard errors in brackets: *** p<0.01, ** p<0.05, * p<0.1.

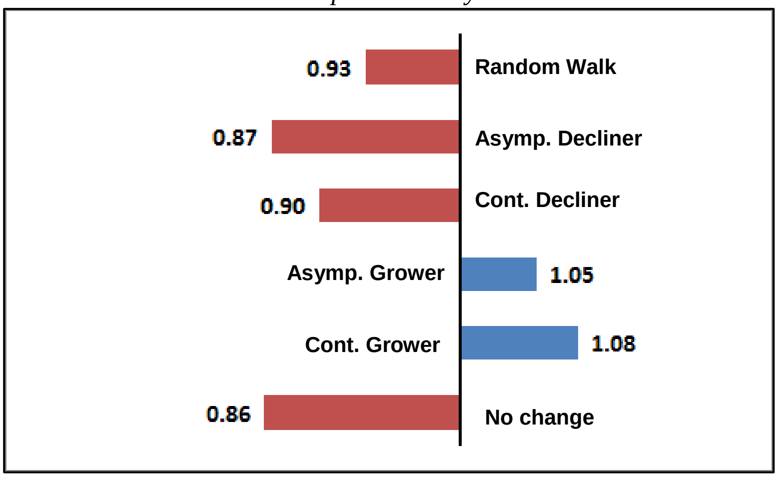
Size



Productivity



Capital intensity



Base category is the failure pattern.

Figure 5.7: Odds ratio plots for aggregated patterns

Regarding capital intensity at the time of entry, the direction of the effect on pattern selection is different between grower and decliner patterns. If any grower firm were to increase its entry capital intensity by one unit, the odds for grower patterns relative to failures would be expected to increase. But the opposite effect is valid for decliner firms. The last panel of Figure 5.7 shows this different impact of capital intensity on grower and decliner patterns.

Hence, we can state that if capital intensive firms are growing in any grower pattern their survival are more likely, while those firms in the decliner pattern have to leave the industry since they do not have the flexible capital intensity structure.

We find the fact that the firms with less financial constraints can survive easily, while the firms that have high interest intensity encounter a fail even if they have any grower pattern.

Concerning the sector specific variables, if any firm were exposed to increase in entry rate or minimum efficient scale in their industry by one unit, the odds for patterns relative to failures would be expected to decrease by some factors given that other variables in the model are held constant. This is true in most patterns for both growers and decliners.

5.5.2 Robustness Check

We control whether the multinomial logit results change with sectoral differences, variable definitions, and model extensions as a robustness check to validate the results presented above.

We estimated multinomial logit models for each sector, separately. We use all explanatory variables for the firms relative to the 4-digit industry averages where the firm operated, as an alternative specification. The main results of the multinomial logit do not change. On the other hand, in order to test the effects for the existence of three sector specific variables, namely entry rate, concentration and minimum efficient scale within the multinomial logit specification, we specify alternative models for the pattern selection without those variables. Again, we reach to similar results as the ones presented in the multinomial logit selection model.

Note that we estimated all multinomial logit regressions with alternative dummy sets of industries/sectors. We re-estimated the models with all possible sets of industry dummies, i.e., the dummies defined at the 2, 3, or 4-digit. We also checked the results with aggregated sectors (by orientation classification), namely labor-intensive, resource-intensive, scale-intensive, and specialized suppliers and science based. All alternative dummy sets of industries provide similar results for the effects of explanatory variables on pattern selection.

We extend the models by including exporter status and R&D performer dummies, and relative product diversification variables. Since these variables are available since 1992, these models are estimated by using a sub-sample of the data. Exporter and R&D dummies are found to be insignificant in most models. We find that the odds ratios for relative product diversification, which is defined as the number of products produced by the firm relative to the 4-digit industry average, are found to be significantly smaller than one. Then, the odds of having any pattern relative to failures are smaller for a unit increase in relative product diversification. This means that product diversification decreases survival probability for all patterns. We need to be aware of the definition of relative product diversification for entry year of the firm. This finding may imply that new firms are faced with difficulties in deciding the number of products due to the limited information. Another explanation may be the inability of the entrants to set up their best configurations of product portfolios. We may claim that this finding supports the learning theories (Jovanovic, 1982; Ericson and Pakes, 1995). Nonetheless, the addition of these variables into the model does not significantly change the effects of other variables already included, i.e., the results summarized above are robust to adding these variables.

The robustness checks show that the multinomial logit model of pattern selection is robust to variable definitions, and extensions of the model.

CHAPTER 6

PATTERN-SPECIFIC DETERMINANTS OF FIRM GROWTH

6.1 Introduction

We investigate the pattern-specific determinants of firm growth by using a selection-bias correction methodology based on the multinomial logit model. Specifically, the first stage investigates the determinants of pattern selection, which has been analyzed in Chapter 5. The second stage analyzes the growth rates based on the selection-correction terms estimated in the first stage. This chapter deals with the second stage, i.e., growth rate equations for each pattern of growth of the two-stage model. Regressions based on the selection correction are conducted to investigate the effects of the firm, sector and region-specific characteristics on growth process in Turkish manufacturing. The estimation of growth regressions with selectivity correction reveals the significant factors that have impact on the growth rates of the firm.

To the best of our knowledge, firm growth process has not been studied by considering different patterns of firm growth with two-stage model as defined here. The contribution of this chapter is to investigate firm growth process based on pattern selection and to analyze how the determinants affect the firm growth according to different patterns.

The methodological consideration of the determinants of firm growth with selection bias correction based on the multinomial logit model is presented in the next section. The subsequent section provides a description of the data and variables used in estimations. Finally, the pattern-specific determinants of firm growth with selection bias correction are analyzed.

6.2 Methodology

We specify the growth rate equation for the firms via two stages. This is because we claim that the selection of the patterns of firm growth is not independent of the determinants of growth dynamics. We thus model firm growth based on pattern selection.

Following Bourguignon et al. (2007), we consider the two-stage model as follows:

$$y_1 = x\beta_1 + u_1 \tag{6.1}$$

$$y_j^* = z\gamma_j + \eta_j$$

where $j = 1,2, \dots, J$ and the disturbance u_1 is not parametrically specified, and confirms $E(u_1|x, z) = 0$ and $V(u_1|x, z) = \sigma^2$. j is a categorical variable, which defines the pattern of growth of a firm among J (pattern) alternatives based on y_j^*. The vector z shows the maximum set of explanatory variables for all patterns and the vector x includes all determinants of the firm growth. There is an assumption that the model is non-parametrically identified from exclusion of some of the variables in the model z from the variables in x. The growth variable y_1 is observed if and only if pattern 1 is selected in the following situation:

$$y_1^* > \max_{j\neq 1}(y_j^*) \tag{6.2}$$

Defining $\varepsilon_1 = \max_{j\neq 1}(y_j^* - y_1^*) = \max_{j\neq 1}(z\gamma_j + \eta_j - z\gamma_1 - \eta_1)$, we can see $\varepsilon_1 < 0$.

Assuming that the η_j terms are independent and identically Gumbel distributed, the specification turns out to be multinomial logit model with

$$P(\varepsilon_1 < 0|z) = \frac{\exp(z\gamma_1)}{\sum_j \exp(z\gamma_j)} \quad (6.3)$$

Although the consistent maximum likelihood estimates of the η_j terms can be obtained, the problem is to estimate β_1 when considering that the disturbance term u_1 may not be independent of all η_j terms. OLS estimates of β_1 would not be consistent because some correlations may exist between the explanatory variables and disturbance term in the growth equation.

Describing $\Gamma = [z\gamma_1, z\gamma_2, \dots, z\gamma_J]$ and generalizing Heckman (1979) model, bias correction can be based on the conditional mean of u_1 :

$$E(u_1|\varepsilon_1 < 0, \Gamma) = \lambda(\Gamma)$$

Therefore, the probability of pattern m of firm growth identified is

$$P_m = \frac{\exp(z\gamma_m)}{\sum_j \exp(z\gamma_j)} \quad (6.4)$$

Then, we can define $(u_1|\varepsilon_1 < 0, \Gamma) = \mu(P_1, P_2, \dots, P_J)$, which takes into account the relationship between Γ and probabilities of J patterns.

Hence, we obtain the consistent estimation of β_1 based on the following regression,

$$y_1 = x\beta_1 + \mu(P_1, P_2, \dots, P_J) + w_1 \quad (6.5)$$

where w_1 is the residuals, which are mean independent of the regressors.

There are some methods suggested in the literature to correct biases. Lee (1983) suggested a generalization of the two-step selection bias correction method introduced by Heckman (1979), which extends to the case where selectivity is modelled as a multinomial logit. The other method is proposed by Dubin and McFadden (1984). This method has three different variations. The original method assumes that the sum of the correlation coefficients between the disturbances in first and second steps for each category (those are patterns in our case) equals to zero. In the second method, Bourguignon et al. (2007) relax this assumption, which is exploited in our estimations. The last alternative of Dubin and McFadden (1984) model allows error terms in the growth equations to have normal distribution. Finally, Dahl (2002) proposed a semi-parametric approach, which performs bias corrections using selection probabilities in polynomial form.

The method of Lee (1983) is the weakest one to capture the effects of selection because it allows for identifying one correction coefficient, which is related to only own pattern of the corresponding growth equation. Thus, it provides limited information about the selection process. The first variant of Dubin and McFadden (1984) method has an unnecessarily restrictive assumption on relations between disturbances. We claim that the third variant of Dubin and McFadden (1984) method is also based on restrictive assumption about the error terms. Dahl (2002) method becomes unfeasible as the number of categories in multinomial logit increases. On the other hand, Schmertmann (1994) claimed that Dubin and McFadden approach should be followed on theoretical ground. Moreover, based on Monte Carlo simulations, Bourguignon et al. (2007) show that all variants of Dubin and McFadden (1984) methods are to be preferred to Lee's and Dahl's methods. They also claim that the second variant of Dubin and McFadden (1984) is the superior one in order to improve the correction performance. Consequently, we prefer the second variant of the Dubin and McFadden (1984) method as specified in Bourguignon et al. (2007). Nonetheless, we implemented all other correction methods for the robustness check.

The selection correction method we employ is specified as follows:

$$\mathrm{E}(u_1|\eta_1, \dots, \eta_M) = \sigma \frac{\sqrt{6}}{\pi} \sum_{j=1,\dots,J} r_j \left(\eta_j - \mathrm{E}(\eta_j)\right) \tag{6.6}$$

where r_j is the correlation coefficient between u_1 and η_j. Based on the multinomial logit model,

$$E\left(\eta_1 - E(\eta_1)|y_1^* > \max_{s\neq 1} y_s^*, \Gamma\right) = -\ln P_1 \tag{6.7}$$

$$E\left(\eta_j - E(\eta_j)|y_1^* > \max_{s\neq 1} y_s^*, \Gamma\right) = \frac{P_j \ln P_j}{1 - P_j}, \quad \forall j > 1. \tag{6.8}$$

Therefore, our firm growth rate equation can be estimated by OLS consistently on the basis of

$$y_1 = x_1\beta_1 + \sigma\frac{\sqrt{6}}{\pi}\left[\sum_{j=2,\dots,J.} r_j\left(\frac{P_j \ln P_j}{1 - P_j}\right) - r_1 \ln P_1\right] + w_1 \tag{6.9}$$

In sum, we estimate the firm growth equation for each pattern of firm growth that we identified earlier.

6.3 Data and Variables

In this chapter, we use the same set of the firms analyzed in the previous chapter. Our sample includes 22,536 firms established since 1981. In the previous chapter, we have already discovered detailed patterns for 8,319 firms that were observed at least 6 years, leaving the rest of the firms (14,217) to be categorized as "failed". The variables used in the growth rate estimation are defined in Table 6.1.

We analyze the growth processes of each pattern discovered in the previous chapter. Our dependent variable is overall (log) employment growth trend of the firm. Similar to those in our multinomial logit specification, entry size (*size*), relative labor productivity (*rlp*), capital intensity (*kl*), subcontracted input and output intensities (*subinp*, *suboutp*), advertisement intensity (adverint), interest intensity (*interest*), two dummies for public and FDI firms (*pub*, *fdi*) are included in the growth equation to control the firm-specific characteristics. Entry rate (*entrate*), concentration (*hhi*), and minimum efficient scale (*mes*) are included as the (4-digit) industry specific variables.

Table 6.1: Variables used in growth regressions

Variable		Description
Firm growth	*growth*	Overall (log) employment growth trend
Firm size	*size*	(log) of firm size in terms of employment
Relative labor productivity	*rlp*	(log) ratio of real output to labor (relative to 4-digit sector average)
Capital intensity	*kl*	(log) ratio of real capital to labor
Subcontracted input intensity	*subinp*	Share of expenses for subcontracted inputs in the value of total inputs
Subcontracted output intensity	*suboutp*	Share of revenue from subcontracted output in the value of total output
Advertisement intensity	*adverint*	Share of advertisement and marketing expenditures in the value of total output
Interest intensity	*interest*	Share of interest payments in the value of total output
Public firm dummy	*pub*	for public firms whose ownership share is larger than 10 %
FDI firm dummy	*fdi*	for foreign firms whose ownership share is larger than 10 %
Entry rate	*entrate*	Employment share of entrants in total employment (4-digit)
Herfindahl-Hirschman Index	*hhi*	Sum of squared market shares (in terms of output) (4-digit)
Minimum efficient scale	*mes*	Sectoral median (log) of firm size in terms of employment (4-digit)
Sectoral growth	*sectgr*	(5-year) sectoral growth rate (4-digit)
Provincial growth	*provgr*	(5-year) provincial growth rate

In order to satisfy the identification requirements of the two-stage modelling, the set of variables should differ across the stages. Specifically, the second stage should include some additional variables, which are not included in the first stage. To this end, we consider the multinomial logit specification with sector and province dummies, whereas the growth equation is constructed without those dummies. Furthermore, the growth rate equation includes sectoral and provincial employment (5-year) growth rates (*sectgr*, *provgr*) at the initial year of the firm. Descriptive statistics of the variables used in the growth regressions in this chapter can be seen in Table 6.2. More detailed explanations of the data are given in Data Appendix.

Table 6.2: Mean values of the variables at entry by patterns

Pattern/*variable*	***growth***	***size***	***rlp***	***kl***	***subinp***	***suboutp***	***adverint***
Failure	-	3.046	-0.255	2.342	0.035	0.095	0.002
	-	(0.741)	(1.025)	(1.465)	(0.116)	(0.271)	(0.008)
No Change	0.000	3.215	-0.115	2.22	0.022	0.048	0.001
	(0.000)	(0.789)	(0.851)	(1.465)	(0.082)	(0.187)	(0.005)
Lin. Grower	0.118	3.421	0.241	2.885	0.035	0.058	0.002
	(0.073)	(0.787)	(0.849)	(1.484)	(0.109)	(0.212)	(0.007)
Quad. Grower	0.093	3.453	0.168	2.784	0.035	0.071	0.003
	(0.08)	(0.853)	(0.914)	(1.528)	(0.097)	(0.237)	(0.011)
One-s. Grower	0.058	3.198	-0.022	2.483	0.024	0.053	0.002
	(0.063)	(0.823)	(0.875)	(1.575)	(0.094)	(0.201)	(0.011)
Log. Grower	0.102	3.486	0.207	2.936	0.038	0.072	0.003
	(0.083)	(0.886)	(0.902)	(1.55)	(0.107)	(0.228)	(0.011)
Lin. Decliner	-0.087	3.627	-0.192	2.029	0.02	0.089	0.002
	(0.064)	(0.823)	(0.767)	(1.464)	(0.069)	(0.253)	(0.007)
Quad. Decliner	-0.029	3.554	0.026	2.472	0.03	0.052	0.003
	(0.053)	(0.895)	(0.862)	(1.47)	(0.093)	(0.2)	(0.008)
One-s. Decliner	-0.046	3.482	-0.096	2.275	0.028	0.054	0.002
	(0.056)	(0.92)	(0.846)	(1.498)	(0.103)	(0.204)	(0.008)
Log. Decliner	-0.066	3.421	-0.171	2.184	0.028	0.05	0.001
	(0.063)	(0.905)	(0.832)	(1.574)	(0.094)	(0.185)	(0.005)
Random Walk	0.016	3.494	0.095	2.522	0.024	0.076	0.002
	(0.077)	(0.921)	(0.91)	(1.522)	(0.069)	(0.24)	(0.008)

Pattern/*variable*	***interest***	***pub***	***fdi***	***entrate***	***hhi***	***mes***	***sectgr***	***provgr***
Failure	0.012	0.01	0.012	0.055	0.051	3.382	0.035	0.018
	(0.029)	(0.1)	(0.111)	(0.044)	(0.059)	(0.395)	(0.053)	(0.033)
No Change	0.013	0.018	0.02	0.046	0.055	3.388	0.029	0.022
	(0.03)	(0.134)	(0.142)	(0.042)	(0.055)	(0.473)	(0.051)	(0.039)
Lin. Grower	0.014	0.008	0.024	0.054	0.052	3.415	0.043	0.024
	(0.029)	(0.09)	(0.155)	(0.048)	(0.061)	(0.387)	(0.055)	(0.037)
Quad. Grower	0.015	0.017	0.034	0.055	0.051	3.431	0.041	0.02
	(0.032)	(0.128)	(0.182)	(0.048)	(0.061)	(0.447)	(0.054)	(0.036)
One-s. Grower	0.015	0.015	0.023	0.047	0.056	3.385	0.033	0.021
	(0.032)	(0.12)	(0.149)	(0.042)	(0.06)	(0.404)	(0.051)	(0.038)
Log. Grower	0.014	0.027	0.034	0.053	0.051	3.488	0.043	0.024
	(0.031)	(0.161)	(0.181)	(0.047)	(0.06)	(0.451)	(0.054)	(0.038)
Lin. Decliner	0.017	0.048	0.03	0.054	0.05	3.409	0.022	0.017
	(0.035)	(0.214)	(0.171)	(0.045)	(0.046)	(0.567)	(0.05)	(0.032)
Quad. Decliner	0.014	0.04	0.021	0.053	0.052	3.403	0.036	0.021
	(0.031)	(0.197)	(0.144)	(0.046)	(0.056)	(0.443)	(0.054)	(0.038)
One-s. Decliner	0.014	0.038	0.015	0.052	0.053	3.379	0.027	0.019
	(0.032)	(0.19)	(0.12)	(0.051)	(0.05)	(0.518)	(0.051)	(0.035)
Log. Decliner	0.015	0.029	0.032	0.056	0.055	3.347	0.021	0.017
	(0.035)	(0.167)	(0.176)	(0.048)	(0.053)	(0.565)	(0.05)	(0.037)
Random Walk	0.019	0.024	0.012	0.048	0.052	3.334	0.037	0.022
	(0.037)	(0.153)	(0.109)	(0.042)	(0.049)	(0.38)	(0.053)	(0.031)

Note: Standard deviations are reported in parenthesis

6.4 Determinants of Firm Growth Rates

6.4.1 Growth Regressions without Selectivity

Before the discussion of the estimation results that correct pattern selection bias in the growth rate equations, we look at the effects of explanatory variables on firm growth regardless of selection correction, namely simple OLS results. The results of OLS estimation are reported in Table 6.3.

The coefficient of the entry size variable is negative, indicating that small firms have higher growth rates than large firms for the whole sample. This finding is consistently obtained each pattern except linear and quadratic growers. Relative labor productivity has a positive impact on growth for the whole sample, which means that productive firms grow faster. We found the same effect in one-shot and logistic patterns for growers, as well as linear and quadratic patterns for decliners. Yet, this effect disappears for some grower or decliner patterns. Capital-intensive firms tend to grow faster for the whole sample. This is true for all grower patterns and random walk, too. On the other hand, for the decliner patterns it becomes insignificant in all but the quadratic decliner pattern.

Subcontracting input intensity increases firm’s growth rate for all grower patterns except one-shot category. Besides, it has no impact on growth for decliner patterns. Although there is a substantial effect of subcontracting output intensity on growth for the whole sample, none of the distinct patterns has a significant impact regarding this variable except the logistic grower pattern, which is significant at the margin.

The coefficients of the interest and advertisement intensity variables are not statistically significant for the patterns; the latter is found to be positive for only the whole sample estimation.

Table 6.3: Growth regressions without selection correction for patterns

	All Firms	Lin. Grower	Quad. Grower	One-s. Grower	Log. Grower
size	-0.021***	0.001	-0.001	-0.008***	-0.007**
	[0.001]	[0.006]	[0.004]	[0.003]	[0.003]
rlp	0.012***	-0.003	0.003	0.007***	0.005**
	[0.001]	[0.005]	[0.003]	[0.002]	[0.003]
kl	0.010***	0.005*	0.009***	0.004**	0.008***
	[0.001]	[0.003]	[0.002]	[0.001]	[0.001]
subinp	0.042***	0.087**	0.090***	0.027	0.069***
	[0.011]	[0.039]	[0.028]	[0.022]	[0.021]
suboutp	0.019***	-0.008	-0.020	0.014	0.019*
	[0.005]	[0.021]	[0.012]	[0.011]	[0.010]
adverint	0.323***	0.116	0.117	0.169	0.121
	[0.113]	[0.615]	[0.254]	[0.176]	[0.197]
interest	-0.027	0.165	-0.108	-0.007	0.071
	[0.033]	[0.136]	[0.081]	[0.061]	[0.070]
pub	-0.015**	-0.088**	-0.051**	-0.021	-0.066***
	[0.007]	[0.043]	[0.021]	[0.017]	[0.015]
fdi	0.005	-0.050*	-0.001	0.012	-0.022*
	[0.007]	[0.028]	[0.016]	[0.014]	[0.012]
entrate	0.050**	0.064	0.087	0.090*	0.163***
	[0.024]	[0.086]	[0.059]	[0.048]	[0.048]
hhi	0.023	0.087	-0.018	0.004	-0.002
	[0.020]	[0.068]	[0.048]	[0.034]	[0.038]
mes	0.022***	0.027**	0.028***	0.014**	0.030***
	[0.003]	[0.012]	[0.007]	[0.005]	[0.005]
sectgr	0.144***	0.131	0.052	0.034	0.059
	[0.022]	[0.086]	[0.058]	[0.043]	[0.046]
provgr	0.138***	-0.062	0.194**	0.062	0.199***
	[0.029]	[0.111]	[0.076]	[0.052]	[0.058]
Cons.	-0.006	0.010	-0.015	0.032	-0.011
	[0.010]	[0.043]	[0.026]	[0.020]	[0.021]
R^2	0.101	0.094	0.148	0.055	0.109
Firms	7704	363	886	1081	1469

Table 6.3: Growth regressions without selection correction for patterns (cont'd)

	Lin. Decliner	Quad. Decliner	One-s. Decliner	Log. Decliner	Random Walk
size	-0.019**	-0.019***	-0.023***	-0.021***	-0.025***
	[0.008]	[0.002]	[0.002]	[0.004]	[0.004]
rlp	0.016**	0.004**	0.003	0.005	0.001
	[0.007]	[0.002]	[0.002]	[0.003]	[0.004]
kl	-0.002	0.003**	0.001	-0.001	0.005**
	[0.004]	[0.001]	[0.001]	[0.002]	[0.003]
subinp	-0.077	0.028	-0.007	-0.036	0.039
	[0.076]	[0.018]	[0.016]	[0.030]	[0.054]
suboutp	0.031	0.005	0.012	0.014	0.005
	[0.024]	[0.009]	[0.009]	[0.015]	[0.017]
adverint	-0.844	0.250	0.202	0.625	-0.221
	[0.780]	[0.187]	[0.197]	[0.492]	[0.423]
interest	-0.051	0.003	-0.014	0.052	0.065
	[0.167]	[0.052]	[0.050]	[0.077]	[0.099]
pub	0.042*	0.018*	0.037***	0.057***	0.019
	[0.025]	[0.009]	[0.009]	[0.016]	[0.024]
fdi	0.004	-0.002	0.034**	-0.002	0.025
	[0.030]	[0.011]	[0.013]	[0.016]	[0.033]
entrate	-0.006	-0.011	-0.039	0.013	-0.061
	[0.119]	[0.037]	[0.033]	[0.055]	[0.094]
hhi	-0.166	-0.010	0.089***	-0.077	0.032
	[0.119]	[0.030]	[0.033]	[0.051]	[0.076]
mes	-0.006	0.004	0.003	-0.006	0.001
	[0.012]	[0.004]	[0.004]	[0.006]	[0.010]
sectgr	-0.008	0.084**	-0.032	-0.067	-0.007
	[0.112]	[0.033]	[0.036]	[0.057]	[0.076]
provgr	0.424***	0.003	0.094**	0.088	0.019
	[0.155]	[0.043]	[0.046]	[0.069]	[0.122]
Cons.	0.012	0.013	0.010	0.017	0.092**
	[0.045]	[0.015]	[0.013]	[0.021]	[0.039]
R^2	0.201	0.092	0.128	0.133	0.086
Firms	164	1077	1198	578	407

Note: All models include sector dummies. Standard errors in brackets: *** p<0.01, ** p<0.05, * p<0.1.

Public firms have lower growth rates than private firms for all grower patterns, as well as they have higher growth rates than private ones in all decliner patterns. Foreign ownership dummy has a negative and statistically significant effect on growth for the patterns of linear grower and logistic grower, as well as positive effect on growth for only one-shot decliner pattern. This means that domestic firms have higher growth rates than foreign firms for linear or logistic grower patterns. However, foreign firms have higher growth rates than domestic ones in one-shot decliner pattern. Foreign ownership has no impact on growth for the whole sample.

Regarding the effects of sector specific variables on firm growth, the coefficient of the entry rate variable is found to be positive in one-shot and logistic grower patterns. Therefore, entry rate increases firm growth rates in these patterns. We observe that firm growth rates are higher in more concentrated sectors for only one-shot decliner pattern. Firms grow faster in sectors described by high minimum efficient scale. However, this impact is valid only for grower firms. Firms performing in sectors with high employment growth rates grow at a higher rate for the whole sample, however this effect disappears in almost all patterns. Finally, the firms operating in provinces that have higher growth rates grow faster in some grower and decliner patterns.

In the case of the effects for the growth rate equations of aggregated patterns without selectivity, the results are reported in Table 6.4. Although the results are similar to those obtained for patterns, we would like to interpret them in some detail. We also compare these results with their counterparts based on selection correction in the following sub-section.

The negative sign of the entry size coefficient implies that small firms have higher growth rates than large firms in the whole sample. Also, this is a prevalent effect for all aggregated patterns except the continuously grower patterns. Relative labor productivity has a positive impact on growth for the whole sample, which means that productive firms grow faster. We found the same effect in the cases of asymptotic grower, and continuously and asymptotic decliner patterns. Capital-intensive firms tend to grow faster significantly for the whole sample. This is true for all grower patterns, continuously decliner and random walk patterns, too.

Subcontracting input intensity increases firm growth for all grower patterns. Besides, it has no impact on growth for decliner patterns. Although there is a strong effect of subcontracting output intensity on growth for the whole sample, none of the distinct patterns has a significant impact regarding this variable except for asymptotic grower pattern, in which the effect is positive on growth rate. The coefficients of the interest and advertisement intensity variables are not statistically significant for the patterns; the latter is found to be positive only for whole sample estimation.

Public firms have lower growth rates than private firms for all grower patterns, as well as they have higher growth rates than private ones all decliner patterns, i.e., public firms are less likely to shed labor after entry than private firms. Foreign ownership has no impact on growth rate in patterns.

Regarding the effects of sector specific variables on firm growth, the coefficient of the entry rate variable is found to be positive and significant in asymptotic grower patterns. The concentration variable has no statistically significant impact on the firm growth in the patterns. Firms grow faster in sectors described by high minimum efficient scale. However, this impact is valid for only grower patterns. Firms operating in sectors characterized by high growth rates in employment grow faster not just in all grower patterns but also in continuously decliner pattern. The firms operating in provinces that have higher employment growth grow faster in all grower patterns, and the asymptotic decliner pattern.

Table 6.4: Growth regressions without selection correction for aggregated patterns

	All Firms	**Cont. Grower**	**Asymp. Grower**	**Cont. Decliner**	**Asymp. Decliner**	**Random Walk**
size	-0.021***	-0.001	-0.005**	-0.021***	-0.022***	-0.025***
	[0.001]	[0.003]	[0.002]	[0.002]	[0.002]	[0.004]
rlp	0.012***	0.002	0.007***	0.007***	0.004**	0.001
	[0.001]	[0.003]	[0.002]	[0.002]	[0.002]	[0.004]
kl	0.010***	0.008***	0.007***	0.003***	-0.001	0.005**
	[0.001]	[0.002]	[0.001]	[0.001]	[0.001]	[0.003]
subinp	0.042***	0.096***	0.055***	0.024	-0.013	0.039
	[0.011]	[0.022]	[0.015]	[0.019]	[0.015]	[0.054]
suboutp	0.019***	-0.016	0.019**	0.004	0.012	0.005
	[0.005]	[0.011]	[0.008]	[0.009]	[0.008]	[0.017]
adverint	0.323***	0.030	0.165	0.221	0.322*	-0.221
	[0.113]	[0.226]	[0.138]	[0.194]	[0.189]	[0.423]
interest	-0.027	-0.036	0.013	-0.010	-0.014	0.065
	[0.033]	[0.070]	[0.049]	[0.052]	[0.043]	[0.099]
pub	-0.015**	-0.057***	-0.047***	0.024***	0.044***	0.019
	[0.007]	[0.019]	[0.011]	[0.009]	[0.008]	[0.024]
fdi	0.005	-0.013	-0.011	-0.004	0.010	0.025
	[0.007]	[0.014]	[0.010]	[0.011]	[0.010]	[0.033]
entrate	0.050**	0.080	0.160***	-0.010	-0.034	-0.061
	[0.024]	[0.049]	[0.036]	[0.037]	[0.029]	[0.094]
hhi	0.023	0.020	0.007	-0.008	0.031	0.032
	[0.020]	[0.039]	[0.027]	[0.031]	[0.028]	[0.076]
mes	0.022***	0.027***	0.027***	0.001	-0.001	0.001
	[0.003]	[0.006]	[0.004]	[0.004]	[0.003]	[0.010]
sectgr	0.144***	0.084*	0.073**	0.080**	-0.032	-0.007
	[0.022]	[0.048]	[0.032]	[0.034]	[0.031]	[0.076]
provgr	0.138***	0.111*	0.154***	0.058	0.096**	0.019
	[0.029]	[0.062]	[0.041]	[0.044]	[0.039]	[0.122]
Cons.	-0.006	-0.005	-0.017	0.021	0.013	0.092**
	[0.010]	[0.022]	[0.015]	[0.015]	[0.011]	[0.039]
R^2	0.101	0.122	0.114	0.098	0.117	0.086
Firms	7704	1249	2550	1241	1776	407

Note: All models include sector dummies. Standard errors in brackets: *** p<0.01, ** p<0.05, * p<0.1.

6.4.2 Growth Regressions with Selection Bias Correction based on the Multinomial Logit Model

Considering the selection process structure, as the data gives information on observed growth rates (for firms survived at least 6 years) only for the firms in any pattern rather than failure, observed growth rates do not reveal the real growth if the selection into the patterns is not random. Hence, we need to control for the pattern alternatives that will correct the selection bias.

The two-stage model also creates the coefficients related to any other pattern, whose information is derived from multinomial logit selection step. The selection coefficients measure the effect of non-random sorting firms, while either the positive or negative sign indicates the nature of selection. This means that those coefficients measure the impact on growth rate of a particular pattern for those firms predicted to have selected to any other pattern.

In order to achieve some efficiency gain, all two-stage regressions below are conducted via the weighted least square estimation in the growth rate equations so as to account for existing heteroskedasticity in the model because of selectivity. The corresponding weights can be found in the Appendix of Bourguignon et al. (2007). Moreover, standard errors are estimated by using the bootstrap method with 100 replications, which are presented in Table D.1 and Table D.2 of the Appendix D.

6.4.2.1 Estimation Results

Despite the fact that the impact of entry size on firm growth is strongly negative for almost all distinct patterns without selection correction estimation, negative coefficient of entry size is only true for decliner patterns in the regressions based on selection correction (Table 6.5). Moreover, the coefficient of entry size variable is not significant for the grower patterns. Two-stage model reveals the different impact of the entry size for grower and decliner patterns. We can claim that the pattern selection matters to investigate the effect of entry size on firm's growth rate. The Gibrat Law seems to be valid for only those firms selected into the decliner patterns, and it fails for those firms following the grower patterns. This result is robust to model specification and shows the importance of analyzing the determinants of growth for different patterns separately.

A similar surprising result is obtained for the effects of labor productivity. Although the OLS results imply that productive firms grow faster for both grower and decliner patterns, the sign of the relative labor productivity variable turns out to be negative for linear and one-shot decliner patterns, and it has positive sign for only one-shot growers, and becomes insignificant for other patterns. Therefore, once again, this situation suggests that pattern selection matters for firm's growth rate regression.

The effect of capital intensity is not significant for grower patterns, which all have significantly positive effect without selection correction. However, its effect on firm growth for decliner patterns is ambiguous, positive for one-shot decliners and negative for linear decliners.

The coefficient of subcontracting input intensity turns out to be insignificant for grower patterns, whereas most of them have substantial positive impact in OLS. Besides, its impact becomes significant and positive for one-shot and logistic decliners. There is not much difference between selection correction and OLS models for the effect of subcontracting output intensity except that it becomes significant for quadratic decliner pattern. The coefficients of the interest and advertisement intensity variables turn out to be significant for only logistic grower and linear decliner patterns. Although public firms have lower growth rates than private firms for all grower patterns in case of simple OLS, the effect of variable becomes insignificant for most patterns except only for logistic growers. On the other hand, public firms also have lower growth rates for one-shot decliner pattern, while they have higher growth rates than private ones in all decliner patterns in without selection correction model. In addition, the coefficient of FDI dummy is no more significant in the models.

Table 6.5: Growth regressions based on selection correction for patterns

	Lin. Grower	**Quad. Grower**	**One-s. Grower**	**Log. Grower**
size	0.008	0.014	0.005	0.005
	[0.036]	[0.023]	[0.013]	[0.020]
rlp	0.012	-0.006	0.009*	0.008
	[0.016]	[0.009]	[0.005]	[0.008]
kl	0.010	-0.004	-0.001	0.004
	[0.009]	[0.005]	[0.003]	[0.004]
subinp	0.046	0.029	0.024	0.041
	[0.085]	[0.051]	[0.029]	[0.041]
suboutp	0.039	-0.011	0.023	0.046**
	[0.046]	[0.023]	[0.015]	[0.021]
adverint	-0.580	-0.174	0.274	-0.083
	[1.199]	[0.460]	[0.282]	[0.362]
interest	0.116	0.094	0.023	0.463***
	[0.309]	[0.160]	[0.094]	[0.140]
pub	0.001	-0.005	-0.008	-0.096***
	[0.001]	[0.044]	[0.022]	[0.034]
fdi	-0.016	-0.037	-0.007	-0.040
	[0.075]	[0.035]	[0.023]	[0.029]
entrate	0.024	-0.196*	0.081	0.028
	[0.212]	[0.109]	[0.071]	[0.091]
hhi	0.100	-0.228***	-0.031	-0.055
	[0.109]	[0.063]	[0.039]	[0.051]
mes	0.048	-0.004	0.012	0.022*
	[0.037]	[0.016]	[0.010]	[0.013]
sectgr	0.312***	-0.038	0.069	0.115**
	[0.121]	[0.076]	[0.043]	[0.057]
provgr	-0.212	0.213**	0.015	0.170**
	[0.161]	[0.096]	[0.055]	[0.078]
Cons.	-0.411	0.229	0.056	-0.236
	[0.438]	[0.303]	[0.115]	[0.195]
R^2	0.148	0.193	0.064	0.131
Sum of Weights	2034	8281	17898	12072
Firms	210	618	957	986

Table 6.5: Growth regressions based on selection correction for patterns (cont'd)

	Lin. Decliner	Quad. Decliner	One-s. Decliner	Log. Decliner	Random Walk
size	-0.154**	-0.020*	-0.049***	-0.047**	-0.008
	[0.061]	[0.012]	[0.009]	[0.021]	[0.042]
rlp	-0.081***	0.005	-0.009**	-0.001	0.003
	[0.027]	[0.005]	[0.004]	[0.010]	[0.015]
kl	-0.023**	0.004	0.004*	0.005	-0.007
	[0.010]	[0.002]	[0.002]	[0.005]	[0.007]
subinp	-0.032	0.018	0.056***	0.110*	-0.01
	[0.151]	[0.029]	[0.021]	[0.059]	[0.109]
suboutp	-0.082	0.024*	-0.008	0.021	-0.001
	[0.052]	[0.014]	[0.011]	[0.024]	[0.036]
adverint	-2.551*	0.168	-0.06	1.637	0.564
	[1.453]	[0.279]	[0.253]	[1.138]	[0.812]
interest	0.706*	-0.054	0.014	-0.021	0.272
	[0.366]	[0.081]	[0.068]	[0.158]	[0.244]
pub	0.008	0.023	-0.032**	0.038	-0.001
	[0.043]	[0.016]	[0.013]	[0.029]	[0.071]
fdi	0.078	-0.001	0.044	-0.026	0.116
	[0.095]	[0.017]	[0.028]	[0.037]	[0.078]
entrate	0.233	-0.024	0.137***	-0.036	-0.317*
	[0.270]	[0.055]	[0.044]	[0.104]	[0.190]
hhi	-0.535**	-0.041	0.112***	0.151**	0.05
	[0.246]	[0.037]	[0.033]	[0.075]	[0.130]
mes	-0.007	0.002	0.021***	0.001	0.004
	[0.044]	[0.009]	[0.007]	[0.014]	[0.034]
sectgr	0.038	0.045	0.044	-0.178**	0.117
	[0.157]	[0.037]	[0.034]	[0.076]	[0.101]
provgr	-0.006	0.098**	0.086*	0.112	0.121
	[0.320]	[0.040]	[0.049]	[0.097]	[0.171]
Cons.	1.588***	0.075	0.335***	0.238	0.355
	[0.566]	[0.108]	[0.109]	[0.222]	[0.350]
R^2	0.590	0.103	0.162	0.281	0.146
Sum of Weights	463	19811	6963	4352	1715
Firms	67	905	603	342	245

Standard errors in brackets: *** p<0.01, ** p<0.05, * p<0.1.

Regarding the effects of sector specific variables on firm's growth rate, the coefficient of entry rate is found to be negative in quadratic grower and random walk patterns, while entry rate increases the firm growth rates in one-shot and logistic grower patterns in simple OLS. Unlike the simple OLS, we also observe that entry rate increases the firm growth in one-shot decliner pattern in growth regression based on selection correction. Although we observe that firm growth rates are higher in more concentrated sectors for only one-shot decliner pattern in the model without selection correction, we find that firm growth are lower in more concentrated sectors in quadratic grower and linear decliner patterns, besides firm growth rates are higher in more concentrated sectors in one-shot and logistic decliner patterns for the case of selection correction. In contrast to the simple OLS models, firms grow faster in sectors described by high minimum efficient scale for all grower patterns, and this effect remains valid for only logistic growers in regressions based on selection correction. In addition, we find the same effect in one-shot decliner pattern. Firms operating in sectors with high growth rates in employment grow faster in linear and logistic grower patterns, as well as the opposite sign of the coefficient for logistic decliner patterns. However, this effect does not exist in simple OLS case. Finally, we observe that there is no much difference between models with and without selection correction in terms of the impact of provincial growth on firm growth rates.

The selection terms are reported in Table 6.6 for the growth regressions based on selection correction. Some of the selection terms are significantly different than zero, confirming that there is an evidence of selection effect in the growth rate equations for most patterns. This evidence also suggests that the OLS estimate without selection process is biased due to the pattern selection effect.

The positive selection coefficient indicates that unobserved variables that increase the probability of selection into a specific pattern are positively correlated with the growth rate of those firms selected into that pattern. In other words, the positive coefficients of the selection terms show that there are positive selection effects, indicating a downward bias in the OLS estimate without correction process. This would also mean that the firms in a certain pattern are likely to have higher growth rate than a random set of comparable firms. This means that a particular pattern includes some firms which perform well there but there exist an alternative pattern they would most probably be in if they did not have this pattern. Similarly, if the selectivity coefficient related to any other pattern is negative and significant in a growth rate equation of a certain pattern, growth rates of that pattern are overestimated in the regression without selection process as the firms with worse unobserved characteristics were sorted into any other pattern. Then, the firms would have performed better in another pattern most probably, on the basis of their unobserved attributions, than the pattern they are allocated.

The "unobserved characteristics" that determine selection into a certain pattern could be firm-specific, sector-specific, and region-specific variable. In this context, the characteristics of entrepreneur could be t the most crucial one. Because the research on firm growth indicates that entrepreneurship skills, objectives and strategies play an essential role in determination of firm growth. Unfortunately, we cannot control for those variables because of the lack of data.

It can be interpreted the direction and significance of the selection bias in two-stage model, addressing the corresponding patterns. For instance, we observe positive coefficients related to the pattern equations of one-shot decliner and random walk in the growth rate equation of quadratic grower pattern. This means that there is a downward bias in the growth rate equation of quadratic grower firms without correction process. Therefore, we find higher growth rates of the firms in the quadratic grower pattern than those of randomly selected firms on account of the allocation of firms with unfavorable unobserved characteristics out of the quadratic grower pattern into the one-shot decliner and random walk patterns. Any omitted variable in the pattern selection model contributing one-shot decliner or random walk patterns makes a higher growth rate of quadratic grower pattern more likely. This indicates that quadratic grower pattern includes some firms, which perform well there but would have been one-shot decliner or had random walk pattern most probably if they were not quadratic grower.

Table 6.6: Correction terms for pattern selection bias

	Lin. Grower	Quad. Grower	One-s. Grower	Log. Grower
Failure	-0.253	-0.105	0.050	-0.187
	[0.347]	[0.175]	[0.085]	[0.128]
No change	0.314	-0.200	-0.052	-0.105
	[0.402]	[0.172]	[0.100]	[0.134]
Lin. Grower	0.004	0.102	-0.132	-0.106
	[0.027]	[0.210]	[0.114]	[0.158]
Quad. Grower	0.104	-0.077**	0.061	-0.318
	[0.499]	[0.031]	[0.136]	[0.208]
One-s. Grower	-0.274	0.011	0.010	-0.114
	[0.345]	[0.159]	[0.014]	[0.139]
Log. Grower	-0.037	-0.215	0.071	0.001
	[0.322]	[0.179]	[0.090]	[0.021]
Lin. Decliner	0.071	0.004	0.414**	-0.097
	[0.729]	[0.406]	[0.207]	[0.349]
Quad. Decliner	-0.356	-0.062	0.079	-0.119
	[0.373]	[0.200]	[0.108]	[0.165]
One-s. Decliner	-0.243	0.349**	0.056	-0.08
	[0.318]	[0.155]	[0.086]	[0.133]
Log. Decliner	0.084	-0.342	-0.04	0.162
	[0.397]	[0.240]	[0.114]	[0.175]
Random Walk	0.146	0.383*	0.009	0.384**
	[0.493]	[0.205]	[0.120]	[0.196]

	Lin. Decliner	Quad. Decliner	One-s. Decliner	Log. Decliner	Random Walk
Failure	1.095***	0.068	0.308***	0.195	0.155
	[0.339]	[0.071]	[0.068]	[0.156]	[0.235]
No change	0.521	0.027	0.122	0.100	-0.06
	[0.846]	[0.097]	[0.090]	[0.172]	[0.248]
Lin. Grower	0.401	0.113	-0.047	0.611**	-0.261
	[0.466]	[0.097]	[0.118]	[0.279]	[0.298]
Quad. Grower	0.067	-0.103	0.297**	-0.262	0.727
	[0.467]	[0.122]	[0.127]	[0.285]	[0.445]
One-s. Grower	0.835	0.005	0.124*	-0.075	0.436*
	[0.751]	[0.086]	[0.071]	[0.180]	[0.247]
Log. Grower	-0.747**	0.068	-0.016	0.082	-0.42
	[0.337]	[0.083]	[0.075]	[0.155]	[0.304]
Lin. Decliner	-0.025	0.137	-0.200	-0.268	-0.039
	[0.035]	[0.158]	[0.129]	[0.259]	[0.889]
Quad. Decliner	0.364	0.010	0.050	0.265	0.513
	[0.404]	[0.015]	[0.088]	[0.219]	[0.320]
One-s. Decliner	0.258	0.003	-0.006	-0.018	0.226
	[0.433]	[0.070]	[0.011]	[0.172]	[0.262]
Log. Decliner	0.453	-0.012	0.256**	0.004	-0.571
	[0.429]	[0.102]	[0.100]	[0.017]	[0.478]
Random Walk	-0.149	0.155	-0.236**	0.076	-0.006
	[0.645]	[0.113]	[0.095]	[0.197]	[0.035]

On the other hand, there is a negative selectivity coefficient of logistic grower pattern in the growth rate equation of linear decliner pattern, highlighting an upward bias in the growth rate equation of linear decliner firms without correction process. Therefore, we find lower growth rates of the firms in the linear decliner pattern than those of randomly chosen firms on account of the allocation of firms with better unobserved characteristics out of the linear decliner pattern into the logistic grower pattern. This means that unobserved characteristics of the firms that increase the probability of selecting logistic grower pattern lower the growth rates of linear decliner pattern. That means the firms, whose unobserved attributions are more appropriate for allocation into logistic grower, end up in linear decliner pattern instead. Then, the firms would most probably have performed better in logistic grower pattern, on the basis of their unobserved attributions, allocate in linear decliner pattern.

The results of growth regressions based on selection correction in case of aggregated patterns of firm growth are reported in Table 6.7. The negative coefficient of entry size is only true for continuously and asymptotic decliner patterns in the regressions based on selection correction. Moreover, the coefficient of entry size variable is positive for continuously grower patterns while the effect turns out not to be significant in the asymptotic grower patterns. Therefore, the inconsistent behavior concerning the estimated signs and significances of with and without selectivity is valid for the case of aggregated pattern estimations. Again, two-stage model reveal the decomposition of the effect of entry size at least for grower and decliner patterns, and we point out that the pattern selection matters to investigate the effect of entry size on firm growth rate. The small firms grow faster than their large counterparts for the firms in decliner patterns. Then, Gibrat Law does not hold for some firms because of the existence of different size effect on growth by the patterns of firm growth.

We find that relative labor productivity has a positive impact on firm’s growth rate in asymptotic grower, continuously and asymptotic decliner patterns in the case of simple OLS. However, the coefficient remains significant in only asymptotic decliner patterns in two-stage model. While the effect of capital intensity is not significant for grower patterns, it is significantly positive in case of the models without selection correction. However, its effect on firm growth for all decliner patterns is positive. The model with selection correction again decomposes the effect of capital intensity in terms of grower and decliner patterns; we can claim that the pattern selection matters to investigate the effect of capital intensity on firm growth rate. The coefficient of subcontracting input intensity turns out to be insignificant for continuously grower patterns, whereas all grower patterns have a strong positive impact in simple OLS. Besides, its impact becomes significant and positive for asymptotic decliners. We can state that two-stage model decomposes the effect of subcontracting input intensity in terms of continuous patterns and at least asymptotic patterns. Latter has the growth advantage with higher subcontracting input intensity. We observe that there is no much difference between with and without selection correction models for the effect of subcontracting output intensity.

The coefficients of the interest and advertisement intensity variables turn out to be significant and negative for asymptotic decliner pattern, while we observe significant positive coefficient in continuously decliner pattern. Although public firms have lower growth rates than private firms for all grower patterns in case of simple OLS, the effect of variable remains significant for asymptotic decliners. On the other hand, the significant effect for decliner patterns disappears, while they had higher growth rates than private ones in all decliner patterns without selection correction model. Foreign ownership dummy becomes significant and negative for all grower patterns and random walk, whereas it has no impact on growth without selection correction.

Table 6.7: Growth regressions based on selection correction for aggregated patterns

	Cont. Grower	**Asymp. Grower**	**Cont. Decliner**	**Asymp. Decliner**	**Random Walk**
size	0.035***	0.008	-0.035***	-0.025***	0.012
	[0.013]	[0.008]	[0.008]	[0.007]	[0.024]
rlp	0.005	0.005	0.002	0.007**	0.01
	[0.005]	[0.003]	[0.004]	[0.003]	[0.009]
kl	-0.002	0.003	0.004**	0.003*	-0.005
	[0.004]	[0.002]	[0.002]	[0.002]	[0.006]
subinp	0.022	0.051**	0.033	0.045**	-0.09
	[0.035]	[0.022]	[0.025]	[0.019]	[0.082]
suboutp	-0.005	0.028**	0.006	-0.004	0.029
	[0.016]	[0.012]	[0.012]	[0.010]	[0.028]
adverint	-0.216	-0.149	0.147	-0.391*	-0.674
	[0.290]	[0.198]	[0.250]	[0.226]	[0.582]
interest	0.173	0.105	0.121*	-0.224***	0.303**
	[0.111]	[0.070]	[0.072]	[0.061]	[0.150]
pub	-0.045	-0.050***	0.018	0.011	0.028
	[0.029]	[0.016]	[0.012]	[0.012]	[0.055]
fdi	-0.056***	-0.023*	-0.005	0.014	-0.076*
	[0.019]	[0.013]	[0.014]	[0.022]	[0.043]
entrate	0.025	0.104**	-0.038	0.055	-0.267*
	[0.076]	[0.051]	[0.053]	[0.041]	[0.139]
hhi	-0.050	-0.030	-0.040	0.122***	-0.111
	[0.046]	[0.031]	[0.033]	[0.033]	[0.081]
mes	0.008	0.015*	0.001	0.009	-0.051*
	[0.013]	[0.008]	[0.008]	[0.007]	[0.027]
sectgr	0.068	0.034	0.079**	0.011	0.029
	[0.055]	[0.036]	[0.035]	[0.035]	[0.084]
provgr	0.096	0.156***	0.046	0.234***	-0.064
	[0.077]	[0.044]	[0.042]	[0.045]	[0.139]
Constant	-0.122	-0.075	0.295***	0.154***	0.177
	[0.142]	[0.091]	[0.106]	[0.053]	[0.215]
R^2	0.132	0.102	0.123	0.165	0.098
Sum of Weights	15557	33979	27980	16825	6988
Firms	995	2108	1140	1095	338

Standard errors in brackets: *** p<0.01, ** p<0.05, * p<0.1.

Regarding the effects of sector specific variables on firm growth, the coefficient of entry rate remains positive and significant in asymptotic growers, besides it is found to be negative in random walk pattern. Firm growth rates are higher in more concentrated sectors in asymptotic decliner pattern, whereas the coefficients of the concentration variable have not statistically significant impact on firm growth rate in the patterns when the selection effect is ignored. In contrast to simple OLS model, firms grow faster in sectors described by high minimum efficient scale for all grower patterns, this effect remained for asymptotic growers in regressions based on selection correction. In addition, we find the opposite sign of the coefficient in random walk pattern. Recalling that firms performing in sectors with high employment growth grow faster in all grower patterns and also for continuously decliner pattern for the case of simple OLS, the coefficient remains positive and significant in continuously decliners. Finally, the firms performing in provinces that have higher growth rates grow faster in only asymptotic grower and decliner patterns. One can state that the two-stage model separates the patterns as asymptotic and continuous. Provincial growth impacts on firm growth rate in only former.

By detecting statistically significant selection terms on the growth rate equations in each aggregated pattern explored, we can search for the symptoms of the pattern selectivity based on unobserved characteristics of the firms. For example, there is a negative coefficient related to the failures in the growth rate equation of continuously grower pattern. This highlights an upward bias of continuously grower pattern growth rates compared to the firms taken at random, due to the allocation of the firms with better unobserved characteristics out of continuous grower pattern into failures. Therefore, the firms in continuously grower pattern have lower growth rates than those of randomly selected firms. Any omitted variable in the pattern selection model conducing failure more likely makes growth rates of continuously grower pattern less. That means the firms, whose unobserved attributions are more appropriate for allocation into failures, end up existing in continuously grower pattern instead.

Table 6.8: Correction terms for aggregated pattern selection bias

	Cont. Grower	Asymp. Grower	Cont. Decliner	Asymp. Decliner	Random Walk
Failure	-0.186*	-0.061	0.164**	0.162***	0.209
	[0.100]	[0.065]	[0.066]	[0.052]	[0.146]
No change	0.134	-0.129	0.062	0.099	0.062
	[0.116]	[0.083]	[0.078]	[0.065]	[0.189]
Cont. Grower	-0.019	-0.100	0.006	0.389***	0.023
	[0.018]	[0.074]	[0.070]	[0.076]	[0.183]
Asymp. Grower	-0.172	0.006	0.132	0.056	-0.037
	[0.120]	[0.017]	[0.081]	[0.062]	[0.203]
Cont. Decliner	0.099	-0.146	-0.004	0.049	0.409
	[0.147]	[0.106]	[0.016]	[0.090]	[0.253]
Asymp. Decliner	-0.009	0.144***	0.138**	0.019**	0.048
	[0.078]	[0.051]	[0.055]	[0.009]	[0.125]
Random Walk	0.203	0.178*	0.145*	-0.206***	0.069***
	[0.157]	[0.094]	[0.078]	[0.074]	[0.022]

Standard errors in brackets: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

To sum up, although significant correction terms do not reveal a consistent structure and it is difficult to reach a coherent story regarding across different patterns, the existence of significant selectivity terms gives an intuition to consider potential selectivity biases for the estimation of unbiased growth rates of such patterns. Having taken into account of the pattern selectivity within the growth regression, we thus provide the evidence that the effects of the factors behind the firm growth vary among different patterns, especially across grower patterns and decliner patterns.

6.4.2.2 Robustness Check

We estimated a number of models by adding new variables and by changing model speficiation in order to check the robustness of estimation results. These controls are important to control for our findings reported in this chapter, and they may provide some insights about the reliability and extendability of the findings.

The firms included in the regressions with respect to the pattern identification can survive or exit the industry. Firstly, we control the exit status of the firm by including an exit dummy in the growth regression. Also, the logarithm of the age of the firm is added to the growth regression to check whether the firm age matters for growth because some patterns may be corelated to the age of the firm. The results show that the exitor firms have lower growth rates than survivors in all patterns. In the case of firm age, young firms grow faster than old firms, and this finding is valid for all grower patterns. Besides, there is a positive relationship between firm growth and age for any decliner pattern, i.e., older firms are more likely to get smaller over the life-cycle of the firm that follows the decliner pattern. Therefore, inclusion of the age variable within the growth rate regression reflects that the age of the firm may have particular effects according to the patterns. However, the basic results of the analysis remain the same.

We consider that some findings we obtain may stem from the sectoral differences. We thus run all growth regressions for each sector separately. Although the selection effects change to some extent, probably due to the different number of observations belonging to each sector and pattern, there is no significant change in our main findings.

We also experimented with different definitions of the explanatory variables used in the firm growth equation. In this context, we re-define all sector-specific explanatory variables at the 4-digit industry level in which the firms are operating in. Yet, the results are robust to that change.

All variables included in our estimations are available for a quite long period (1980-2001). We would like to extend the models by incorporating some additional variables, namely exporter status and R&D performer dummies, relative degree of product diversification, and growth rate of the degree of product diversification, but these variables are only available since 1992. For the sub-sample of the data, we found that export and R&D behavior affect firm growth positively for continuously grower firms, whereas they have negative impact on growth for continuously decliner firms. Similarly, the firms that produce a wide range of products have higher growth rates for grower patterns, but lower growth rates for decliner patterns. There is no qualitative change in the effects of all main variables we analyze in this dissertation.

We estimated all growth regressions in the previous section for the overall employment growth by using all data available for new firms. Since the duration of the data available differs across firms due to the differences in entry time and the duration of survival, the overall employment growth rates are calculated by using varying number of observations. Therefore, we re-defined the employment growth rate as the first five-year trend growth rates as an alternative dependent variable so that we use the same number of observations (the first five years) for all firms. The estimation results are reported in Tables D.3-D.8 of the Appendix D. Moreover, we repeated aforementioned robustness checks (by adding new variables, changing model speficiation, etc.) for this alternative dependent variable. We find more or less different directions and significances of some terms related to pattern selection in the alternative dependent variable case as expected. This is because those estimations attempt to capture the effects for very early growth behavior of the firms instead of overall growth. However, main findings are mostly the same.

Finally, although we are in favor of the second variant of Dubin and McFadden (1984) method, all models in this chapter are estimated by using all other correction methods, too. In other words, we conducted alternative regressions by changing the correction method to check the results are robust to changes in the estimation method.

In a nutshell, all robustness check issues that are executed by numerous regressions do not make our basic results to change. Therefore, we can suggest that main findings of the analyses are robust to changes in the estimation method.

6.5 Discussion

In order to assess the merit of the last two chapters, we would like to highlight the main implications of our findings. Chapter 5 reveals that it is misleading to assume that growth rates of all firms are drawn from the same distribution. Distinct patterns of firm growth exist and they can be identified by using statistical techniques even if it is difficult to classify firms into those patterns by using the available data. In this chapter, we estimated growth rate regressions by correcting for selection bias based on the multinomial logit model. Our empirical strategy allows us to determine not only the direction of the selection bias related to the allocation of the firms into a distinct pattern, but also to identify the source of selection among other patterns the bias stems from.

The results show that although there is a negative impact of entry size on firm growth for decliner patterns, the firms in grower patterns are positively affected (or not affected in some cases) by entry size. A similar result is also obtained for other characteristics of the firms. Hence, ‘unobserved characteristics’ plays critical role in the selection of growth patterns by firms. We need to emphasize that unobserved characteristics might be related to the firm, sector, region, and especially the entrepreneur.

To sum up, one needs to focus on overall process of firm growth and identify the patterns of firm growth for each firm so as to investigate the role of firm characteristics. It seems that the determinants of growth are specific to certain patterns. The majority of empirical literature has not been able to construct a proper way to test firm growth theories. We suggest that each theory highlights a specific dimension of the growth processs, and makes some predictions that depend on those specific conditions. In other words, theories of firm growth are not universal, but are applicable to certain types of growth. This implies that the theoretical predictions of growth theories may hold for only some specific patterns. Therefore, the researchers need to take into account the existence of patterns of firm growth in order to understand the growth process and to provide better insights to policy-makers.

CHAPTER 7

CONCLUSION

There is no solid theoretical model that includes all aspects of the process of firm growth. The theories of firm growth concentrate on some specific dimensions of the issue. There is a large number of econometric studies on firm growth in the empirical literature, but econometric studies usually suffer from the assumption that all firms are drawn from the same distribution and that their objectives are all the same. We suggest that firms do not behave the same way because of heterogeneity in their objectives, capabilities, and opportunities. Therefore, one cannot assume that all firms follow the same pattern of growth. Although there are some studies analyzing the patterns of firm growth in the empirical literature, they mainly focus on growing firms by completely ignoring no-growers, decliners, and exitors, and try to classify firms according to their growth rates. In this dissertation, we analyze the process of firm growth by taking into account significant heterogeneity of firms and their growth processes, and identify the patterns of growth for all firms. Moreover, our analysis on pattern-specific determinants of firm growth could provide better insights for policy makers.

The first contribution of this dissertation is to explore empirical patterns of firm growth by using a novel statistical strategy. The second contribution of the study is to identify the determinants of the patterns of firm growth. The final contribution of this dissertation is to analyze the firm growth process based on the pattern selection and to investigate the factors that affect the pattern-specific growth processes.

By using firm-level data on Turkish manufacturing for the period 1980-2001, we first examine the employment generation-firm growth nexus, and analyze the impacts of firm and sector specific factors on firm growth by using conventional approach to firm growth. We then identify the patterns of firm growth in relation with the entry size and sectors, and analyze the determinants of patterns of firm growth. Finally, we investigate in detail the pattern-specific determinants of firm growth by taking into account the process of selection into different patterns.

The main results of this dissertation can be summarized as follows:

Survival and age have a significant effect on employment generation in Turkish manufacturing industry. By their 10th years of existence, the entrants have almost doubled their employment shares in total manufacturing employment. Moreover, they have had more than fifty percent share by their fifteenth year. Thus, we need to emphasize that the contribution of new firms to employment generation in Turkish manufacturing is very important. The contribution to total employment of the fastest growing firms is even more striking (80 % of employment creation in ten years is accounted by the top 200 firms). The share of the fastest growing firms in total employment of manufacturing is higher in labor intensive sectors while the employment generation by the firms in other sectors has not been insignificant. The economic crisis in 2001 had a significant adverse impact on almost all firms in the manufacturing sector and the fastest growing firms were no exception. Moreover, we detected the strong effect for employment destruction due to the large-sized continuing firms.

Our analysis on firm size distributions revealed the fact that the average size of firms that operate in specialized supplier, science based and scale intensive sectors is significantly higher than the average size of firms in other sectors. This reflects the need for being large-scaled so as to benefit from scale economies in those industries. . We also shed light on the fact that right-skewed behavior of firm size distribution decreases with survival and age, and they converge to log normal distribution for both surviving firms and older firms.

Using a standard approach to firm growth regression, we analyzed the determinants of new firm growth for the Turkish manufacturing industry by using alternative estimation techniques. We found that small firms grow faster than large firms, but the effect is weaker when survival selection is controlled for. Note that the magnitude of the effect is larger in static and dynamic panel data models than in OLS and Heckman models. The estimation results showed that the relationships between age and firm growth, and age and survival are nonlinear and exhibit L-shaped and inverse L-shaped patterns, respectively. Age negatively affects firm growth while its effect on survival is positive. Both survival and growth processes are significantly and positively affected by relative productivity. This implies that more productive firms grow faster than those that are less productive. Therefore, our estimation results confirm the predictions of passive and active learning theories (Jovanovic, 1982; Ericson and Pakes, 1995). Although capital intensity increases the expected growth rate, capital-intensive firms are less likely to survive. We thus found that initial capital cost is crucial for the capital intensive firms, indicating that such firms do not have the flexibility to substitute labor for capital. The positive effect of advertisement intensity on growth is stronger when the survival selection is controlled for. Advertisement also leads to a higher probability to survive. Our findings also show that financial constraints make firms less likely to survive and grow. In case of sectoral effects, we found that firms' growth rates are higher in less concentrated industries, and in those industries that have lower entry rates. On the other hand, firms grow faster in sectors that are characterized by high minimum efficient scale. Finally, the impacts of sectoral and regional growth variables are positive on growth rates. Note that these effects become larger when survival selection of the firms is controlled for.

Firm growth decreases with age in case of the standard growth rate regressions by age cohorts. However, age and growth relationship disappears after age 1 when the survival selection is controlled for, implying that survival selection is particularly important to understand the effect of age on growth. The effect of size on growth is negative for all age cohorts, but its impact is diminishing with age. The size effect is much stronger in the early years. Moreover, size effect by age is decreasing slightly when the survival selection is controlled for. The positive effect of productivity on firm growth is more important in the early years of the firm. This effect becomes even stronger when the survival selection is controlled for, implying that young firms need to be more productive to grow as they survive. Finally, although the effect is mitigated when survival is controlled for, the effect of capital intensity on growth is decreasing with age.

We identified 10 patterns of firm growth by using a novel statistical approach that addresses directly the heterogeneity of firm growth, which cannot be addressed properly by conventional growth regressions. Our analysis shows that most of the firms do not have any long term employment growth prospects, which is consistent with the stylized facts documented in the literature. Although the probability of having any pattern relative to failure (exit) increases by size, we found that the effect of entry size is significantly larger for decliner patterns than the grower patterns. Moreover, productive firms are more likely to have grower patterns than decliner ones. This finding highlights the importance of the survival effect on firm growth in the context of learning models. However, the probability of having a grower pattern is lower for capital intensive firms. We suggest that capital-intensive firms tend to enter at their "optimum" size, and do not have any strong intensive to grow further, i.e., they are likely to employ most of the workers that will eventually be employed at the time of entry.

Finally, the determinants of firm growth that take into account the pattern selectivity bias are analyzed. Regression models based on the selection correction are estimated to explore the effects of the firm-specific and sector specific characteristics on growth rates in Turkish manufacturing. The estimations of growth regressions with selectivity correction reveal the significant factors that have an impact on growth processes. Although there is a negative impact of entry size on firm growth for all decliner patterns, it disappears or even becomes positive for the firms in grower patterns. This finding can explain the ambiguous findings of conventional growth regressions regarding the effect of (entry) size on growth. We suggest that the pattern selection process matters to investigate the effect of entry size on firm growth. Our empirical strategy allows us to determine not only the direction of the selection bias related to the allocation of the firms into a distinct pattern, but also to identify the source of selection among other patterns the bias stems from. Those results suggest that 'unobserved characteristics' plays a crucial role in the selection process to the growth patterns. We need to emphasize that unobserved characteristics might be related to unobserved firm, sector, region, and, especially, entrepreneurial characteristics.

The analyses on growth patterns reveal that it is misleading to assume that growth rates of all firms are drawn from the same distribution. Despite the fact that it is difficult to classify firms into those patterns by observable variables (partly because of missing data for the characteristics of entrepreneurs), patterns of firm growth exist and can be identified by statistical techniques. Dynamics of growth differs across patterns since the pattern selection process matters. Therefore, growth patterns are needed to be taken into account. By doing so, we discovered the common negative impact of size on firm growth for only declining firms. Besides, growing firms have positive or neutral size effects. Thus, we can claim that Gibrat Law does not hold for some firms because the size effect differs according to the growth patterns.

Although there is a sizeable empirical literature on firm growth, the previous empirical research provides no solid understanding of the overall process of firm growth. From this point of view, some critical dimensions should be taken into account in the firm growth process. One needs to focus on overall process of firm growth and identify the patterns of firm growth for each firm in order to investigate the role of firm characteristics, because the effects of these characteristics on the growth process may differ between the growth patterns. Therefore, theories of firm growth need to be tested by taking into account the relevant patterns of growth. In other words, the theoretical predictions may hold for only some specific patterns, not for all patterns. All in all, focusing on growth patterns gives more insights on the growth process.

Heterogeneity in the patterns of firm growth should be taken into account in designing public support policies for SMEs. Policy-makers should pay attention to growth patterns and various phases of the life-cycles of firms. Having survived, most of the firms settle on a constant employment size for as long as two decades.

Public policy towards small firms should be designed so as to pay due attention to those firms that do not need to grow and those that cannot.

We claimed at the outset that one of the contributions of this dissertation is to develop a methodology to explore empirical patterns of firm growth. Therefore, our methodological specification can be easily applicable for any further (empirical) study focused on firm growth process.

Our results revealed the crucial role of heterogeneity on firm growth. The heterogeneity among patterns of firm growth cannot be ignored in analyzing the process of firm growth. In other words, firm growth process is intrinsically based on pattern-selectivity. Another recommendation for further studies is thus to use more homogenous sample in the context of 'patterns of firm growth' so as to clarify the determinants of firm growth.

The current research agenda has been properly underlining the importance of entrepreneur in the process of firm growth (see Davidsson et al., 2006; Raposo et al., 2011 and Davidsson and Wiklund, 2013). It is shown that the entrepreneur plays a vital role for firm growth, industry growth, and economic growth (see Audretsch et al., 2006 for an excellent discussion of theoretical models in this context). Unfortunately, we are not able to include the entrepreneur in our models due to the lack of data on entrepreneurs. We suggest for further research that 'entrepreneurial characteristics' as well as other firm-specific and environment-specific variables should be incorporated into empirical models of firm growth and growth patterns.

The data set for the period 1980-2001 collected by TurkStat is used in this dissertation. TurkStat revised its survey methodology in 2002, and has started to collect data at the enterprise level. As a result, these two longitudinal databases are no longer comparable. More importantly, there is no information to trace establishments in the 1980-2001 database in the new database. Although the time dimension of the post-2002 dataset is relatively short, it would be useful to conduct a similar analysis for the post-2002 period.

We have examined the patterns of firm growth for only manufacturing industries. It is clear that service sectors have different characteristics from the manufacturing. Therefore, our final recommendation for further studies would be to analyze growth process of firms in service sectors regarding patterns of firm growth which is possible thanks to the new longitudinal dataset collected by TurkStat since 2003.

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APPENDICES

APPENDIX A

Data Appendix

We use the micro-level databases of the Turkish manufacturing industry, which are obtained from the Turkish Statistical Institute (TurkStat). TurkStat does not permit the database to be removed from its premises. Thus, all empirical analyses in this dissertation were conducted in Micro-data Research Center of TurkStat in Ankara, owing to data confidentiality and confident data security. The results of research are controlled in detail by related Departments of TurkStat.

Starting from 1980, TurkStat periodically conducted the Census of Industry and Business Establishments until 2001 for all establishments (for the years 1980, 1985, 1992), and Annual Surveys of Manufacturing Industries for all other years. The annual surveys include all public establishments, all private establishments with 10 or more employees, and a small sample of micro establishments (which is drawn from the most recent census up to 1992). Note that different surveys were conducted to 10-24 and 25+ size groups during the period 1983-92. The information about the population of the firms was obtained from Census of Industry and Business Establishments during Annual Surveys of Manufacturing Industries. Also, every non-census year, the information of newly opened firms with 10 or more employees was obtained from the chambers of the industry. Therefore, any plant entry can be observed in every year of the sample. On the other hand, due to the concerted effort by TurkStat to include all establishments in the census years, a larger number of new plants and thus a higher share of smaller plants can be existed in Census of Industry and Business Establishments years (TurkStat, 2004).

We used a sample, which matches establishments from Annual Surveys of Manufacturing Industries and Census of Industry and Business Establishments, and then appended all databases of different years into a common data format and checked the consistency issues. Finally, note that the resulting sample we used covers all public establishments and all private establishments with 10 or more employees for the period 1980-2001.

The data is at the plant-level, not the firm-level. However, we treat the plants as firms. This is because the number of multi plant firms is very few although they exist in Turkish manufacturing. Moreover, “plants” have a certain level of decision making autonomy. Therefore, we believe that the plant-level data does not cause any bias in our estimations for the firm growth.

Our data covers the regional dimension at province level. However, some provinces can have little number of firms per year. For all regressions with regional variables defined at province level, the provinces that have less than average ten firms per year were merged into another province by using regional concentration ratios. Table A.1 provides the correspondence of merged provinces.

Table A.1: Merged provinces

Provinces are merged →	**into**
Tunceli, Muş, Bingöl	Elazığ
Ağrı, Kars	Erzurum
Artvin	Rize
Hakkari, Mardin, Bitlis	Siirt
Adıyaman	Şanlıurfa
Gümüşhane	Trabzon

In the context of industrial dimension, we have all four-digit ISIC (Rev. 2) industries in manufacturing. All regressions with industrial variable include the variables defined at four-digit level unless otherwise stated. In addition, some descriptive analysis includes the classification of manufacturing industries according to the orientation, i.e., labor intensive, resource intensive, scale intensive, specialized suppliers, and science based industries. Classification of manufacturing industries used in the analysis is given in Table A.2.

Table A.2: Classification of manufacturing industries

ISIC	Industry	Orientation
3111	Slaughtering, preparing and preserving meat	RI
3112	Manufacture of dairy products	RI
3113	Canning and preserving of fruits and vegetables	RI
3114	Canning, preserving and processing of fish, crustaces and similar foods	RI
3115	Manufacture of vegetable and animal oils and fats	RI
3116	Grain mill products	RI
3117	Manufacture of bakery products	RI
3118	Sugar factories and refineries	RI
3119	Manufacture of cocoa, chocolate and sugar confectionery	RI
3121	Manufacture of food products not elsewhere classified	RI
3122	Manufacture of prepared animal feeds	RI
3131	Distilling, rectifying and blending spirits	RI
3132	Wine industries	RI
3133	Malt liquors and malt	RI
3134	Soft drinks and carbonated waters industries	RI
3140	Tobacco manufactures	RI
3211	Spinning, weaving and finishing textiles	LI
3212	Manufacture of made-up textile goods except wearing apparel	LI
3213	Knitting mills	LI
3214	Manufacture of carpets and rugs	LI
3215	Cordage, rope and twine industries	LI
3219	Manufacture of textiles not elsewhere classified	LI
3221	Manufacture of fur and leather products	LI
3222	Manufacture of wearing apparel, except fur and leather	LI
3231	Tanneries and leather finishing	LI
3232	Fur dressing and dyeing industries	LI
3233	Manufacture of products of leather and leather substitutes, except footwear and wearing apparel	LI
3240	Manufacture of footwear, except vulcanized or moulded rubber or plastic footwear	LI
3311	Sawmills, planing and other wood mills	SI
3312	Manufacture of wooden and cane containers and small cane ware	SI
3319	Manufacture of wood and cork products not elsewhere classified	SI
3320	Manufacture of furniture and fixtures, except primarily of metal	SI
3411	Manufacture of pulp, paper and paperboard	RI
3412	Manufacture of containers and boxes of paper and paperboard	RI
3419	Manufacture of pulp, paper and paperboard articles not elsewhere classified	RI
3421	Printing, publishing and allied industries	RI
3511	Manufacture of basic industrial chemicals except fertilizers	SI
3512	Manufacture of fertilizers and pesticides	SI
3513	Manufacture of synthetic resins, plastic materials and man-made fibres except glass	SI
3521	Manufacture of paints, varnishes and laquers	SI
3522	Manufacture of drugs and medicines	SB
3523	Manufacture of soap and cleaning preparations, perfumes, cosmetics and other toilet preparations	SI
3529	Manufacture of chemical products not elsewhere classified	SI

Table A.2: Classification of manufacturing industries (cont'd)

ISIC	Industry	Orientation
3530	Petroleum refineries	RI
3541	Manufacture of asphalt paving and roofing materials	RI
3542	Manufacture of coke coal and briquettes	RI
3543	Compounded and blended lubricating oils and greases	RI
3544	Liquid petroleum gas tubing	RI
3551	Tyre and tube industries	SI
3559	Manufacture of rubber products not elsewhere classified	SI
3560	Manufacture of plastic products not elsewhere classified	SI
3610	Manufacture of pottery, china and earthenware	RI
3620	Manufacture of glass and glass products	RI
3691	Manufacture of structural clay products	RI
3692	Manufacture of cement, lime and plaster	RI
3699	Manufacture of non-metallic mineral products not elsewhere classified	RI
3710	Iron and steel basic industries	SI
3720	Non-ferrous metal basic industries	RI
3811	Manufacture of cutlery, hand tools and general hardware	LI
3812	Manufacture of furniture and fixtures primarily of metal	LI
3813	Manufacture of structural metal products	LI
3819	Manufacture of fabricated metal products except machinery and equipment not elsewhere classified	LI
3821	Manufacture of engines and turbines	SS
3822	Manufacture of agricultural machinery and equipment	SS
3823	Manufacture of metal and wood working machinery	SS
3824	Manufacture of special industrial machinery and equipment except metal and wood working machinery	SS
3825	Manufacture of office, computing and accounting machinery	SB
3829	Machinery and equipment except electrical not elsewhere classified	SS
3831	Manufacture of electrical industrial machinery and apparatus	SS
3832	Manufacture of radio, television and communication equipment and apparatus	SS
3833	Manufacture of electrical appliances and housewares	SS
3839	Manufacture of electrical apparatus and supplies not elsewhere classified	SS
3841	Ship building and repairing	SI
3842	Manufacture of railroad equipment	SI
3843	Manufacture of motor vehicles	SI
3844	Manufacture of motorcycles and bicycles	SI
3845	Manufacture of aircraft	SB
3849	Manufacture of transport equipment not elsewhere classified	SI
3851	Manufacture of professional and scientific, and measuring and controlling equipment not elsewhere classified	SB
3852	Manufacture of photographic and optical goods	SB
3853	Manufacture of watches and clocks	SB
3854	Other	SB
3901	Manufacture of jewellery and related articles	LI
3902	Manufacture of musical instruments	LI
3903	Manufacture of sporting and athletic goods	LI
3909	Manufacturing industries not elsewhere classified	LI

Note: ISIC Rev 2. RI: resource-intensive; LI: labor -intensive; SI: scale-intensive; SS: specialized supplier; SB: science-based (OECD, 1992).

All consistency checks of the data, corrections and computations, and estimations are performed using Stata 13. Moreover, outliers were discovered using Cook's distance measure, and not included in the regression analyses (Cook, 1977). Note that all real variables in the data are calculated by deflating nomial values by relevant product price indices measured at the ISIC Rev2 4-digit level. Thus, we rely on the deflators that can control the industry level demand shocks and inflation (see Griliches and Mairesse (1998) for the discussion of the problems of using the same price index for all firms).

Our resulting sample includes 31,176 firms and 219,236 firm-year observations correspondingly. 22,536 firms were established from 1981 onwards, corresponding to 123,002 firm-year observations. There are 22,536 new firms established after 1980, and these firms are observed until either they exit from the market or until 2002. Thus, we can observe their characteristics every year since their start-ups. The dataset is unbalanced because of the entry and exit of the firms in and out of business. Yet, entry and exit movements composed just a small percentage of the total number of firms within each year. A summary of sample in terms of firm demography and employment is provided in Tables A.3-A.11.

Finally, note that the results and the interpretations expressed in this dissertation are exclusive responsibility of the author and, by no means, represent official statistics.

Table A.3: Firm demography and employment in Turkish manufacturing

	Number of firms			*Number of employees*		
	Total	**Entry**	**Exit**	**Total**	**Entry**	**Exit**
1980	8,640		704	789,940		20,862
1981	9,161	1,830	807	805,229	58,454	21,420
1982	9,442	1,073	1,140	836,566	33,020	40,578
1983	9,227	837	829	870,603	31,383	28,741
1984	8,727	410	753	896,798	27,475	37,326
1985	10,585	2,729	1,242	935,223	69,268	36,062
1986	9,704	367	700	948,985	29,428	24,623
1987	9,377	465	759	978,875	30,714	31,630
1988	9,302	600	679	1,014,641	36,110	26,859
1989	9,411	796	831	1,025,981	38,068	33,713
1990	8,858	476	852	1,027,309	29,272	30,203
1991	8,245	458	798	945,704	21,158	35,254
1992	11,186	3,481	1,258	983,586	95,882	32,990
1993	10,547	777	1,217	977,960	26,169	34,388
1994	10,108	671	794	935,311	25,604	29,152
1995	10,210	993	984	972,394	40,557	34,799
1996	10,573	1,255	1,210	1,038,256	44,422	56,195
1997	11,347	1,579	967	1,137,988	77,210	42,507
1998	12,299	1,694	1,502	1,203,263	65,855	64,847
1999	11,245	585	1,132	1,111,966	26,113	48,607
2000	11,095	734	2,071	1,128,667	38,593	137,817
2001	9,947	726		993,364	31,555	

Table A.4: Firm demography and employment by size class

	Number of firms			*Number of employees*		
	Small	**Medium**	**Large**	**Small**	**Medium**	**Large**
1980	6,545	1,224	871	134,023	100,431	555,486
1981	6,958	1,301	902	144,452	106,411	554,366
1982	7,068	1,396	978	149,286	113,911	573,369
1983	6,720	1,500	1,007	144,791	123,703	602,109
1984	6,201	1,476	1,050	137,618	121,412	637,768
1985	7,979	1,526	1,080	168,558	127,217	639,448
1986	6,936	1,631	1,137	153,415	135,157	660,413
1987	6,472	1,682	1,223	147,071	141,074	690,730
1988	6,224	1,787	1,291	142,780	148,970	722,891
1989	6,338	1,758	1,315	146,009	149,130	730,842
1990	5,756	1,770	1,332	137,189	151,767	738,353
1991	5,237	1,747	1,261	127,804	149,006	668,894
1992	7,964	1,958	1,264	175,428	164,201	643,957
1993	7,271	1,976	1,300	167,418	166,830	643,712
1994	6,907	1,944	1,257	160,168	166,144	608,999
1995	6,765	2,068	1,377	162,136	174,945	635,313
1996	6,850	2,256	1,467	168,202	193,273	676,781
1997	7,151	2,557	1,639	175,925	218,361	743,702
1998	7,830	2,781	1,688	195,008	235,468	772,787
1999	7,127	2,535	1,583	181,331	214,803	715,832
2000	6,960	2,499	1,636	178,872	214,338	735,457
2001	6,290	2,188	1,469	159,405	189,238	644,721

Small: <50, Medium: 50-149, Large: >149.

Table A.5: Number of firms by sector

	31	32	33	34	35	36	37	38	39
1980	1,801	1,686	354	366	1,011	595	494	2,255	78
1981	1,990	1,865	330	395	1,066	609	499	2,308	99
1982	2,099	1,929	366	383	1,084	612	475	2,401	93
1983	2,047	1,919	359	382	1,031	595	478	2,316	100
1984	1,891	1,833	327	371	971	576	444	2,214	100
1985	2,273	2,536	491	451	1,020	677	488	2,527	122
1986	2,149	2,140	421	421	964	647	477	2,374	111
1987	1,997	2,155	392	400	933	639	463	2,289	109
1988	1,978	2,254	356	376	888	646	461	2,238	105
1989	2,083	2,300	342	357	819	722	445	2,242	101
1990	1,895	2,333	314	341	821	686	385	1,992	91
1991	1,762	2,229	286	312	758	671	347	1,794	86
1992	2,166	3,313	471	398	932	861	417	2,513	115
1993	1,968	3,134	442	366	914	827	387	2,405	104
1994	1,867	2,976	412	356	900	831	354	2,304	108
1995	1,801	3,145	413	353	888	844	401	2,264	101
1996	1,831	3,336	415	367	924	839	375	2,379	107
1997	1,865	3,600	482	387	1,027	875	406	2,587	118
1998	1,936	3,807	512	431	1,103	954	442	2,987	127
1999	1,784	3,394	451	384	1,050	884	417	2,757	124
2000	1,715	3,373	441	397	1,041	860	396	2,744	128
2001	1,613	3,261	419	343	932	673	359	2,216	131

Two-digit sectors (ISIC, Rev2). See Table A.2 for classification of manufacturing industries.

Table A.6: Number of employees by sector

	31	32	33	34	35	36	37	38	39
1980	184,383	185,319	17,226	28,497	75,820	58,900	75,087	161,568	3,140
1981	176,915	193,004	16,605	29,478	78,410	59,963	76,036	170,872	3,946
1982	180,134	203,170	17,977	30,270	83,434	60,455	76,995	179,765	4,366
1983	186,832	216,971	19,021	31,703	83,882	62,152	77,914	187,259	4,869
1984	194,851	225,795	18,625	33,689	82,606	65,062	79,112	191,972	5,086
1985	193,376	235,185	21,592	36,288	88,172	71,259	81,418	202,197	5,736
1986	193,891	236,479	21,166	36,309	92,717	73,776	82,716	206,723	5,208
1987	189,176	256,121	21,807	36,981	96,998	76,786	83,576	212,135	5,295
1988	188,637	278,719	21,473	37,189	98,211	81,727	86,121	217,209	5,355
1989	197,304	292,819	21,019	36,115	98,965	82,494	85,164	206,894	5,207
1990	188,589	295,946	20,281	37,122	101,176	77,554	84,036	217,593	5,012
1991	183,543	262,372	18,113	34,653	93,667	69,511	74,927	204,294	4,624
1992	185,449	288,400	22,347	34,962	93,466	70,327	71,250	212,240	5,145
1993	178,011	292,038	22,480	34,264	93,755	65,924	69,417	216,791	5,280
1994	169,352	288,916	20,820	33,391	90,534	64,927	63,518	198,675	5,178
1995	169,383	318,723	20,471	34,640	92,623	66,464	63,918	200,152	6,020
1996	173,332	356,908	23,262	36,312	98,298	67,341	59,207	216,764	6,832
1997	178,141	398,121	26,194	33,434	108,224	73,529	64,488	247,921	7,936
1998	186,672	414,555	28,915	36,827	110,780	79,371	66,555	270,894	8,694
1999	179,417	369,467	26,752	33,453	108,588	77,988	60,367	247,193	8,741
2000	175,361	385,016	28,243	34,318	109,374	74,198	59,893	252,946	9,318
2001	159,375	360,071	24,343	27,364	92,755	60,134	49,656	209,829	9,837

Table A.7: Firm demography and employment by sectoral orientation

	Number of firms				*Number of employees*			
	LI	**RI**	**SI**	**SS&SB**	**LI**	**RI**	**SI**	**SS&SB**
1980	2,551	2,959	1,997	1,133	225,708	302,408	176,378	85,446
1981	2,795	3,212	2,010	1,144	236,064	297,704	181,011	90,450
1982	2,892	3,305	2,036	1,209	249,919	302,464	187,536	96,647
1983	2,832	3,233	1,967	1,195	265,664	312,738	191,681	100,520
1984	2,703	3,031	1,851	1,142	275,084	324,025	195,033	102,656
1985	3,522	3,610	2,147	1,306	285,732	331,340	210,374	107,777
1986	3,056	3,413	1,989	1,246	287,802	335,044	214,402	111,737
1987	3,022	3,233	1,898	1,224	307,829	334,865	219,117	117,064
1988	3,099	3,192	1,800	1,211	330,677	339,278	223,309	121,377
1989	3,154	3,347	1,713	1,197	341,386	347,785	219,906	116,904
1990	3,116	3,083	1,605	1,054	345,662	333,930	225,579	122,138
1991	2,881	2,895	1,481	988	306,783	313,747	210,981	114,193
1992	4,270	3,593	2,014	1,309	337,236	315,250	215,284	115,816
1993	4,063	3,319	1,931	1,234	341,725	301,797	218,035	116,403
1994	3,862	3,210	1,846	1,190	335,291	290,245	202,427	107,348
1995	4,004	3,164	1,856	1,186	367,717	292,366	203,570	108,741
1996	4,237	3,198	1,891	1,247	412,727	298,681	210,984	115,864
1997	4,593	3,301	2,120	1,333	463,540	308,957	234,921	130,570
1998	4,947	3,515	2,297	1,540	486,217	327,799	245,989	143,258
1999	4,439	3,239	2,140	1,427	434,609	313,099	229,568	134,690
2000	4,432	3,158	2,092	1,413	453,196	306,327	234,372	134,772
2001	4,197	2,801	1,866	1,083	420,263	265,832	201,888	105,381

See Table A.2 for classification of manufacturing industries.

Table A.8: Firm demography and employment by size class (New firms established since 1981)

	Number of firms			*Number of employees*		
	Small	**Medium**	**Large**	**Small**	**Medium**	**Large**
1981	1,642	131	57	27,964	10,518	19,972
1982	2,221	219	88	39,682	17,560	30,014
1983	2,368	299	111	44,152	24,658	39,447
1984	2,245	329	143	44,690	26,586	62,097
1985	4,394	434	190	82,499	35,479	80,136
1986	3,709	528	233	75,534	43,821	103,662
1987	3,477	624	296	73,586	51,420	125,821
1988	3,452	742	366	75,410	61,377	151,636
1989	3,718	810	410	82,260	67,816	169,363
1990	3,457	869	439	80,181	73,971	187,155
1991	3,245	896	455	77,404	74,636	187,579
1992	5,994	1,156	491	126,483	94,412	190,425
1993	5,465	1,227	540	121,333	101,228	202,753
1994	5,210	1,215	545	117,294	102,038	206,456
1995	5,234	1,368	639	122,662	114,482	242,432
1996	5,452	1,538	735	131,339	130,053	283,091
1997	5,805	1,831	885	140,248	154,239	339,645
1998	6,588	2,061	949	161,766	172,501	367,682
1999	5,956	1,890	909	149,490	157,680	349,014
2000	5,863	1,905	986	148,916	160,827	380,805
2001	5,345	1,721	902	134,478	146,722	344,900

Small: <50, Medium: 50-149, Large: >149.

Table A.9: Number of firms by sector (New firms established since 1981)

	31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**
1981	453	350	53	81	212	73	91	487	30
1982	566	537	95	88	309	113	123	670	27
1983	604	623	100	101	309	128	142	731	40
1984	561	629	88	103	295	129	134	737	41
1985	1,013	1,465	270	201	426	232	201	1,141	69
1986	950	1,148	223	183	404	221	203	1,079	59
1987	893	1,217	207	174	392	216	193	1,048	57
1988	912	1,348	185	172	381	230	216	1,061	55
1989	1,048	1,469	181	163	361	331	216	1,116	53
1990	973	1,547	164	160	372	323	183	991	52
1991	931	1,533	154	147	367	331	169	916	48
1992	1,371	2,644	331	229	571	524	244	1,648	79
1993	1,223	2,480	311	207	577	521	232	1,607	74
1994	1,189	2,349	295	204	575	532	209	1,537	80
1995	1,165	2,548	302	208	582	556	255	1,552	73
1996	1,229	2,763	314	224	628	560	250	1,674	83
1997	1,261	3,042	384	244	727	604	276	1,889	94
1998	1,357	3,273	426	292	815	698	320	2,313	104
1999	1,253	2,911	377	260	777	651	302	2,124	100
2000	1,215	2,917	373	279	783	644	288	2,149	106
2001	1,160	2,838	362	245	719	526	269	1,737	112

Table A.10: Number of employees by sector (New firms established since 1981)

	31	32	33	34	35	36	37	38	39
1981	14,140	10,614	1,910	2,795	5,416	4,631	3,044	15,191	713
1982	17,803	17,586	3,261	3,787	10,418	6,389	5,651	21,592	769
1983	22,416	24,786	3,960	4,487	8,781	8,740	8,011	25,887	1,189
1984	34,715	28,849	3,967	6,187	9,225	10,147	8,399	30,620	1,264
1985	44,408	50,227	7,680	9,501	16,551	14,579	10,011	42,791	2,366
1986	52,616	57,878	7,464	9,923	19,358	16,127	11,247	46,504	1,900
1987	55,019	73,268	8,094	10,268	22,265	17,312	11,093	51,568	1,940
1988	58,521	88,583	7,738	11,335	24,864	20,633	15,284	59,593	1,872
1989	64,693	101,660	8,274	11,217	25,742	24,804	17,163	64,044	1,842
1990	63,715	110,036	7,766	12,335	32,205	24,931	16,961	71,359	1,999
1991	66,633	107,824	7,082	11,253	31,330	24,858	15,806	72,884	1,949
1992	72,544	143,592	11,893	12,801	35,348	30,441	16,064	85,819	2,818
1993	69,824	152,190	12,699	12,775	37,171	30,080	16,560	90,976	3,039
1994	68,761	158,266	12,066	12,810	37,686	30,474	15,433	87,068	3,224
1995	72,253	187,471	12,837	13,790	40,275	33,410	23,539	92,157	3,844
1996	79,692	221,568	15,980	15,039	44,841	35,824	24,297	102,517	4,725
1997	84,909	261,070	19,405	15,945	52,383	42,567	26,830	125,473	5,550
1998	93,882	280,761	22,287	18,554	55,866	49,513	29,144	145,502	6,440
1999	92,849	252,313	21,312	17,348	54,518	49,725	26,035	135,518	6,566
2000	93,050	274,811	23,301	19,371	57,682	48,395	26,166	140,483	7,289
2001	89,960	265,405	20,231	16,653	50,210	40,096	22,206	113,316	8,023

Table A.11: Firm demography and employment by sectoral orientation (New firms established since 1981)

	Number of firms				Number of employees			
	LI	RI	SI	SS&SB	LI	RI	SI	SS&SB
1981	553	655	392	230	15,298	23,800	11,996	7,360
1982	812	827	573	316	24,179	31,006	21,844	10,227
1983	923	901	586	368	32,675	40,379	22,307	12,896
1984	937	857	554	369	38,950	55,920	23,379	15,124
1985	1,919	1,533	979	587	63,234	73,659	39,344	21,877
1986	1,573	1,436	890	571	71,323	83,966	41,255	26,473
1987	1,610	1,366	855	566	87,253	89,412	44,901	29,261
1988	1,744	1,400	824	592	104,073	97,895	50,545	35,910
1989	1,887	1,627	816	608	116,878	108,463	54,849	39,249
1990	1,944	1,530	764	527	128,552	108,525	61,783	42,447
1991	1,862	1,483	733	518	125,036	110,297	59,477	44,809
1992	3,281	2,221	1,288	851	167,403	123,086	70,727	50,104
1993	3,119	2,044	1,265	804	177,713	120,035	75,332	52,234
1994	2,954	2,015	1,217	784	182,855	119,499	73,751	49,683
1995	3,144	2,028	1,265	804	214,042	126,684	86,008	52,842
1996	3,408	2,115	1,330	872	252,808	139,016	95,527	57,132
1997	3,783	2,221	1,558	959	299,580	152,930	112,844	68,778
1998	4,173	2,481	1,764	1,180	325,515	172,699	123,958	79,777
1999	3,733	2,296	1,638	1,088	293,967	169,613	116,422	76,182
2000	3,761	2,273	1,628	1,092	319,062	170,927	122,130	78,429
2001	3,590	2,059	1,487	832	305,277	155,217	104,967	60,639

APPENDIX B

Supplementary Tables and Figures for Chapter 3

Table B.1: Employment share, creation and growth for the top 200 firms for employment growth rate

		Emp. share (%)			
Entry	**Age 10**	**At entry**	**At age10**	**Creation**	**10-year growth (%)**
1981	1991	0.08	0.67	5672	852.93
1982	1992	0.08	0.67	5938	853.16
1983	1993	0.06	0.46	3995	753.77
1984	1994	0.05	0.43	3617	895.30
1985	1995	0.10	0.94	8208	865.82
1986	1996	0.02	0.12	1074	720.81
1987	1997	0.07	0.55	5637	842.60
1988	1998	0.08	0.77	8411	1001.31
1989	1999	0.05	0.55	5544	997.12
1990	2000	0.07	0.48	4708	697.48

Employment share is out of total employment in all manufacturing. Creation is defined as the difference between at age 10 and at entry on account of the number of employees. Besides, 10-year growth is calculated as (log) growth.

Table B.2: Top 200 firms for employment growth rate by sectors

Entry	Age 10	LI	RI	SI	SS	Total
1981	1991	15	6	4	3	28
1982	1992	10	3	6	3	22
1983	1993	11	5	3	3	22
1984	1994	3	3	1	2	9
1985	1995	29	4	4	2	39
1986	1996	5		1	1	7
1987	1997	14	2	2	2	20
1988	1998	12	4	1		17
1989	1999	11	8		2	21
1990	2000	10	2	3		15
	Total	120	37	25	18	200

Note: LI: labor -intensive; RI: resource-intensive; SI: scale-intensive; SS: specialized supplier and science-based. See Data Appendix.

Table B.3: 57 firms exiting out of top 200 firms for employment growth rate by exit years, sectors and ages

Exit year	Total	LI	RI	SI	SS	10	11	12	13	14	15	16	17	18	19
1991	2	1	1			2									
1992	1		1				1								
1993	4	2		1	1		2	2							
1994	0														
1995	3	1			2			1	1	1					
1996	8	7			1	1	2		3	1	1				
1997	5	4	1			2		2			1				
1998	7	6		1		1	1	1	3			1			
1999	7	5	1		1	2		1		2		2			
2000	20	7	4	5	4	3	1	2	2		4	2	1	3	2
Total	57	33	8	7	9	11	7	9	9	4	6	5	1	3	2

Note: LI: labor -intensive; RI: resource-intensive; SI: scale-intensive; SS: specialized supplier and science-based. See Data Appendix. Columns from 10-19 denote ages of the firms.

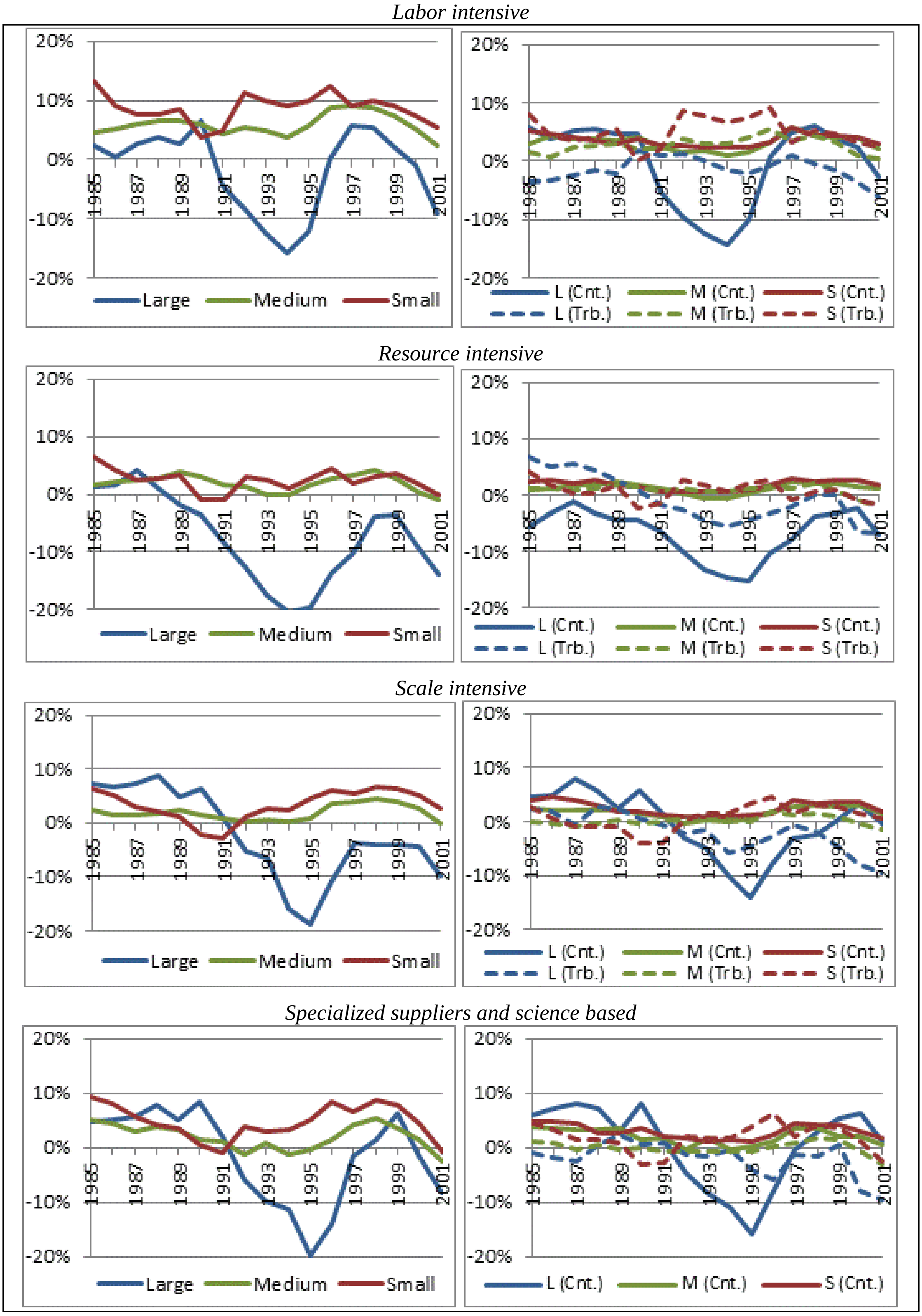
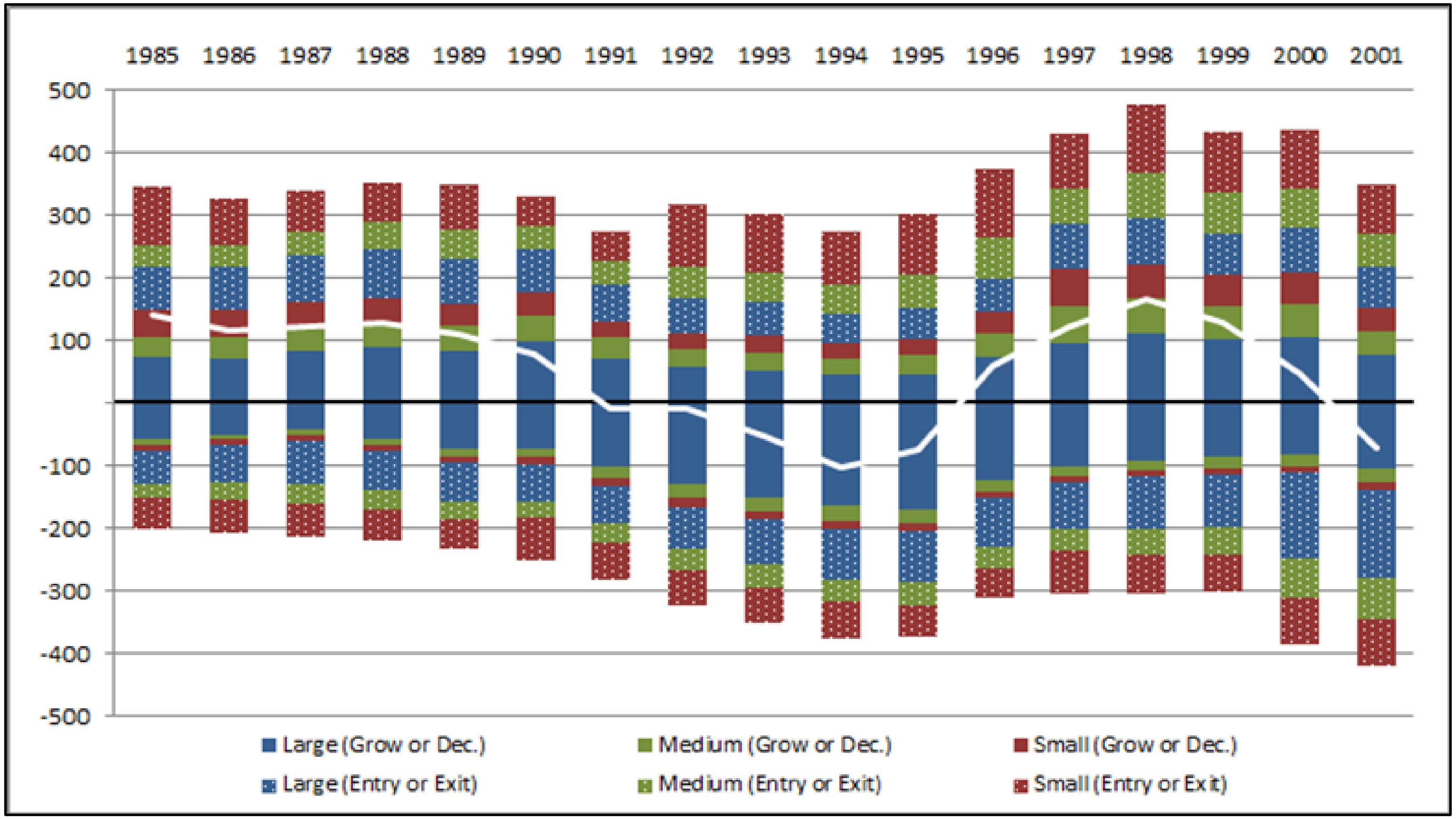


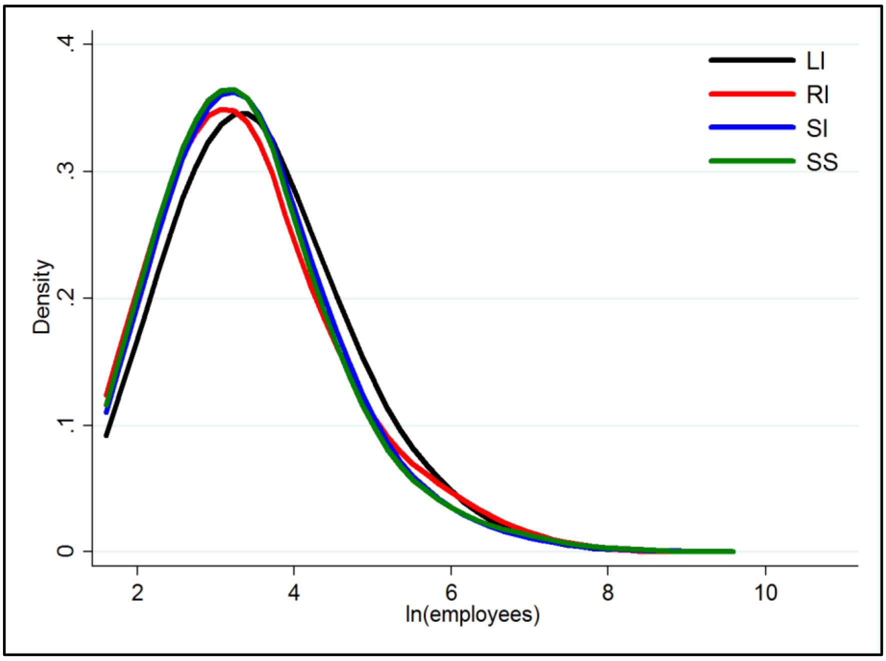
Figure B.1: Decomposition of employment change in the last 5 years by sector



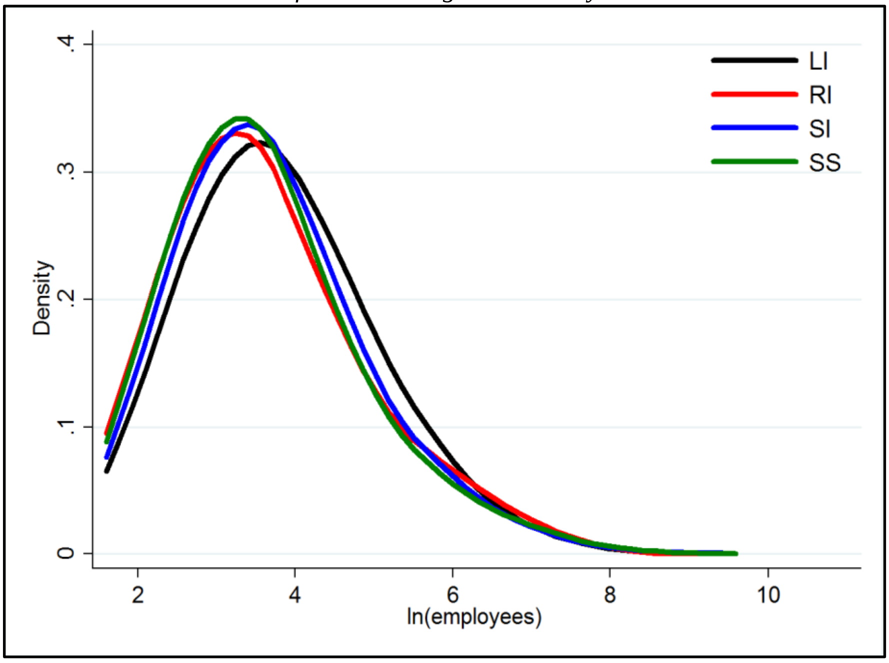
Positive numbers indicate the employment generation of the continuing firms that grow, and entrants, for corresponding size class.
Negative numbers indicate the employment destruction of the continuing firms that decline, and exitors, for corresponding size class.
White line shows net growth of employment in manufacturing for each year.

Figure B.2: Decomposition of employment change in the last 5 years by size class, growth and turbulence.

New Firms



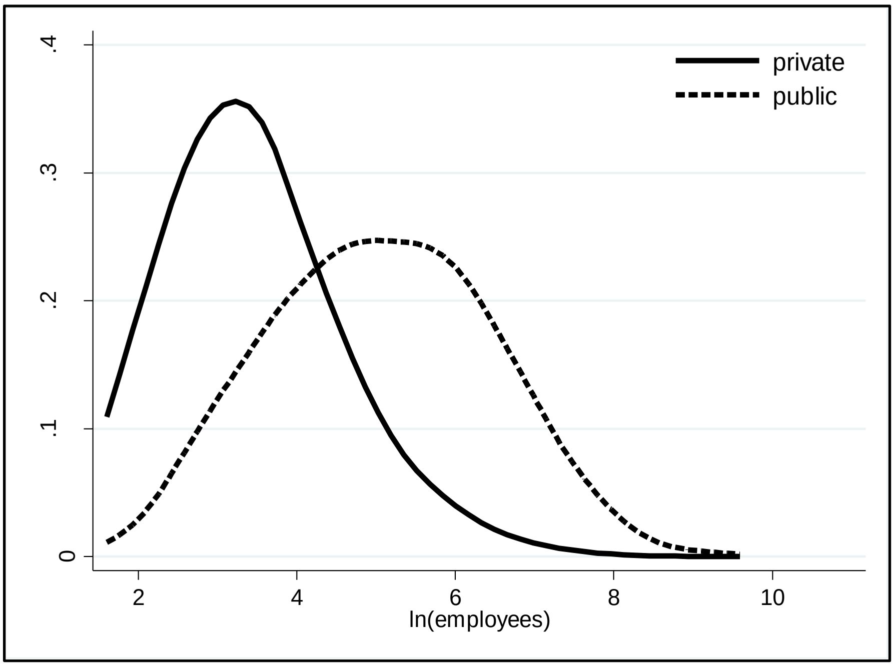
New firms surviving 10 or more years



Note: LI: labor -intensive; RI: resource-intensive; SI: scale-intensive;
SS: specialized supplier and science-based. See Data Appendix.

Figure B.3: Size distributions of new firms by sector

New Firms



New firms surviving 10 or more years

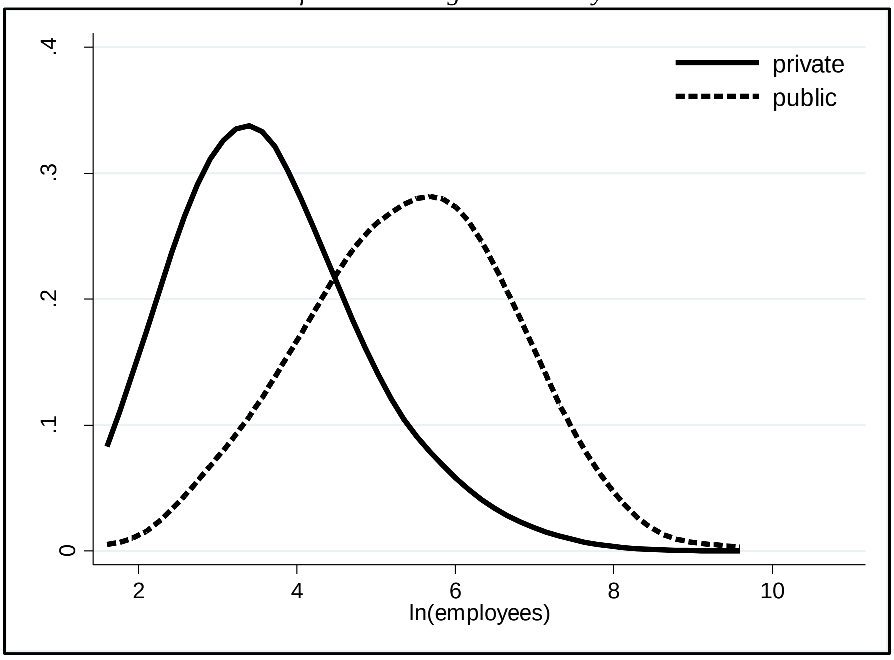


Figure B.4: Size distributions of new firms by ownership

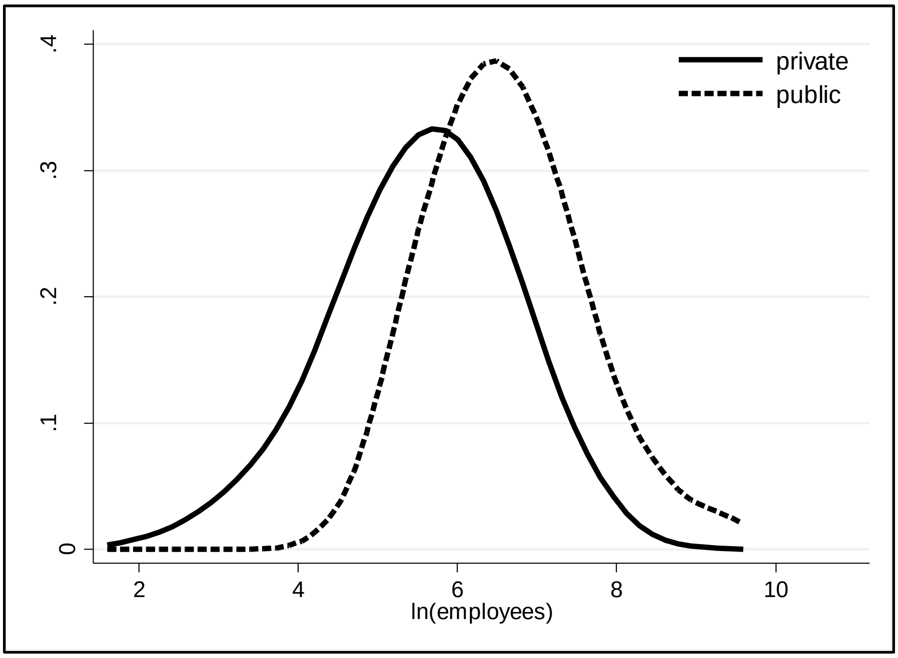


Figure B.5: Size distributions of new firms by ownership (Top 200 firms)

APPENDIX C

Supplementary Tables and Figures for Chapter 5

Table C.1: Wald tests for combining patterns

Alternatives	Chi2	Alternatives	Chi2
No change-Lin. Grower	114.55***	Quad. Grower-Quad. Decliner	85.67***
No change-Lin. Decliner	73.00***	Quad. Grower-One-s. Grower	124.93***
No change-Quad. Grower	142.25***	Quad. Grower-One-s. Decliner	183.83***
No change-Quad. Decliner	96.87***	Quad. Grower-Log. Grower	31.41*
No change-One-s. Grower	38.39*	Quad. Grower-Log. Decliner	191.31***
No change-One-s. Decliner	93.72***	Quad. Grower-Random Walk	74.02***
No change-Log. Grower	188.36***	Quad. Grower-Failure	396.81***
No change-Log. Decliner	93.83***	Quad. Decliner-One-s. Grower	141.86***
No change-Random Walk	92.19***	Quad. Decliner-One-s. Decliner	72.17***
No change-Failure	170.37***	Quad. Decliner-Log. Grower	143.09***
Lin. Grower-Lin. Decliner	115.57***	Quad. Decliner-Log. Decliner	107.77***
Lin. Grower-Quad. Grower	23.85	Quad. Decliner-Random Walk	62.43***
Lin. Grower-Quad. Decliner	86.78***	Quad. Decliner-Failure	566.18***
Lin. Grower-One-s. Grower	85.50***	One-s. Grower-One-s. Decliner	170.88***
Lin. Grower-One-s. Decliner	137.43***	One-s. Grower-Log. Grower	193.13***
Lin. Grower-Log. Grower	40.47*	One-s. Grower-Log. Decliner	146.58***
Lin. Grower-Log. Decliner	153.77***	One-s. Grower-Random Walk	91.58***
Lin. Grower-Random Walk	71.60***	One-s. Grower-Failure	299.40***
Lin. Grower-Failure	225.82***	One-s. Decliner-Log. Grower	317.31***
Lin. Decliner-Quad. Grower	111.17***	One-s. Decliner-Log. Decliner	45.58**
Lin. Decliner-Quad. Decliner	58.20***	One-s. Decliner-Random Walk	82.12***
Lin. Decliner-One-s. Grower	103.21***	One-s. Decliner-Failure	592.46***
Lin. Decliner-One-s. Decliner	32.63*	Log. Grower-Log. Decliner	286.66***
Lin. Decliner-Log. Grower	137.42***	Log. Grower-Random Walk	131.70***
Lin. Decliner-Log. Decliner	25.79	Log. Grower-Failure	675.21***
Lin. Decliner-Random Walk	74.09***	Log. Decliner-Random Walk	108.55***
Lin. Decliner-Failure	173.69***	Log. Decliner-Failure	345.25***
		Random Walk-Failure	272.57***

Ho: All coefficients except intercepts associated with a given pair of alternatives are 0.
All Chi2 statistics in the table have 31 degrees of freedom. *** p<0.01, ** p<0.05, * p<0.1.
(also holds for Table C.2)

Table C.2: Wald tests for combining aggregated patterns

Alternatives	**Chi2**
No change-Cont. Grower	157.06***
No change-Asymp. Grower	110.47***
No change-Cont. Decliner	91.00***
No change-Asymp. Decliner	96.20***
No change-Random Walk	86.55***
No change-Failure	172.73***
Cont. Grower-Asymp. Grower	53.10***
Cont. Grower-Cont. Decliner	141.60***
Cont. Grower-Asymp. Decliner	284.84***
Cont. Grower-Random Walk	81.55***
Cont. Grower-Failure	542.74***
Asymp. Grower-Cont. Decliner	161.75***
Asymp. Grower-Asymp. Decliner	343.77***
Asymp. Grower-Random Walk	97.41***
Asymp. Grower-Failure	656.27***
Cont. Decliner-Asymp. Decliner	78.24***
Cont. Decliner-Random Walk	62.80***
Cont. Decliner-Failure	643.23***
Asymp. Decliner-Random Walk	93.56***
Asymp. Decliner-Failure	740.92***
Random Walk-Failure	296.89***

Table C.3: Odds ratios in pattern selection model (Alternative base: Grower patterns)

	Lin. Grower	Quad. Grower	One-s. Grower	Log. Grower
Size				
Fail	0.529***	0.522***	0.708***	0.544***
No change	0.818**	0.807***	1.095	0.842**
Lin. Grower		0.987	1.339***	1.029
Quad. Grower	1.013		1.357***	1.042
One-s. Grower	0.747***	0.737***		0.768***
Log. Grower	0.972	0.959	1.302***	
Lin. Decliner	1.484***	1.465***	1.988***	1.527***
Quad. Decliner	1.269***	1.253***	1.7***	1.306***
One-s. Decliner	1.267***	1.251***	1.697***	1.304***
Log. Decliner	1.191**	1.175**	1.595***	1.225***
Random Walk	1.208**	1.192**	1.618***	1.243***
Relative labor productivity				
Fail	0.617***	0.67***	0.751***	0.658***
No change	0.742***	0.805***	0.903	0.791***
Lin. Grower		1.086	1.217***	1.066
Quad. Grower	0.921		1.121**	0.982
One-s. Grower	0.821***	0.892**		0.876***
Log. Grower	0.938	1.019	1.142***	
Lin. Decliner	0.668***	0.725***	0.813*	0.712***
Quad. Decliner	0.791***	0.859***	0.963	0.843***
One-s. Decliner	0.707***	0.768***	0.861***	0.754***
Log. Decliner	0.628***	0.682***	0.764***	0.669***
Random Walk	0.923	1.002	1.123	0.984
Capital intensity				
Fail	0.895***	0.934**	0.207	0.888***
No change	0.772***	0.806***	0.89***	0.767***
Lin. Grower		0.368	1.153***	0.879
Quad. Grower	0.368		1.105***	0.124
One-s. Grower	0.867***	0.905***		0.861***
Log. Grower	0.879	0.124	1.161***	
Lin. Decliner	0.693***	0.724***	0.799***	0.688***
Quad. Decliner	0.829***	0.866***	0.159	0.824***
One-s. Decliner	0.782***	0.816***	0.901***	0.776***
Log. Decliner	0.766***	0.8***	0.884***	0.761***
Random Walk	0.836***	0.873***	0.395	0.83***

Note: The figures in cells denote the odds ratio of a pattern (in rows) relative to alternative base (in columns) patterns, for the relevant explanatory variable in the pattern selection model.

Table C.4: Odds ratios in pattern selection model (Alternative base: Decliner patterns)

	Lin. Decliner	Quad. Decliner	One-s. Decliner	Log. Decliner
Size				
Fail	0.356***	0.417***	0.417***	0.444***
No change	0.551***	0.645***	0.645***	0.687***
Lin. Grower	0.674***	0.788***	0.789***	0.84**
Quad. Grower	0.683***	0.798***	0.800***	0.851**
One-s. Grower	0.503***	0.588***	0.589***	0.627***
Log. Grower	0.655***	0.766***	0.767***	0.816***
Lin. Decliner		1.169	1.171	1.246**
Quad. Decliner	0.855		1.002	1.066
One-s. Decliner	0.854	0.999		1.064
Log. Decliner	0.802**	0.938	0.940	
Random Walk	0.814*	0.952	0.953	1.014
Relative labor productivity				
Fail	0.924	0.78***	0.873***	0.983
No change	1.110	0.938	1.049	1.181**
Lin. Grower	1.497***	1.264***	1.414***	1.593***
Quad. Grower	1.379***	1.164***	1.302***	1.467***
One-s. Grower	1.230*	1.039	1.162***	1.309***
Log. Grower	1.404***	1.186***	1.326***	1.494***
Lin. Decliner		0.844	0.944	1.064
Quad. Decliner	1.184		1.118**	1.260***
One-s. Decliner	1.059	0.894**		1.127*
Log. Decliner	0.940	0.794***	0.888*	
Random Walk	1.382***	1.167**	1.305***	1.470***
Capital intensity				
Fail	1.291***	1.079***	1.145***	1.167***
No change	1.114*	0.931*	0.748	0.866
Lin. Grower	1.443***	1.206***	1.280***	1.305***
Quad. Grower	1.382***	1.155***	1.225***	1.25***
One-s. Grower	1.251***	0.159	1.110***	1.131***
Log. Grower	1.453***	1.214***	1.289***	1.314***
Lin. Decliner		0.836***	0.887**	0.904*
Quad. Decliner	1.197***		1.061**	1.082**
One-s. Decliner	1.128**	0.943**		0.582
Log. Decliner	1.106*	0.924**	0.582	
Random Walk	1.206***	0.850	0.108	1.091*

Note: The figures in cells denote the odds ratio of a pattern (in rows) relative to alternative base (in columns) patterns, for the relevant explanatory variable in the pattern selection model.

Table C.5: Odds ratios in pattern selection model
(Alternative base: Failure, no change, random walk patterns)

	Failure	**No change**	**Random Walk**
Size			
Fail		0.646***	0.438***
No change	1.547***		0.677***
Lin. Grower	1.892***	1.223**	0.828**
Quad. Grower	1.916***	1.239***	0.839**
One-s. Grower	1.412***	0.913	0.618***
Log. Grower	1.838***	1.188**	0.805***
Lin. Decliner	2.807***	1.815***	1.229*
Quad. Decliner	2.400***	1.552***	1.051
One-s. Decliner	2.397***	1.549***	1.049
Log. Decliner	2.252***	1.456***	0.986
Random Walk	2.284***	1.477***	
Relative labor productivity			
Fail		0.832***	0.669***
No change	1.202***		0.804***
Lin. Grower	1.621***	1.349***	1.084
Quad. Grower	1.492***	1.242***	0.998
One-s. Grower	1.331***	1.108	0.890
Log. Grower	1.520***	1.265***	1.016
Lin. Decliner	1.082	0.901	0.724***
Quad. Decliner	1.282***	1.067	0.857**
One-s. Decliner	1.146***	0.954	0.766***
Log. Decliner	1.017	0.847**	0.680***
Random Walk	1.495***	1.245***	
Capital intensity			
Fail		1.159***	1.07*
No change	0.863***		0.103
Lin. Grower	1.118***	1.295***	1.196***
Quad. Grower	1.071**	1.241***	1.146***
One-s. Grower	0.207	1.123***	0.395
Log. Grower	1.126***	1.304***	1.205***
Lin. Decliner	0.775***	0.898*	0.829***
Quad. Decliner	0.927***	1.074*	0.850
One-s. Decliner	0.874***	0.748	0.108
Log. Decliner	0.857***	0.866	0.917*
Random Walk	0.935*	0.103	

Note: The figures in cells denote the odds ratio of a pattern (in rows) relative to alternative base (in columns) patterns, for the relevant explanatory variable in the pattern selection model.

Table C.6: Odds Ratios in Aggregated Pattern Selection Model (Alternative Basis)

	Failure	No Change	Cont. Grower	Asymp. Grower	Cont. Decliner	Asymp. Decliner	Random Walk
Size							
Failure		0.646***	0.525***	0.602***	0.408***	0.426***	0.438***
No Change	1.548***		0.813***	0.932	0.632***	0.659***	0.678***
Cont. Grower	1.904***	1.23***		1.146***	0.777***	0.811***	0.834**
Asymp. Grower	1.661***	1.073	0.872***		0.678***	0.707***	0.728***
Cont. Decliner	2.451***	1.583***	1.287***	1.476***		1.044	1.074
Asymp. Decliner	2.348***	1.517***	1.233***	1.414***	0.958		1.029
Random Walk	2.283***	1.475***	1.199**	1.374***	0.931	0.972	
Relative labor productivity							
Failure		0.832***	0.655***	0.696***	0.797***	0.907***	0.669***
No Change	1.202***		0.788***	0.837***	0.958	1.090	0.804***
Cont. Grower	1.527***	1.27***		1.062	1.216***	1.384***	1.021
Asymp. Grower	1.437***	1.195***	0.942		1.145***	1.303***	0.962
Cont. Decliner	1.255***	1.044	0.822***	0.873***		1.138***	0.840**
Asymp. Decliner	1.103***	0.918	0.723***	0.768***	0.879***		0.738***
Random Walk	1.495***	1.243***	0.979	1.040	1.191**	1.355***	
Capital intensity							
Failure		1.158***	0.924***	0.950***	1.109***	1.151***	1.071*
No Change	0.864***		0.798***	0.821***	0.958	0.994	0.925
Cont. Grower	1.082***	1.253***		1.028	1.200***	1.245***	1.158***
Asymp. Grower	1.053***	1.219***	0.973		1.167***	1.212***	1.127***
Cont. Decliner	0.902***	1.044	0.834***	0.857***		1.038	0.965
Asymp. Decliner	0.869***	1.006	0.803***	0.825***	0.964		0.930*
Random Walk	0.934*	1.081	0.863***	0.887***	1.036	1.075*	

Note: The figures in cells denote the odds ratio of a pattern (in rows) relative to alternative base (in columns) patterns, for the relevant explanatory variable in the aggregated pattern selection model.

Table C.7: Marginal effects for grower and decliner patterns

	Lin. Grower	Quad. Grower	One-s. Grower	Log. Grower
size	0.007***	0.018***	-0.003	0.024***
	[0.002]	[0.003]	[0.005]	[0.004]
rlp	0.008***	0.016***	0.011***	0.028***
	[0.002]	[0.003]	[0.003]	[0.003]
kl	0.003***	0.006***	-0.001	0.014***
	[0.001]	[0.002]	[0.002]	[0.002]
subinp	0.004	-0.013	-0.013	0.007
	[0.013]	[0.022]	[0.029]	[0.026]
suboutp	0.002	0.009	-0.003	0.018
	[0.007]	[0.010]	[0.013]	[0.013]
adverint	-0.115	0.296	0.272	0.459*
	[0.171]	[0.203]	[0.266]	[0.254]
interest	-0.051	-0.098	0.022	-0.270***
	[0.045]	[0.071]	[0.078]	[0.090]
pub	-0.016***	-0.017	-0.011	0.001
	[0.006]	[0.014]	[0.019]	[0.026]
fdi	-0.008	0.003	0.009	-0.011
	[0.006]	[0.013]	[0.019]	[0.015]
entrate	0.001	0.050	-0.206***	0.017
	[0.030]	[0.048]	[0.063]	[0.061]
hhi	0.003	0.016	0.013	-0.004
	[0.024]	[0.040]	[0.045]	[0.049]
mes	-0.003	-0.001	-0.008	0.023***
	[0.004]	[0.005]	[0.007]	[0.007]

	Lin. Decliner	Quad. Decliner	One-s. Decliner	Log. Decliner
size	0.007***	0.040***	0.043***	0.017***
	[0.001]	[0.003]	[0.003]	[0.002]
rlp	-0.001	0.007**	-0.002	-0.006***
	[0.001]	[0.003]	[0.003]	[0.002]
kl	-0.002***	-0.006***	-0.010***	-0.006***
	[0.000]	[0.002]	[0.002]	[0.001]
subinp	-0.014	-0.035	-0.004	0.010
	[0.011]	[0.027]	[0.028]	[0.019]
suboutp	0.003	-0.034***	-0.029**	-0.019**
	[0.003]	[0.013]	[0.014]	[0.009]
adverint	-0.058	0.313	-0.439	-0.868**
	[0.107]	[0.235]	[0.345]	[0.350]
interest	0.0076	-0.161**	-0.083	0.0400
	[0.024]	[0.079]	[0.081]	[0.051]
pub	0.002	0.036*	0.023	-0.005
	[0.005]	[0.021]	[0.019]	[0.009]
fdi	0.002	-0.021	-0.038***	0.019
	[0.005]	[0.013]	[0.013]	[0.015]
entrate	0.010	-0.042	-0.088	0.053
	[0.018]	[0.054]	[0.059]	[0.037]
hhi	-0.026	0.010	-0.042	-0.003
	[0.019]	[0.044]	[0.050]	[0.032]
mes	-0.001	-0.020***	-0.023***	-0.013***
	[0.002]	[0.006]	[0.006]	[0.004]

Table C.8: Marginal effects for failure, no change and random walk patterns

	Failure	No change	Random Walk
size	-0.167***	0.002	0.013***
	[0.007]	[0.002]	[0.002]
rlp	-0.069***	0.001	0.007***
	[0.005]	[0.002]	[0.002]
kl	0.007**	-0.005***	-0.001
	[0.003]	[0.001]	[0.001]
subinp	0.112**	-0.009	-0.046**
	[0.046]	[0.020]	[0.018]
suboutp	0.052**	-0.013	0.015**
	[0.022]	[0.009]	[0.007]
adverint	0.362	-0.145	-0.077
	[0.580]	[0.235]	[0.182]
interest	0.549***	-0.043	0.088**
	[0.155]	[0.056]	[0.039]
pub	-0.006	-0.008	-0.001
	[0.042]	[0.011]	[0.010]
fdi	0.046	0.015	-0.016***
	[0.038]	[0.016]	[0.006]
entrate	0.425***	-0.116***	-0.106***
	[0.105]	[0.043]	[0.037]
hhi	0.068	-0.004	-0.031
	[0.086]	[0.030]	[0.030]
mes	0.073***	-0.003	-0.023***
	[0.013]	[0.004]	[0.004]

Table C.9: Marginal effects for aggregated patterns

	Failure	No Change	Cont. Grower	Asymp. Grower	Cont. Decliner	Asymp. Decliner	Random Walk
size	-0.168***	0.002	0.024***	0.024***	0.046***	0.060***	0.012***
	[0.007]	[0.002]	[0.003]	[0.005]	[0.003]	[0.004]	[0.002]
rlp	-0.069***	0.001	0.024***	0.039***	0.006**	-0.008**	0.007***
	[0.005]	[0.001]	[0.003]	[0.004]	[0.003]	[0.004]	[0.002]
kl	0.008**	-0.004***	0.009***	0.013***	-0.008***	-0.015***	-0.001
	[0.003]	[0.001]	[0.002]	[0.003]	[0.002]	[0.002]	[0.001]
subinp	0.108**	-0.009	-0.010	0.001	-0.051*	0.005	-0.045**
	[0.046]	[0.020]	[0.025]	[0.036]	[0.029]	[0.032]	[0.018]
suboutp	0.051**	-0.013	0.011	0.014	-0.029**	-0.049***	0.015**
	[0.022]	[0.009]	[0.013]	[0.018]	[0.013]	[0.016]	[0.006]
adverint	0.272	-0.149	0.203	0.694*	0.246	-1.184***	-0.081
	[0.570]	[0.231]	[0.253]	[0.363]	[0.256]	[0.447]	[0.179]
interest	0.540***	-0.043	-0.145*	-0.258**	-0.144*	-0.039	0.088**
	[0.154]	[0.055]	[0.083]	[0.116]	[0.082]	[0.094]	[0.039]
pub	-0.005	-0.008	-0.035**	-0.007	0.038*	0.017	-0.001
	[0.042]	[0.010]	[0.015]	[0.027]	[0.021]	[0.021]	[0.010]
fdi	0.0478	0.015	-0.005	-0.002	-0.019	-0.021	-0.016***
	[0.038]	[0.016]	[0.015]	[0.024]	[0.015]	[0.019]	[0.006]
entrate	0.406***	-0.115***	0.048	-0.168**	-0.035	-0.030	-0.105***
	[0.104]	[0.042]	[0.056]	[0.083]	[0.057]	[0.068]	[0.036]
hhi	0.059	-0.005	0.017	0.022	-0.016	-0.0453	-0.032
	[0.086]	[0.030]	[0.046]	[0.064]	[0.048]	[0.058]	[0.030]
mes	0.071***	-0.003	-0.004	0.017*	-0.021***	-0.038***	-0.023***
	[0.013]	[0.004]	[0.007]	[0.009]	[0.006]	[0.007]	[0.004]

APPENDIX D

Supplementary Tables and Figures for Chapter 6

Table D.1: Growth regressions based on selection correction for patterns with 100 bootstrap replications

	Lin. Grower	Quad. Grower	One-s. Grower	Log. Grower
size	0.008	0.014	0.005	0.005
	[0.050]	[0.034]	[0.023]	[0.025]
rlp	0.012	-0.006	0.009	0.008
	[0.023]	[0.015]	[0.009]	[0.012]
kl	0.010	-0.004	-0.001	0.004
	[0.016]	[0.008]	[0.006]	[0.007]
subinp	0.046	0.029	0.024	0.041
	[0.133]	[0.085]	[0.045]	[0.061]
suboutp	0.039	-0.011	0.023	0.046
	[0.060]	[0.033]	[0.028]	[0.029]
adverint	-0.580	-0.174	0.274	-0.083
	[2.857]	[0.673]	[0.550]	[0.560]
interest	0.116	0.094	0.023	0.463**
	[0.506]	[0.264]	[0.160]	[0.198]
pub	0.001	-0.005	-0.008	-0.096**
	[0.075]	[0.065]	[0.028]	[0.046]
fdi	-0.016	-0.037	-0.007	-0.040
	[0.097]	[0.074]	[0.043]	[0.036]
entrate	0.024	-0.196	0.081	0.028
	[0.267]	[0.198]	[0.114]	[0.136]
hhi	0.100	-0.228**	-0.031	-0.055
	[0.172]	[0.113]	[0.068]	[0.093]
mes	0.048	-0.004	0.012	0.022
	[0.043]	[0.028]	[0.016]	[0.019]
sectgr	0.312*	-0.038	0.069	0.115
	[0.187]	[0.136]	[0.078]	[0.077]
provgr	-0.212	0.213	0.015	0.170
	[0.190]	[0.195]	[0.114]	[0.130]
Cons.	-0.411	0.229	0.056	-0.236
	[0.545]	[0.379]	[0.179]	[0.245]

Table D.1: Growth regressions based on selection correction for patterns with 100 bootstrap replications (cont'd)

	Lin. Decliner	Quad. Decliner	One-s. Decliner	Log. Decliner	Random Walk
size	-0.154	-0.020	-0.049***	-0.047*	-0.008
	[0.097]	[0.016]	[0.016]	[0.026]	[0.045]
rlp	-0.081**	0.005	-0.009	-0.001	0.003
	[0.040]	[0.007]	[0.007]	[0.015]	[0.017]
kl	-0.023	0.004	0.004	0.005	-0.007
	[0.021]	[0.004]	[0.004]	[0.007]	[0.012]
subinp	-0.032	0.018	0.056	0.110	-0.010
	[0.256]	[0.039]	[0.040]	[0.092]	[0.143]
suboutp	-0.082	0.024	-0.008	0.021	-0.001
	[0.085]	[0.024]	[0.019]	[0.055]	[0.052]
adverint	-2.551	0.168	-0.060	1.637	0.564
	[3.438]	[0.409]	[0.588]	[1.922]	[1.814]
interest	0.706	-0.054	0.014	-0.021	0.272
	[0.689]	[0.143]	[0.184]	[0.239]	[0.333]
pub	0.008	0.023	-0.032	0.038	-0.001
	[0.177]	[0.030]	[0.029]	[0.037]	[0.077]
fdi	0.078	-0.001	0.044	-0.026	0.116
	[0.125]	[0.027]	[0.036]	[0.063]	[0.119]
entrate	0.233	-0.024	0.137	-0.036	-0.317
	[0.424]	[0.091]	[0.110]	[0.136]	[0.268]
hhi	-0.535	-0.041	0.112	0.151	0.050
	[0.442]	[0.076]	[0.078]	[0.115]	[0.159]
mes	-0.007	0.002	0.021*	0.001	0.004
	[0.073]	[0.015]	[0.012]	[0.025]	[0.047]
sectgr	0.038	0.045	0.044	-0.178*	0.117
	[0.207]	[0.055]	[0.073]	[0.107]	[0.157]
provgr	-0.006	0.098	0.086	0.112	0.121
	[0.508]	[0.097]	[0.116]	[0.123]	[0.286]
Cons.	1.588*	0.075	0.335**	0.238	0.355
	[0.885]	[0.187]	[0.151]	[0.306]	[0.446]

Bootstrapped standard errors in brackets: *** p<0.01, ** p<0.05, * p<0.1.

Table D.2: Growth regressions based on selection correction for aggregated patterns with 100 bootstrap replications

	Cont. Grower	Asymp. Grower	Cont. Decliner	Asymp. Decliner	Random Walk
size	0.035*	0.008	-0.035**	-0.025**	0.012
	[0.018]	[0.010]	[0.015]	[0.012]	[0.033]
rlp	0.005	0.005	0.002	0.007	0.010
	[0.007]	[0.005]	[0.006]	[0.007]	[0.012]
kl	-0.002	0.003	0.004	0.003	-0.005
	[0.007]	[0.003]	[0.004]	[0.004]	[0.008]
subinp	0.022	0.051	0.033	0.045	-0.090
	[0.044]	[0.035]	[0.040]	[0.041]	[0.136]
suboutp	-0.005	0.028	0.006	-0.004	0.029
	[0.025]	[0.018]	[0.021]	[0.021]	[0.040]
adverint	-0.216	-0.149	0.147	-0.391	-0.674
	[0.385]	[0.271]	[0.278]	[0.672]	[1.187]
interest	0.173	0.105	0.121	-0.224	0.303
	[0.133]	[0.106]	[0.121]	[0.136]	[0.261]
pub	-0.045	-0.050***	0.018	0.011	0.028
	[0.032]	[0.016]	[0.024]	[0.022]	[0.059]
fdi	-0.056*	-0.023	-0.005	0.014	-0.076
	[0.029]	[0.016]	[0.023]	[0.039]	[0.118]
entrate	0.025	0.104	-0.038	0.055	-0.267
	[0.120]	[0.076]	[0.084]	[0.085]	[0.217]
hhi	-0.050	-0.030	-0.040	0.122**	-0.111
	[0.077]	[0.041]	[0.054]	[0.055]	[0.152]
mes	0.008	0.015*	0.001	0.009	-0.051
	[0.016]	[0.009]	[0.012]	[0.012]	[0.042]
sectgr	0.068	0.034	0.079	0.011	0.029
	[0.079]	[0.045]	[0.061]	[0.089]	[0.127]
provgr	0.096	0.156**	0.046	0.234***	-0.064
	[0.125]	[0.065]	[0.083]	[0.088]	[0.256]
Cons.	-0.122	-0.075	0.295*	0.154	0.177
	[0.202]	[0.090]	[0.179]	[0.120]	[0.339]

Bootstrapped standard errors in brackets: *** p<0.01, ** p<0.05, * p<0.1.

Table D.3: Growth Regressions based on selection correction for patterns (first 5-year growth)

	Lin. Grower	Quad. Grower	One-s. Grower	Log. Grower
size	0.008	0.021	0.003	0.025
	[0.051]	[0.035]	[0.028]	[0.022]
rlp	-0.006	0.015	-0.007	0.034***
	[0.017]	[0.013]	[0.011]	[0.009]
kl	-0.001	0.004	0.008	0.018***
	[0.011]	[0.008]	[0.005]	[0.005]
subinp	0.079	0.067	0.001	0.068
	[0.106]	[0.078]	[0.059]	[0.046]
suboutp	0.025	-0.027	0.010	0.040
	[0.052]	[0.036]	[0.031]	[0.025]
adverint	-2.849**	-0.476	0.242	0.733
	[1.364]	[0.753]	[0.634]	[0.459]
interest	0.699**	-0.103	-0.25	-0.053
	[0.340]	[0.251]	[0.171]	[0.151]
pub	0.001	0.076	-0.027	-0.044
	[0.001]	[0.077]	[0.054]	[0.031]
fdi	-0.120	-0.033	0.046	-0.018
	[0.073]	[0.060]	[0.048]	[0.031]
entrate	-0.326	-0.194	0.356***	0.023
	[0.229]	[0.178]	[0.130]	[0.103]
hhi	0.069	-0.222**	0.053	0.038
	[0.131]	[0.103]	[0.071]	[0.061]
mes	0.004	-0.023	0.009	0.028**
	[0.040]	[0.026]	[0.018]	[0.014]
sectgr	0.252	0.183	0.158**	0.265***
	[0.154]	[0.118]	[0.079]	[0.070]
provgr	0.021	0.488***	0.178*	0.156*
	[0.196]	[0.150]	[0.107]	[0.094]
Cons.	-0.803*	-0.04	0.476**	-0.256
	[0.478]	[0.477]	[0.213]	[0.188]
R^2	0.205	0.245	0.106	0.134
Sum of Weight	1954	5398	6989	11610
Firms	216	648	665	1144

Table D.3: Growth regressions based on selection correction for patterns (first 5-year growth) (cont'd)

	Lin. Decliner	Quad. Decliner	One-s. Decliner	Log. Decliner	Random Walk
size	-0.016	0.012	-0.009	-0.042*	-0.092
	[0.072]	[0.022]	[0.017]	[0.024]	[0.072]
rlp	0.010	0.014	0.006	-0.01	0.002
	[0.037]	[0.009]	[0.007]	[0.011]	[0.032]
kl	-0.016	-0.001	-0.001	0.001	0.013
	[0.013]	[0.005]	[0.004]	[0.006]	[0.014]
subinp	-0.156	0.020	0.087**	-0.063	0.247
	[0.232]	[0.054]	[0.039]	[0.065]	[0.208]
suboutp	-0.08	-0.023	-0.026	-0.052	-0.012
	[0.078]	[0.027]	[0.020]	[0.037]	[0.087]
adverint	-1.395	0.003	-0.040	2.153	-0.563
	[1.820]	[0.571]	[0.458]	[1.363]	[1.846]
interest	0.543	-0.116	-0.083	0.035	-0.034
	[0.586]	[0.162]	[0.127]	[0.187]	[0.444]
pub	0.159**	0.022	-0.012	0.028	-0.008
	[0.067]	[0.028]	[0.026]	[0.049]	[0.109]
fdi	0.001	-0.004	0.038	-0.002	0.137
	[0.001]	[0.035]	[0.044]	[0.041]	[0.148]
entrate	-0.078	-0.329***	0.050	0.083	-0.490
	[0.420]	[0.111]	[0.079]	[0.124]	[0.373]
hhi	-0.339	-0.055	0.021	-0.09	-0.01
	[0.284]	[0.069]	[0.055]	[0.080]	[0.242]
mes	-0.102	-0.022	0.013	-0.014	0.032
	[0.066]	[0.016]	[0.012]	[0.021]	[0.063]
sectgr	0.434**	0.462***	0.07	0.215**	0.377*
	[0.216]	[0.072]	[0.061]	[0.089]	[0.208]
provgr	0.447	0.054	0.244***	-0.071	0.464
	[0.476]	[0.090]	[0.079]	[0.110]	[0.331]
Cons.	1.432**	0.006	0.169	-0.363	0.685
	[0.691]	[0.211]	[0.175]	[0.273]	[0.682]
R^2	0.516	0.101	0.069	0.184	0.078
Sum of Weight	410	12378	8208	2543	2656
Firms	71	1041	701	339	334

Standard errors in brackets: *** p<0.01, ** p<0.05, * p<0.1.

Table D.4: Correction terms for pattern selection bias
(first 5-year growth)

	Lin. Grower	**Quad. Grower**	**One-s. Grower**	**Log. Grower**
Failure	-0.515	-0.387	0.268	-0.166
	[0.349]	[0.287]	[0.165]	[0.116]
No change	-0.035	-0.233	0.076	-0.410
	[0.508]	[0.303]	[0.184]	[0.258]
Lin. Grower	0.015	-0.286	0.324	-0.323*
	[0.035]	[0.332]	[0.248]	[0.181]
Quad. Grower	-0.486	-0.067	0.110	0.298
	[0.524]	[0.048]	[0.289]	[0.216]
One-s. Grower	-0.352	0.177	-0.031	0.337*
	[0.380]	[0.261]	[0.029]	[0.197]
Log. Grower	-0.401	-0.151	0.180	0.032
	[0.358]	[0.286]	[0.182]	[0.023]
Lin. Decliner	-2.305**	0.543	0.947**	0.450
	[1.025]	[0.645]	[0.442]	[0.289]
Quad. Decliner	-0.903**	-0.630**	0.198	-0.245
	[0.439]	[0.305]	[0.238]	[0.187]
One-s. Decliner	-0.146	0.382	0.171	0.209
	[0.369]	[0.254]	[0.172]	[0.136]
Log. Decliner	0.273	-0.371	0.382	-0.170
	[0.553]	[0.363]	[0.286]	[0.173]
Random Walk	0.421	0.356	-0.035	-0.224
	[0.471]	[0.363]	[0.267]	[0.201]

	Lin. Decliner	**Quad. Decliner**	**One-s. Decliner**	**Log. Decliner**	**Random Walk**
Failure	0.508	-0.116	0.235*	-0.155	0.374
	[0.440]	[0.139]	[0.121]	[0.220]	[0.453]
No change	-0.809	0.064	0.398***	0.340	0.340
	[0.602]	[0.165]	[0.144]	[0.253]	[0.738]
Lin. Grower	-0.486	0.173	0.169	0.405*	-0.04
	[1.247]	[0.184]	[0.183]	[0.238]	[0.580]
Quad. Grower	-1.240	-0.104	0.056	0.255	-0.300
	[0.957]	[0.222]	[0.228]	[0.289]	[0.720]
One-s. Grower	0.249	-0.206	-0.183	-0.243	0.503
	[0.500]	[0.161]	[0.138]	[0.212]	[0.581]
Log. Grower	0.057	-0.089	0.260**	-0.552**	0.294
	[0.524]	[0.166]	[0.126]	[0.217]	[0.474]
Lin. Decliner	-0.110***	-0.064	0.111	-0.565	-0.36
	[0.042]	[0.239]	[0.226]	[0.487]	[0.871]
Quad. Decliner	1.425**	-0.001	-0.027	0.197	-0.300
	[0.680]	[0.029]	[0.149]	[0.226]	[0.572]
One-s. Decliner	-0.156	0.192	0.030*	-0.595***	0.561
	[0.655]	[0.127]	[0.018]	[0.230]	[0.429]
Log. Decliner	1.367*	-0.021	0.112	0.048*	-0.293
	[0.728]	[0.188]	[0.156]	[0.026]	[0.582]
Random Walk	0.652	0.091	0.049	-0.080	-0.015
	[0.764]	[0.180]	[0.174]	[0.290]	[0.069]

Standard errors in brackets: *** p<0.01, ** p<0.05, * p<0.1.

Table D.5: Growth regressions based on selection sorrection for aggregated patterns (first 5-year growth)

	Cont. Grower	Asymp. Grower	Cont. Decliner	Asymp. Decliner	Random Walk
size	0.032*	0.023**	-0.032**	-0.021*	-0.053
	[0.017]	[0.011]	[0.016]	[0.011]	[0.051]
rlp	0.013*	0.025***	0.007	0.015***	-0.006
	[0.007]	[0.005]	[0.007]	[0.005]	[0.022]
kl	0.001	0.011***	0.003	0.007**	0.013
	[0.005]	[0.003]	[0.004]	[0.003]	[0.013]
subinp	0.091**	0.141***	0.063	0.088***	0.260
	[0.045]	[0.030]	[0.048]	[0.031]	[0.169]
suboutp	-0.020	0.049***	-0.014	-0.021	-0.040
	[0.022]	[0.015]	[0.023]	[0.017]	[0.063]
adverint	-0.718*	0.344	-0.187	0.550	-1.777
	[0.398]	[0.310]	[0.457]	[0.479]	[1.482]
interest	-0.137	0.021	-0.021	-0.126	-0.353
	[0.134]	[0.093]	[0.129]	[0.092]	[0.358]
pub	-0.025	0.002	0.005	-0.017	-0.015
	[0.032]	[0.020]	[0.022]	[0.018]	[0.081]
fdi	-0.016	-0.040**	0.002	-0.013	0.175
	[0.025]	[0.017]	[0.026]	[0.023]	[0.125]
entrate	-0.088	0.144**	-0.247**	-0.062	0.142
	[0.100]	[0.072]	[0.098]	[0.064]	[0.338]
hhi	-0.033	0.057	-0.005	0.028	0.040
	[0.062]	[0.045]	[0.064]	[0.049]	[0.225]
mes	-0.019	0.024**	-0.008	0.011	0.004
	[0.016]	[0.010]	[0.015]	[0.010]	[0.057]
sectgr	0.373***	0.320***	0.460***	0.066	0.603***
	[0.073]	[0.052]	[0.069]	[0.051]	[0.205]
provgr	0.039	0.117*	0.091	0.262***	0.304
	[0.100]	[0.064]	[0.087]	[0.066]	[0.315]
Constant	-0.064	-0.522***	0.424**	-0.047	1.010**
	[0.193]	[0.113]	[0.194]	[0.083]	[0.509]
R^2	0.141	0.134	0.119	0.059	0.154
Sum of W.	11373	26357	12307	18653	2406
Firms	1236	2375	1231	1323	321

Standard errors in brackets: *** p<0.01, ** p<0.05, * p<0.1.

Table D.6: Correction terms for aggregated pattern selection bias (first 5-year growth)

	Cont. Grower	**Asymp. Grower**	**Cont. Decliner**	**Asymp. Decliner**	**Random Walk**
Failure	-0.223*	-0.395***	0.170	0.024	0.635*
	[0.130]	[0.070]	[0.112]	[0.082]	[0.355]
No change	0.063	-0.604***	0.232*	0.125	0.329
	[0.165]	[0.102]	[0.126]	[0.096]	[0.547]
Cont. Grower	-0.024	-0.290***	0.008	0.257***	0.552
	[0.023]	[0.095]	[0.123]	[0.094]	[0.430]
Asymp. Grower	-0.193	-0.011	0.028	0.083	-0.037
	[0.161]	[0.022]	[0.153]	[0.101]	[0.430]
Cont. Decliner	-0.169	-0.203	-0.018	-0.317**	0.198
	[0.199]	[0.134]	[0.030]	[0.140]	[0.596]
Asymp. Decliner	0.165	-0.020	0.229**	0.030**	0.592**
	[0.101]	[0.057]	[0.095]	[0.014]	[0.285]
Random Walk	0.128	0.095	0.047	-0.098	-0.019
	[0.174]	[0.107]	[0.138]	[0.126]	[0.052]

Standard errors in brackets: *** p<0.01, ** p<0.05, * p<0.1.

Table D.7: Growth regressions based on selection correction for patterns with 100 bootstrap replications (first 5-year growth)

	Lin. Grower	Quad. Grower	One-s. Grower	Log. Grower
size	0.008	0.021	0.003	0.025
	[0.064]	[0.056]	[0.041]	[0.038]
rlp	-0.006	0.015	-0.007	0.034**
	[0.025]	[0.025]	[0.018]	[0.013]
kl	-0.001	0.004	0.008	0.018**
	[0.015]	[0.015]	[0.009]	[0.008]
subinp	0.079	0.067	0.001	0.068
	[0.142]	[0.133]	[0.068]	[0.064]
suboutp	0.025	-0.027	0.010	0.040
	[0.070]	[0.064]	[0.039]	[0.040]
adverint	-2.849	-0.476	0.242	0.733
	[2.473]	[1.188]	[0.950]	[0.688]
interest	0.699	-0.103	-0.25	-0.053
	[0.493]	[0.367]	[0.237]	[0.276]
pub	0.001	0.076	-0.027	-0.044
	[0.088]	[0.095]	[0.063]	[0.050]
fdi	-0.120	-0.033	0.046	-0.018
	[0.111]	[0.100]	[0.080]	[0.054]
entrate	-0.326	-0.194	0.356*	0.023
	[0.351]	[0.323]	[0.186]	[0.194]
hhi	0.069	-0.222	0.053	0.038
	[0.237]	[0.193]	[0.116]	[0.099]
mes	0.004	-0.023	0.009	0.028
	[0.052]	[0.051]	[0.033]	[0.024]
sectgr	0.252	0.183	0.158	0.265**
	[0.216]	[0.243]	[0.131]	[0.117]
provgr	0.021	0.488*	0.178	0.156
	[0.254]	[0.270]	[0.145]	[0.123]
Cons.	-0.803	-0.040	0.476	-0.256
	[0.550]	[0.686]	[0.328]	[0.331]

Table D.7: Growth regressions based on selection correction for patterns with 100 bootstrap replications (first 5-year growth) (cont'd)

	Lin. Decliner	Quad. Decliner	One-s. Decliner	Log. Decliner	Random Walk
size	-0.016	0.012	-0.009	-0.042	-0.092
	[0.083]	[0.031]	[0.023]	[0.037]	[0.115]
rlp	0.010	0.014	0.006	-0.010	0.002
	[0.044]	[0.016]	[0.010]	[0.017]	[0.051]
kl	-0.016	-0.001	-0.001	0.001	0.013
	[0.020]	[0.009]	[0.006]	[0.009]	[0.025]
subinp	-0.156	0.020	0.087	-0.063	0.247
	[0.306]	[0.084]	[0.055]	[0.118]	[0.314]
suboutp	-0.080	-0.023	-0.026	-0.052	-0.012
	[0.110]	[0.043]	[0.034]	[0.068]	[0.132]
adverint	-1.395	0.003	-0.040	2.153	-0.563
	[4.362]	[0.899]	[0.786]	[2.594]	[3.215]
interest	0.543	-0.116	-0.083	0.035	-0.034
	[0.832]	[0.252]	[0.222]	[0.395]	[0.922]
pub	0.159	0.022	-0.012	0.028	-0.008
	[0.206]	[0.061]	[0.042]	[0.067]	[0.212]
fdi	0.001	-0.004	0.038	-0.002	0.137
	[0.118]	[0.085]	[0.063]	[0.103]	[0.267]
entrate	-0.078	-0.329	0.05	0.083	-0.490
	[0.517]	[0.222]	[0.128]	[0.198]	[0.722]
hhi	-0.339	-0.055	0.021	-0.090	-0.010
	[0.469]	[0.134]	[0.109]	[0.137]	[0.413]
mes	-0.102*	-0.022	0.013	-0.014	0.032
	[0.058]	[0.027]	[0.020]	[0.032]	[0.108]
sectgr	0.434	0.462***	0.07	0.215	0.377
	[0.282]	[0.110]	[0.101]	[0.164]	[0.394]
provgr	0.447	0.054	0.244*	-0.071	0.464
	[0.571]	[0.180]	[0.143]	[0.162]	[0.586]
Cons.	1.432	0.006	0.169	-0.363	0.685
	[1.041]	[0.301]	[0.303]	[0.524]	[1.028]

Bootstrapped standard errors in brackets: *** p<0.01, ** p<0.05, * p<0.1.

Table D.8: Growth regressions based on selection correction for aggregated patterns with 100 bootstrap replications (first 5-year growth)

	Cont. Grower	Asymp. Grower	Cont. Decliner	Asymp. Decliner	Random Walk
size	0.032	0.023	-0.032*	-0.021	-0.053
	[0.024]	[0.016]	[0.018]	[0.018]	[0.065]
rlp	0.013	0.025***	0.007	0.015*	-0.006
	[0.012]	[0.007]	[0.009]	[0.008]	[0.035]
kl	0.001	0.011**	0.003	0.007*	0.013
	[0.008]	[0.004]	[0.006]	[0.004]	[0.019]
subinp	0.091	0.141***	0.063	0.088	0.260
	[0.068]	[0.043]	[0.061]	[0.055]	[0.271]
suboutp	-0.020	0.049**	-0.014	-0.021	-0.040
	[0.035]	[0.023]	[0.032]	[0.024]	[0.089]
adverint	-0.718	0.344	-0.187	0.55	-1.777
	[0.738]	[0.399]	[0.478]	[0.734]	[1.759]
interest	-0.137	0.021	-0.021	-0.126	-0.353
	[0.213]	[0.142]	[0.174]	[0.138]	[0.601]
pub	-0.025	0.002	0.005	-0.017	-0.015
	[0.050]	[0.031]	[0.029]	[0.028]	[0.105]
fdi	-0.016	-0.040	0.002	-0.013	0.175
	[0.037]	[0.031]	[0.042]	[0.036]	[0.205]
entrate	-0.088	0.144	-0.247**	-0.062	0.142
	[0.162]	[0.106]	[0.118]	[0.088]	[0.525]
hhi	-0.033	0.057	-0.005	0.028	0.040
	[0.096]	[0.065]	[0.087]	[0.067]	[0.338]
mes	-0.019	0.024*	-0.008	0.011	0.004
	[0.025]	[0.014]	[0.018]	[0.016]	[0.084]
sectgr	0.373***	0.320***	0.460***	0.066	0.603**
	[0.098]	[0.057]	[0.097]	[0.099]	[0.307]
provgr	0.039	0.117	0.091	0.262**	0.304
	[0.149]	[0.087]	[0.135]	[0.106]	[0.477]
Cons.	-0.064	-0.522***	0.424**	-0.047	1.010
	[0.291]	[0.167]	[0.196]	[0.131]	[0.735]

Bootstrapped standard errors in brackets: *** p<0.01, ** p<0.05, * p<0.1.

APPENDIX E

TURKISH SUMMARY

Bölüm 1: Giriş

İktisadi büyüme ve istihdam yaratma potansiyeli ile doğrudan ilişkili olan firma büyümesi konusu, iktisat biliminde daima gündemde olan bir araştırma alanı olmuştur. Firma düzeyindeki panel veri setlerine erişimin daha kolay hale gelmesiyle birlikte son yirmi yılda bu alandaki ampirik çalışmaların sayısında da hızlı bir artış gerçekleşmiştir. Bu bağlamda yapılan ekonometrik çalışmaların odak noktasını Gibrat yasası oluşturmaktadır (Santarelli vd., 2006). Gibrat yasası, firma büyüklüğü ile firma büyümesinin birbirinden bağımsız olduğunu ileri sürmektedir (Gibrat, 1931). Yine bu bağlamdaki ekonometrik çalışmaların çoğunda firma büyüme oranı denklemleri tahmin edilmekte ve dolayısıyla firma büyüme oranlarının belirleyicileri saptanmaya çalışılmaktadır (Coad, 2009).

Firma büyümesi yazınında yaygın olarak kullanılan regresyon modelleri gibi ampirik araçlar, firma düzeyindeki büyüme oranlarının aynı dağılıma sahip olduklarını varsaymakta ve/veya tüm firmaların ortak büyüme amaçlarına sahip olduğunu kabul etmektedir. Dolayısıyla yazında firma büyümesini incelemek için kullanılan hakim ampirik yaklaşım, firmaların heterojen oldukları gerçeğini görmezden gelmektedir. Kuşkusuz bu varsayım doğru değildir. Çünkü girişimcilerin aynı amaçlara sahip olmadığı ve farklı fırsat ve kısıtlarla karşılaştıkları gerçeğini gözardı etmektedir. Dolayısıyla konunun firmaların heterojen bir grup olduğu hesaba katılarak incelenmesi gerekmektedir.

Firma büyüme örüntüleri (patterns) kritik bir öneme sahiptir. Firma büyüme örüntüleriyle ilgili yazında az sayıda çalışma olmasına karşın, bu çalışmalar yalnızca büyüyen firmalara odaklanmıştır. Ayrıca, bu çalışmaların çoğunda firmalar sadece büyüme oranlarına bakılarak gruplandırılmaktadır (örneğin Delmar vd., 2003 ve Garnsey vd., 2006).

Firma büyüme örüntülerini ele alan bu çalışmada bir firmanın, doğası gereği, büyüyebileceği, küçülebileceği ya da büyüklüğünün sabit kalabileceği noktasından hareketle, sadece büyüyen firmalar için değil, tüm firmalar için büyüme örüntüleri tespit edilmektedir. Zaman içindeki farklı büyüme dinamiklerini belirlemek amacıyla tanımlanan örüntüler için büyüme oranları da dikkate alınmaktadır. Ancak, buradaki amaç sadece benzer büyüme oranına sahip firmaları gruplamak değil, tüm firmaları ele alarak farklı büyüme örüntülerini ortaya çıkarmaktır.

Dolayısıyla heterojenlik sorunu konusunda daha bilgilendirici ve daha verimli bir yöntem önerilmekte ve büyüme oranından ziyade büyüme örüntülerine odaklanılmaktadır. Bazı firmalar farklı piyasalara girerek sürekli büyüyebilir, bazıları teknoloji ve piyasa koşullarınca belirlenen belli bir büyüklük düzeyine yakınsayabilir, bazıları ise girişimci tercihlerinden dolayı kuruluş büyüklüğünde kalabilir. Firma büyüme örüntülerinin ve bunların belirleyenlerinin tespit edilmesi aynı zamanda önemli politika çıkarımlarına yol açar. Çünkü eğer firmalar farklı büyüme örüntülerine sahiplerse, politika tercihleri de bu farkları dikkate almalı ve farklı firma türlerine farklı politikalar uygulanmalıdır.

Türkiye imalat sanayiini 1980-2001 döneminde ele alan bu tezin temel amaçları; firmaların istihdam yaratma kapasitesi ve büyümesi arasındaki ilişkiyi incelemek, firma ve sektöre özgü etkilerin firma büyümesine etkisini geleneksel yöntemlerle analiz etmek, firma büyüme örüntülerini istatistiksel yöntemler kullanarak belirlemek ve bu örüntüleri belirleyen faktörleri saptamak ve nihayet bu süreçteki örüntü ayrımını dikkate alarak firma büyümesini belirleyen unsurları örüntü bazında analiz etmektir.

Bildiğimiz kadarıyla firmaların büyüme süreci, tüm büyüme örüntüleri dikkate alınarak daha önce incelenmemiş ve yine bu bağlamda firma büyümesi farklı örüntülerden kaynaklanan seçim yanlılığı düzeltmesi yapılarak analiz edilmemiştir. Firmaların ve büyüme süreçlerinin heterojen yapısını dikkate alan bu tezin ilk katkısı, sadece büyüyen firmalar için değil, hem tüm firmalar için hem de firmaların tüm yıllarını göz önüne alarak tüm potansiyel büyüme örüntülerini saptamaktır. Bu saptama için bazı istatistiksel araçlar ilk kez kullanılmakta ve özgün bir yöntem önerilmektedir. Tezin ikinci katkısı, saptanan bu büyüme örüntülerini belirleyen faktörleri incelemektir. Tezin bir diğer önemli katkısı ise örüntü seçimi yanlılığına dayanan firma büyüme sürecini analiz etmek ve büyüme unsurlarının etkisinin farklı örüntülere göre farklılaşıp farklılaşmadığını incelemektir.

Yedi bölümden oluşan bu tezin giriş bölümünden sonraki 2. Bölüm'ünde kuramsal ve ampirik yazına değinilmektedir. 3. Bölüm'de Türkiye imalat sanayiindeki firmaların büyüme ve istihdam yaratma ilişkileri ele alınmaktadır. 4. Bölüm'de Türkiye imalat sanayiinde firma, sektör ve bölge özelliklerinin firma büyümesi üstündeki etkileri geleneksel yöntemlerle incelenmekte, ayrıca firma yaşının faktör etkilerinde bir etkisi olup olmadığı ele alınmaktadır. Firmaların ve büyüme yapılarının heterojenliği hesaba katılarak özgün bir yöntemle ampirik büyüme örüntüleri tespit edilmekte ve bunları belirleyen etmenler 5. Bölüm'de araştırılmaktadır. 6. Bölüm'de büyüme örüntülerinden kaynaklanan seçim yanlılığını hesaba katan ve firma büyüme sürecini daha doğru bir şekilde ele alan iki aşamalı yöntemle, firma, sektör ve bölge düzeyindeki unsurların firma büyümesini örüntülere göre nasıl etkilediği ve seçin yanlılığının hangi örüntülerden kaynaklandığı incelenmektedir. Son bölümde ise genel bir özet, sonuç düşünceleri ve sonraki çalışmalar için öneriler sunulmaktadır.

Bölüm 2: Firma Büyümesi: Bir Yazın Taraması

Ampirik yazında oldukça fazla sayıda çalışma olmasına karşın firma büyüme sürecinin tüm boyutlarını tatminkâr düzeyde ela alan bir kuram yoktur. Firma büyüme kuramları belli boyutlara odaklanmakta ve buradan hareketle firma büyümesini belirleyen bazı etmenlerin önemini vurgulamaktadır. Bu bölümde firma büyüme kuramlarına değinilmekte ve bu kuramların temel varsayımları doğrultusunda ortaya koydukları büyüme mekanizmaları özetlenmektedir. Daha sonra ise firma büyümesini ampirik olarak ele alan yazına değinilmektedir.

Temsili bir firmanın kâr maksimizasyonunu sağlayan üretim düzeyini temel alacağını ve ölçek ekonomilerinden faydalanarak maliyetlerini optimum ölçeğe kadar düşürebileceğini varsayan neoklasik kuram, bir firmanın ilgili sanayideki minimum etkin ölçekten daha fazla üretim yapmasının dolayısıyla bu noktadan sonra büyümesinin rasyonel olmayacağını ifade eder. Bu yaklaşımın temel kısıtı, firma büyümesinin daima optimum bir ölçekle sınırlanacağını varsayması ve firma büyümesi ve piyasa yapısı etkileşimini hesaba katmamasıdır.

Olasılıksal firma büyümesi yaklaşımı, Gibrat'ın (1931) ortaya koyduğu ve kendisinden sonraki ampirik yazını tartışılmaz biçimde etkilediği 'bir firmanın büyüme oranı büyüklüğünden bağımsızdır' hipotezi (Gibrat yasası) ile şekillenmiştir. Bu yaklaşıma göre küçük ve büyük firmalar herhangi bir zamanda belli büyüme oranlarını başarma olasılığa aynıdır. Buradan hareketle olasılıksal firma büyümesi yaklaşımı, bazı firmaların şanslı oldukları için büyüdüklerini, bazı firmaların ise şanssız oldukları için küçüldüklerini ya da sabit bir büyüklükte kaldıklarını ima eder. Bu yaklaşımda, firma büyümesini etkileyen çok fazla faktörün olduğu ve her bir faktörün büyüme sürecini açıklama gücünün oldukça düşük olduğu varsayılmaktadır. Ancak kuramsal bir çerçevesinin olmayışı ve ampirik yazının oldukça kuşkulu bulgular barındırıyor olması bu yaklaşıma getirilen temel eleştirilerdendir.

Yaşam döngüsü modellerine (büyüme aşamaları modelleri) göre bir firmanın büyüme süreci doğumundan erişkinliğe (ya da ölümüne) kadar ele alınan bir evrim sürecidir. Örneğin Greiner (1972) modelinde her biri evrim ve devrim bölümlerini içeren beş aşama vardır ve firmalar bu aşamalar yoluyla büyümektedir.

Evrim bölümleri yaratıcılık, yönlendirme, görevlendirme, eşgüdüm ve işbirliğinden; devrim bölümleri ise liderlik, özerklik, kontrol ve bürokrasiden oluşmaktadır. Bu tip modeller firmaların yapısal dönüşümleri ve aşamalar arasındaki geçişleri açısından önemli bakış açıları sağlamaktadır. Ancak bu aşama geçişlerinin nasıl olacağı konusunda ayrıntılı bir mekanizma sunmamakta ve tüm firmalar için aynı evrimsel sürecin olduğunu varsaymaktadır.

Kaynağa dayalı yaklaşım bir firmayı kaynaklardan oluşan bir bütün olarak ele almakta ve firmanın bu kaynaklara göre faaliyette bulunduğunu varsaymaktadır. Bu görüş, firmanın kaynakları, yetenekleri, sınırları ve rekabet avantajlarıyla ilgilenmektedir. Bu yaklaşımın temeli, firma büyüme sürecini kapsamlı şekilde ilk kez ele alan Penrose'un (1959) çığır açıcı Firma Büyüme Teorisi kitabıyla atılmıştır. Penrose, Schumpeter'in büyüme kuramını temel alarak, büyümek için üretken fırsatların ve kısıtların değişiminin, zaman içinde oluşan kaynak birikim süreci bağlamında firma büyüme süreciyle açıklanması gerektiğini belirtmektedir. Penrose'a göre bir firma, üretim fonksiyonundan ziyade kaynakların heterojenliği ve farklı bileşimleri doğrultusunda kendine has yapılanmasından oluşmaktadır. Penrose, yaparak öğrenme yoluyla yöneticilerin daha üretken hale geldiklerini, zaman içinde karşılaşılan sorunlarla mücadele ederek sürekli tecrübe kazandıklarını ve büyüme fırsatları için değer yarattıklarını ifade etmektedir. Ve büyüme ekonomilerinin yönetsel kaynaklarla gerçekleşebileceğini belirtmektedir. Bu kaynakların, değerli, kıt, tam olarak taklit edilemeyen ve ikame edilemez olması gerektiğini vurgulamaktadır. Bu yaklaşıma yöneltilen temel eleştiriler arasında kaynakların büyüme sürecinde tek başına yeterli olamayacağı, firma ve piyasa etkileşiminin göz ardı edildiği, somut ve soyut kaynakların (varlıkların) hangisinin daha önemli olduğunun muğlak olduğu ve bu yaklaşımın küçük firmalardan ziyade büyük firmaların stratejik yönetim süreçlerine daha uygun olduğu hususları dikkati çekmektedir.

Evrimci yaklaşım Schumpeter'in yaratıcı yıkım süreci ve dinamik bir ekonomik çevredeki seçim mekanizmasına dayanmaktadır. Evrimci iktisatçılar, günümüz ekonomilerinin teknik değişme ve çalkantılı bir rekabetle şekillendiğini ve rekabet avantajlarını ana-akım iktisadın kavramlarıyla değil dinamik bir şekilde ele almanın sanayi iktisadı açısından daha uygun olduğunu belirtmektedirler (Nelson ve Winter, 1982). Sanayinin izlek bağımlılığı çerçevesinde seçimin evrimci mekanizması daha uygun olan (fitter) firmaların hayatta kalacağını ve büyüyeceğini ancak diğer firmaların küçüleceğini ve piyasadan çıkacağını iddia etmektedir. Bu anlamda yenilik yoluyla rekabet avantajını artıran firmaların daha karlı hale geleceklerini, dolayısıyla büyüyeceklerini ve piyasa paylarını artıracaklarını ifade etmektedir.

Ancak bu yaklaşımda uygun olanın büyüyeceği savından ziyade, (büyüyerek ya da büyümeyerek) uygun olanın hayatta kalacağı savı daha güçlüdür.

Evrimci modellere benzer şekilde öğrenme modelleri de firma büyümesi olgusunu üretkenlik ve hayatta kalma ilişkisi çerçevesinde ele almaktadır. Jovanovic'in (1982) pasif öğrenme modelinde küçük firmalar için gürültülü bir seçim süreci vardır. Bu modele göre her firma piyasaya girmeden önce kendi göreli üretkenlik düzeyi hakkında bilgi sahibi değildir, ancak piyasaya girdikten sonra bunu öğrenir. Firmanın hayatta kalma ve büyümesi göreli etkinliğine bağlıdır. Pasif öğrenme modeli etkin firmaların büyüyeceği ve hayatta kalacaklarını, etkin olmayanların ise küçüleceklerini ve piyasadan çıkacaklarını ifade etmektedir. Dolayısıyla küçük firmaların ya hızlı büyüyeceklerini ya da başarısız olma riskiyle karşılaşacaklarını öngörmektedir. Pasif öğrenme modelinde ise (Ericson ve Pakes, 1995), firmalar hem piyasa içinde hem de piyasa dışında maruz kalabilecekleri rekabete karşı etkinlik düzeylerini artırma amacıyla aynı zamanda hem çevrelerini tanırlar hem de yatırım yaparlar. Bu anlamda başarılı olan firmalar büyürken başarısız olanlar küçülür ya da piyasadan çıkarlar. Öğrenme modelleri hayatta kalma ve büyümenin belirleyicileri olarak firmaların heterojen yapısını, firma dinamiklerini ve etkinlik düzeylerini dikkate almaktadır.

Firma büyümesini ampirik olarak ele alan çalışmaların odak noktası temel olarak üç boyuta sahiptir. Birinci boyut, firma büyümesi ve istihdam yaratma ilişkisini ele alır. İkinci boyut, geleneksel yaklaşımla ele alınan firma büyüme regresyonları aracılığıyla firma büyümesini belirleyen etmenlerle ilgilidir. Üçüncü boyut ise firma büyüme örüntülerini belirleyen etmenleri araştıran çalışmalardır.

Küçük firmaların büyüme yoluyla istihdam yaratma kapasitelerinin önemi ampirik düzeyde ilk olarak Birch (1979) tarafından vurgulanmıştır. Birch (1981), ceylanlar (gazelles) olarak adlandırdığı hızlı büyüyen küçük firmaların istihdam yaratma kapasitelerinin büyük firmalara oranla daha önemli olduğunu vurgulamaktadır. Hatta istihdam yaratıcıların küçük firmalar olduğunu, istihdam kayıplarına yol açanların ise büyük firmalar olduğunu belirtmektedir. Ancak Birch'ün ampirik bulguları, firma büyüklüğü ile istihdam yaratma arasında bir ilişki olmadığı yönünde eleştirilere maruz kalmıştır. Bu eleştirilerin çıkış noktası firma yaşıdır ve bu eleştirilerde küçük ya da büyük olmasından bağımsız olarak, aslında genç firmaların önemli oranda istihdam yarattıkları vurgulanmaktadır. Daha sonraki çalışmalarda büyük ceylanların da istihdam yaratma konusunda ciddi katkıları olduğu ortaya konmuştur.

Türkiye imalat sanayiini 1980-2001 aralığında çeşitli alt dönemler itibariyle ele alarak firmaların istihdam yaratma kapasitelerini liberalizasyon, üretkenlik, rekabet, yabandı yatırım, emek talebi ve ücretler bağlamlarında ele alan bazı çalışmalar olmuştur (örneğin (Özler vd., 2004; Taymaz, 1998, 2001, 2006, 2007).

Oldukça fazla sayıda çalışılan (geleneksel) firma büyüme regresyonları firma büyümesi yazınına kuramsal yaklaşımlardan daha hâkim durumdadır. Davidsson vd. (2005)'e göre bunun temel nedeni, veri yönelimli yaklaşımların belli bağlamlarda kuramsal öngörüleri mutlaka destekleyebileceği gerçeğidir. Bazı firmalar diğer firmalardan neden daha fazla büyür? Son on yıllarda bu sorunun cevabını arayan zengin ampirik yazında pek çok disiplinin izlerini görmek mümkündür. Dolayısıyla araştırılan etkiler de disiplinlere göre değişmektedir. Kabaca söylemek gerekirse, iktisatta büyüklük ve yaş etkisi, firma stratejisinde iş stratejileri ve çevre etkisi, girişimcilik araştırmalarında girişimci davranışları etkisi araştırılmaktadır. Ancak bu özelliklerin firma büyümesini nasıl etkilediği konusunda yazında net bir uzlaşma yoktur. Storey ve Greene (2010), firma büyümesini belirleyen faktörleri üç başlık altında toplamaktadır: kuruluş öncesi girişimci özellikleri (yaşı cinsiyet, etnik yapı, eğitim, sektörel deneyim, yönetsel deneyim, aile, iş ortakları, işsizlik ve kişilik), kuruluş özellikleri (kuruluş büyüklüğü, firmanın hukuki yapısı, sektör ve bölgesel konum) ve kuruluş sonrası özellikler (kurumsal iş planı, çalışanlara verilen eğitim, girişimci yetenekleri, strateji, dış çevre, finans kaynağı ve yenilik).

Girişimci özellikleri bağlamında deneyim ve büyüme arzusu en çok çalışılan etmenlerdendir. Sektörel özellikler, piyasanın rekabet yapısı, dinamizm, büyüme fırsatları ve mekânsal boyutlar, çevresel özellikler bağlamında yaygınlıkla çalışılan faktörlerdir.

Firma özellikleri bağlamında çalışılan etmenlerin başında, Gibrat yasasının yazında yaygın şekilde ele alınmasının bir sonucu olarak firma büyüklüğü gelmektedir. Bu yasa özetle, küçük ve büyük firmaların herhangi bir zamanda herhangi bir büyüme oranını aynı olasılıkla gerçekleştirebileceklerini ve dolayısıyla büyüklük ve büyüme arasında bir ilişkinin olmadığını iddia etmektedir. Gibrat yasasını ele alan ilk çalışmalarda ya pozitif bir büyüklük etkisi bulunmuş ya da büyüklük ve büyüme arasında bir ilişki bulunamamıştır. Ancak 1980'li yıllardan itibaren büyüklük ve büyüme arasında negatif bir ilişki olduğu ve dolayısıyla küçük firmaların büyük firmalara göre daha hızlı büyüdükleri bulguları yaygınlık kazanmıştır. Dolayısıyla ampirik yazında bu yasayı ele alan çalışmaların sonuçlarına bakıldığında genel geçer bir sonuç olduğundan söz edilemez.

Firma özellikleri bağlamında yaygın olarak çalışılan bir diğer etmen firma yaşıdır. Bu çalışmalardaki hâkim bulgu, genç firmaların daha hızlı büyüdükleri yönündedir.

Bu bağlamda firma yaşının gözardı edilemeyecek etkilere sahip olduğu vurgulanmaktadır. Firma performansı ve büyümesi ilişkisi genelde üretkenlik ve karlılığın firma büyümesine etkisi bağlamında tartışılmıştır. Bazı çalışmalar firma performansının büyümesini artırdığı sonucuna ulaşırken, bazılarında bu etki anlamlı bulunamamıştır.

Firma büyümesi evrimci iktisat ekolünce sanayinin ya da piyasanın evrimi bağlamında ele alınmakta ve belirsizlik, üretkenlik, öğrenme ve seçim/hayatta kalma süreçlerinin firma büyümesi üstündeki rollerine değinilmektedir. Bu anlamda izlek bağımlılığının firma büyümesini açıklamadaki önemi de vurgulanmaktadır.

Türkiye'de TÜİK'in işyeri düzeyindeki verisiyle geleneksel firma büyüme regresyonu yapan ilk çalışma Taymaz (1997)'dir. Bu çalışmada, firma büyüklüğü, teknik personel oranı, göreli üretkenlik, göreli ücret oranı, kar marjı, reklam harcamaları, AR-GE yoğunluğu gibi etmenlerin firma büyüklüğüne etkileri araştırılmaktadır. Özler ve Taymaz (2004) ve Taymaz ve Yılmaz (2014) çalışmaları ise yine TÜİK'in 1980-2001 işyeri düzeyindeki verisetiyle yabancı sermayenin firma büyümesindeki rolü üstüne odaklanmıştır.

Firma büyüme örüntülerini tespit etmeye yönelik ampirik çalışmaların hemen hemen hepsi sadece büyüyen firmalar üstüne odaklanmakta ve örüntü tespiti için firma büyüme oranını kullanmaktadırlar. Bu çalışmaların temel yöntemi, benzer büyüme oranlarına sahip firmaları gruplamaktır (örneğin McMahon, 2001; Delmar vd., 2003 ve Garnsey vd., 2006). Bu çalışmaların temel vurgusu, firma büyüme sürecini ele alırken varolan heterojen firma yapılarının göz ardı edilmemesi gerektiğidir. Ancak sözkonusu ampirik çalışmalar uygulanan yöntem, büyüme ölçütü, zaman aralığı gibi pek çok konuda farklılık gösterdiğinden ulaştıkları sonuçları karşılaştırma olanağı pek yoktur.

Firma büyüme örüntüleri ya da büyüme gruplarını belirleyen etmenlerin tartışıldığı ampirik yazın genellikle hızlı büyüyen firmalara (ceylanlar) odaklanmaktadır. Bu çalışmaların kullandıkları ekonometrik yaklaşımlar kategorik bağımlı değişken içeren yöntemlere dayanmaktadır. Firma büyümesini etkilyen faktörlerin ele alınan gruplara göre nasıl bir belirlenim gösterdiği incelenmektedir. Birinci yaklaşımda iki değerli kategorik bağımlı değişken kullanılmakta ve logit ve probit modelleri tahmin edilmektedir. İkinci yaklaşımda sıralı değerler alan bağımlı değişken kullanılmakta ve sıralı logit ya da sıralı probit modelleri tahmin edilmektedir. Son yaklaşımda ise çok değerli kategorik alan bağımlı değişkenler kullanılarak çok terimli logit modelleri tahmin edilmektedir. Bu çalışmalar da firma büyümesinin çeşitli gruplara ya da örüntülere göre farklılaştığını belirttikleri için firma heterojenliğinin önemini vurgulamaktadır. Ancak hem veri yapıları hem de değişken tanımları oldukça farklılaştığı için bu çalışmaların sonuçlarının doğrudan karşılaştırma imkanı bulunmamaktadır.

Bölüm 3: Türkiye İmalat Sanayiinde İstihdam Katkıları ve Firma Büyümesi

Bu bölümde Türkiye imalat sanayiinde 1980-2001 dönemi için firma büyümesi ve istihdam yaratma ilişkisi incelenmiştir. Bunun için ilk olarak genç ve erişkin firmaların istihdam katkılarını görebilmek için toplam istihdamın firma yaşı aralıklarına göre karşılaştırması yapılmış ve ayrıca firmaların her giriş yılına göre istihdamları hayatta kalma etkileri de gözetilerek incelenmiştir. Daha sonra 10 ve daha üzeri yıl yaşayan firmaların istihdam dinamiklerine bakılmış, bu anlamda büyüklük grupları, hayatta kalma davranışları ve hızlı büyüyen firmaların istihdam katkıları incelenmiştir. Son olarak ise yine benzer karşılaştırmalar için firma büyüklük dağılımları oluşturulmuş ve istihdam-büyüklük dağılımı-firma büyümesi bağlantıları yıl, firma yaşı, sektör ve hayatta kalma özelliklerine göre ele alınmıştır.

Genç firmalar, piyasaya girdikleri yılı izleyen 5 yıl içinde imalat sanayi toplam istihdamının % 20'sine sahip olmaktadır. İkinci 5 yılları içinde bu payı % 38'e, ilk 15 yılları sonunda ise % 50'nin üstüne çıkarmaktadırlar. İstihdam katkıları artışında azalan bir eğilim olsa bile 15 yılları sonunda imalat sanayi istihdamının yarısından fazlasına sahip olmaları, ciddi oranda istihdam katkıları yaptıklarının açık bir göstergesidir.

Hayatta kalan firmaların istihdama katkıları ile piyasadan çıkan firmaların katkıları arasında ciddi bir farklılaşma vardır. Hayatta kalan firmaların istihdam katkıları yaşla birlikte artmakta ancak diğer firmaların katkıları yaşla birlikte azalmaktadır. Bu durum genelde tüm firmaların piyasaya küçük olarak girdiklerini ama hayatta kaldıkça hızla büyüdüklerini ve sektördeki ortalama büyüklüğe kısa sürede erişebildiklerini göstermektedir.

10 ve daha üzeri yıl yaşayan firmaların hepsi ilk 10 yıllarında büyümektedirler. 10 yıldan fazla yaşayanlar büyümelerini sürdürmekte, 10 yıldan sonra çıkan firmalar ise önce küçülmekte ve sonra piyasadan çıkmaktadırlar. 10 yıl ve daha fazla yaşayan firmaların istihdamları 10 yılda ortalama olarak % 60 oranında artmaktadır.

En hızlı büyüyen 200 firmanın istihdam katkıları incelendiğinde, bu firmaların 10 yıl boyunca ortalama olarak % 250 büyüdükleri ve 10 ve daha fazla yıl yaşayan firmaların toplam istihdam katkısının % 80'ini tek başına yarattıkları görülmektedir. Dolayısıyla hızlı büyüyen firmalar, aslında istihdam katkısının temel kaynakları olarak karşımıza çıkmaktadır. En hızlı büyüme gerçekleştiren 200 firmanın yarısı emek-yoğun sanayilerde faaliyet göstermektedir.

2000-2001 Krizi'nin olumsuz etkileri tüm imalat sanayiinde ciddi biçimde hissedilirken, en hızlı büyüyen 200 firma bile krizden nasibini almıştır. Öyle ki, bu firmalardan 49 tanesi 1991-2000 döneminde piyasadan çıkmış, bunlardan 17 tanesi sadece kriz yılında piyasadan çıkmıştır.

Son 5 yılda piyasaya giren firmaların istihdam katkıları/kayıpları firma büyüklüğüne göre ayrıştırıldığında, küçük ve orta büyüklükteki firmaların zaman içinde dalgalanma gösterse de daima istihdam artışına neden oldukları görülmektedir. Ancak büyük firmaların 1994 ve 2000-2001 Krizlerinin önceki sonraki yıllarında düzenli olarak istihdam kayıplarına neden olduğu tespit edilmiştir. Benzer bir karşılaştırma, piyasada varolan firmalar ve giriş-çıkış yapan firmalar ayrımında da yapılmış, istihdam kayıplarının büyük oranda varolan büyük firmaların küçülmesinden kaynaklandığı görülmüştür.

Bu bölümde firma büyümesi ve istihdam yaratma ilişkisi, ayrıca firma büyüklük dağılımları aracılığıyla yıllara, yaşa, sektöre, sahipliğe ve hayatta kalma durumuna göre incelenmektedir. Bu bağlamda karşılaştırılacak her bir farklı grup için kernel yoğunluk tahminleri oluşturulmuş ve firma büyüklük dağılımları elde edilmiştir.

Genel bir gözlem olarak, Cabral ve Mata (2003)'te vurgulanan sağa çarpık bir dağılım yapısı bu çalışmadaki sonuçlarda da görülmektedir. Ayrıca, yaş ve hayatta kalmanın firma büyüklüğü üstünde pozitif bir etkisi olduğu tespit edilmiş ve istihdam katkıları açısından bu iki boyutun son derece önemli olduğu görülmektedir. Firmaların istihdam katkıları yaşla birlikte tutarlı olarak artsa da, firmaların bu katkıları büyük oranda ilk 5 yıllarında gerçekleştirdikleri görülmektedir.

En hızlı büyüyen 200 firmanın büyüklük dağılımlarına sektörel düzeyde bakıldığında büyük firmaların uzmanlaşmış ve bilime dayalı sanayiler ile ölçek-yoğun sanayilerde daha fazla olduğu göze çarpmaktadır. Bunun temel nedeni ise

Bu firmaların ölçek ekonomilerinden yararlanmak için ve hatta çarpıcı bir büyüme gerçekleştirebilmek için kaçınılmaz olarak daha büyük olmaları gerektiği gerçeğidir.

Bölüm 4: Geleneksel Firma Büyüme Regresyonları

Bu bölümde firma büyümesi geleneksel büyüme oranı regresyonlarıyla analiz edilmekte ve firmaya özgü, sektörel ve bölgesel etmenlerin firma büyümesine etkileri araştırılmaktadır. Bu belirlenim sürecinin yaşlara göre farkedip etmediğini görebilmek için aynı regresyonlar her yaş için ayrıca yapılmakta ve firma yaşının bu süreçteki önemi ele alınmaktadır.

Ekonometrik olarak dört alternatif tahmin yöntemi kullanılmaktadır: havuzlanmış en küçük kareler, sabit etkiler, genel momentler yöntemi ve Heckman seçim modeli. Tüm modellerde firma büyüklüğünün firma büyümesine etkisi negatif çıkmıştır. Bu durum küçük firmaların büyük firmalara oranla dah ahızlı büyüdüklerini ima etmektedir. Bu bulgu, son yıllardaki ampirik çalışmaları desteklemektedir. Ayrıca, hayatta kalma seçimini kontrol eden Heckman modelinde büyüklük etkisinin negatif olmakla birlikte, büyüme üzerinde daha az bir etkiye sahip olduğu görülmektedir.

Benzer şekilde firma yaşının büyümeye etkisi de negatiftir ve dolayısıyla genç firmaların erişkin firmalara göre daha hızlı büyüdükleri görülmektedir. Öte yandan firma yaşının firma büyümesi ile doğrusal olmayan U-biçimli bir ilişki içinde ve hayatta kalma ile ise ters U-biçimli bir ilişki içinde olduğu tespit edilmiştir. Ancak veri setinde yer alan firmaların çoğunun firma yaşının büyümeyi azalttığı ve hayatta kalmayı artırdığı aralıkta piyasadan çıktıkları hesaba katıldığında, doğrusal olmayan bir yaş etkisi gözlemlense bile çoğu firma için yaş ile büyüme arasında negatif, yaş ile hayatta kalma arasında pozitif bir ilişkinin olduğu sonucuna ulaşılabilir.

Göreli üretkenliğin hem büyüme hem de hayatta kalma üstünde pozitif etkiye sahip olduğu görülmektedir. Dolayısıyla yüksek üretkenliğe sahip firmalar daha hızlı büyümektedir ve bu firmaların hayatta kalma şansları daha fazladır. Sermaye yoğunluğunun büyümeyi artırdığı ancak hayatta kalma olasılığını düşürdüğü görülmektedir. Bu durum, kuruluş sermaye maliyetinin sermaye yoğun firmalar için çok önemli olduğunu v bu firmaların sermayeyi işgücü ile ikame etme esnekliğine sahip olmadıklarını göstermektedir.

Firma büyüme regresyonları her yaş için ayrı ayrı yapıldığında, büyümenin yaşa göre azaldığı görülmekte, ancak bu etkinin hayatta kalma seçimi kontrol edildiğinde 1 yaşından sonra ortadan kaybolduğu görülmektedir. Dolayısıyla hayatta kalma seçiminin kontrol edilmesi firma yaşı ve büyüme ilişkisinin ortaya çıkarılmasında önemli bir rolü vardır. Firma büyüklüğü ile büyüme arasındaki negatif ilişki, yaşlara göre yapılan regresyonlarda da görülmekte ve bu etkinin firmanın ilk yıllarında daha yüksek olduğu dikkati çekmektedir. Benzer şekilde göreli etkinliğin büyüme üzerindeki pozitif etkisinin de ilk yıllarda çok daha önemli olduğu bulgusuna ulaşılmıştır.

Bölüm 5: Firma Büyümesinin Ampirik Örüntüleri

Firma büyüme yazınındaki hakim ampirik yaklaşımın firmalar ve büyüme oranlarıyla ilgili örtük olarak gözardı ettiği heterojenlikten dolayı, firmaların büyüme etmenleri örüntülere göre farklılaştırılacak incelenmelidir. Ayrıca, bu çalışmada, sadece büyüyen firmalara odaklanmanın ya da sadece büyüme oranlarının gruplamasının bu anlamda çok fikir vermediği, bunun yerine potansiyel tüm büyüme örüntülerini hesaba katmanın daha uygun olduğu düşünülmektedir.

Bu bölümde öncelikle örüntü tespiti için ilk kez istatistiksel yöntemler kullanılması önerilmekte ve potansiyel tüm örüntüler keşfedilmeye çalışılmaktadır. Daha sonra ise keşfedilen bu büyüme örüntülerini belirleyen etmenler incelenmektedir.

Büyüme örüntülerinin tespiti için potansiyel olarak altı işlevsel biçimin (sabit, doğrusal, karesel, sıçramalı, lojistik ve rassal yürüme) varolduğu varsayılmakta, bu biçimlerin her biri her firma için tahmin edilmekte, Bayes bilgi kriterine ve parametre anlamlılıklarına göre her bir firma için bir büyüme örüntüsü belirlenmektedir. Bu örüntüler sabit ve rassal büyüme biçimleri dışındaki işlevler için büyüyen ve küçülen örüntüler olarak ikiye ayrılmaktadır. Sonuç olarak 10 farklı büyüme örüntüsü tespit edilmiştir. bu örüntülerden hareketle firmaların çoğunun uzun dönemde sürekli büyüme davranışına sahip olmaktan ziyade belli bir büyüklüğe yakınsadıkları görülmektedir. Ayrıca büyüme örüntülerinin sektör ve firma büyüklük gruplarına göre istatistiksel olarak anlamlı farklar taşıdığı sonucuna ulaşılmaktadır.

Büyüme örüntülerini belirleyen etmenler incelendiğinde ise firmaların daha fazla kuruluş büyüklüğüne sahip olmalarının, ilk 5 yılda piyasadan çıkan firmalara göre, herhangi bir büyüme örüntüsüne sahip olma olasılığını artırdığı ve dolayısıyla hayatta kalma şanslarının daha yüksek olduğu görülmektedir. Ancak bu etki, azalan örüntüye sahip firmalar için daha yüksek bulunmaktadır. Göreli üretkenlik düzeyi daha yüksek olan firmaların hayatta kalma şansları da daha yüksektir ancak bu etki büyüyen örüntüye sahip firmalarda daha yüksek çıkmıştır. Sermaye yoğunluğu açısından duruma bakıldığında, sermaye yoğunluğu artışının büyüyen örüntüye sahip olma şansını artırdığı, ancak küçülen örüntüye sahip olma şansını azalttığı görülmektedir. Dolayısıyla bu bulgu sermaye yoğun firmaların büyüyen örüntüye sahip olmaları durumunda kolaylıkla hayatta kalabildiklerini gösterirken, büyümedikleri durumda ise esnek bir sermaye yoğunluğuna sahip olmamalarından dolayı piyasayı terk etmek zorunda olduklarına işaret etmektedir.

Tüm bunlar değerlendirildiğinde ise firma büyümesini belirleyen etmenlerin örüntülere göre farklılaştığı ve büyüme örüntülerindeki heterojenliğin bu anlamda dikkate alınması gerektiği ortaya çıkmaktadır.

Bölüm 6: Firma Büyümesini Belirleyen Örüntü Temelli Etmenler

Bu bölümde firma büyüme regresyonu iki aşamalı biçimde ele alınmakta, ilk aşamada büyüme örüntüsünün belirleyenleri için bir denklem tahmin edilmekte ve bu tahminden gelen sonuçlar doğrultusunda ikinci aşamada örüntü seçimi yanlılığı düzeltmesi yapılarak firma büyüme regresyonu tahmin edilmektedir. Tahmin sonuçlarında güçlü biçimde görülen hususlardan biri, kuruluş büyüklüğünün büyüme negatif etkisinin sadece küçülen örüntülerde tespit edilmesidir. Büyüyen örüntülere sahip olan firmalar için bu etki ya anlamsız ya da pozitiftir. İki aşamalı model ayrıca örüntü seçimindeki yanlılığın hangi örüntüler arasından kaynaklandığı konusunda da bilgi vermektedir. Bu yanlılığın temel nedeni, gözlenemeyen ve dolayısıyla tahmin denklemlerinde yer almayan değişkenlerle ilgilidir. Bu özellikler, firma, sektör, bölge, en önemlisi de girişimci ile ilgili olabilir.

Son iki bölümde ele alınan yaklaşım özetle firma büyüme sürecinin örüntülerden bağımsız olarak ele alınamayacağının altını çizmektedir. Buna göre bazı örüntüler için önemli olan etmenler bazıları için önemli olmayabilir, hatta bu etmenler örüntüler arasında ters yönlü etkilere sahip olabilir. Bu konudaki ampirik yazın, firma büyüme kuramlarının test edilebilmesi için uygun bir yol oluşturamamıştır. Bu çalışmada ulaşılan sonuçların da gösterdiği gibi, bu durumun temel nedeni, her bir kuramın öngörüsünün farklı örüntülere göre test edilmesinin daya uygun olduğu görüşüdür. Böylelikle, kuramsal öngörülerin odaklandığı boyutlar sadece belli örüntüler için gerçekleşmiş olabilir. Buradan hareketle, firma büyüme sürecinin örüntülere göre farklılaşabildiği ve örüntü temelli heterojenliğin hem araştırmacılara hem de politika yapıcılara daha fazla bilgi sunduğu söylenebilir.

Bölüm 7: Sonuç

Yazındaki kuramsal modeller firma büyüme sürecindeki tüm boyutları kapsamamaktadır. Bu modeller, konunun sadece bazı yönleri üstünde odaklanmaktadır. Firma büyümesi ampirik yazında da oldukça ilgi gören bir konu olmuştur. Ancak bu çalışmaların hemen hemen hepsi firmaların aynı dağılımdan geldiğini ve dolayısıyla ortak bir büyüme amacına sahip olduğunu varsaymaktadır. Bu çalışmada, bu varsayımın yanlış olduğu ve büyüme sürecinin firma büyüme örüntülerinden bağımsız olarak ele alınamayacağı öne sürülmektedir. Benzer bir düşünceyle yola çıkan önceki birkaç çalışmada temel olarak firma büyüme oranları üzerinden bir gruplamaya gidilmiş ve sadece büyüyen firmalar ele alınmıştır. Bu tezde ise sadece büyüyen firmalar için değil, tüm firmalar için potansiyel tüm büyüme örüntüleri belirlenmiş ve sadece büyüme oranı üstünden değil büyüme sürecindeki heterojenlik üstünden tanımlamalar yapılarak konu analiz edilmiştir. Çünkü bu yaklaşımın politika yapıcılara daha bilgilendirici bakış açıları sağlayacağı düşünülmektedir.

Bu tezde büyüme dinamikleri bağlamında mümkün olan tüm ampirik örüntüler ilk kez keşfedilmektedir. Bu noktada özgün bir yöntem önerilmekte ve örüntü saptanmasında istatistiksel araçlar kullanılması ilk kez önerilmektedir. Tezin ikinci katkısı, büyüme örüntülerini belirleyen etmenlerin incelenmesidir. Büyüme örüntülerinden kaynaklanan seçim yanlılığı sorununu düzelten bir tahmin tekniğiyle firma büyüme sürecinin örüntülere göre farklı analiz edilmesi ise tezin bir diğer katkısıdır.

1980-2001 dönemi için Türkiye imalat sanayiini ele alan bu tezin amaçları; istihdam yaratma ve firma büyümesi bağını incelemek, firma, sektör ve bölge özelliklerinin firma büyümesi üstündeki etkisini geleneksel yaklaşımlarla analiz etmek, firma büyüme örüntülerini ve bunların belirleyen etmenleri saptamak ve son olarak örüntü seçim yanlılığını düzelten iki aşamalı bir model yardımıyla firma büyümesini belirleyen örüntü-temelli etmenleri ortaya çıkarmaktır. Çalışmanın temel sonuçları aşağıda özetlenmektedir:

Firmaların istihdam yaratma kapasiteleri ve büyümeleri arasındaki ilişki incelendiğinde, firmaların hayatta kalmasının ve firma yaşının istihdam yaratmada önemli etkileri olduğu görülmektedir. Piyasaya yeni giren firmalar ilk on yıllarının sonunda imalat sanayi içindeki istihdam paylarını neredeyse iki katına çıkarmaktadırlar. Dahası, ilk 15 yıllarından sonra bu firmaların imalat sanayi istihdamının yarısına sahip oldukları görülmektedir. Dolayısıyla Türkiye imalat sanayiinde 1980-2001 dönemi için yeni firmaların istihdam yaratma kapasiteleri oldukça önemlidir. Diğer yandan, bu dönemde çok hızlı büyüyen firmaların istihdam katkılarının yadsınamayacağı da önemli bulgular arasındadır. Bu katkılar hemen hemen her sektörde gerçekleşirken emek-yoğun sanayilerin istihdam yaratma potansiyelinin daha fazla olduğu görülmüştür. 2000-2001 krizinin olumsuz etkisi sadece tüm imalat sanayi için değil, hızlı büyüyen firmalar için de gözlenmiştir. Ayrıca sözkonusu dönemdeki istihdam kayıpları önemli ölçüde büyük firmalardan kaynaklandığı ve bu durumun kriz yılları için de geçerli olduğu görülmüştür. Dolayısıyla krizin olumsuz etkisi, büyük firmaların da zor zamanlara dayanma direncini kırmaktadır.

Firma büyüklük dağılımları incelendiğinde, kuruluş yılı büyüklüğünün hem hayatta kalmak hem de büyümek için kritik bir öneme sahip olduğu görülmektedir. Aynı zamanda, 1980-2001 dönemi için Türkiye imalat sanayiinde yaşın ve hayatta kalmanın istihdam yaratma üstünde anlamlı bir olumlu etkisi olduğu görülmektedir. Uzmanlaşmış, bilime dayalı ve ölçek yoğun sanayilerdeki firmaların göreli olarak daha büyük oldukları gözlenmiştir. Bu durum, firmaların büyük ölçekli olmaları ve hatta etkili bir büyüme başarısı gösterebilmeleri için ölçek ekonomilerinden faydalanmaları gerektiğini ima etmektedir. Hızlı büyüyen firmaların istihdam katkıları, büyüklük dağılımlarının zaman içindeki seyrinden de net biçimde görülmektedir. Yazında da vurgulandığı gibi sağa çarpık büyüklük dağılımları Türkiye imalat sanayiinde de baskın görünmektedir. Öte yandan sağa çarpıklık yapısı hayatta kalma ve yaş etkisi ile azalmaktadır. Hatta bu etki daha homojen firma grupları, özellikle de hayatta kalan ve yaşlı firmalar için logaritmik normal dağılıma yakınsamaktadır.

Firma büyüme regresyonlarını 1980-2001 dönemi Türkiye imalat sanayii için geleneksel yaklaşımla ele alan bölümde alternatif tahmin yöntemleri kullanılmıştır. Tüm modellerde küçük firmaların büyük firmalara göre daha hızlı büyüdükleri, ancak hayatta kalma seçimi kontrol edildiğinde sözkonusu büyüklük etkisinin azaldığı görülmüştür. Büyüklük etkisinin düzeyi statik ve dinamik panel veri modellerinde daha yüksektir. Firma yaşı ile hem hayatta kalma hem de firma büyüme arasındaki ilişki doğrusal değildir ve sırasıyla U-biçimli ve ters U-biçimli bir tarza sahiptir. Ancak veride yer alan firmaların çoğu, yaş etkisinin firma büyümesini azalttığı yerde ve hayatta kalmayı artırdığı yerde piyasadan çıkmaktadır. Dolayısıyla veride yer alan firmaların çoğu için yaş ile büyüme arasında negatif, yaş ile hayatta kalma arasında ise negatif bir ilişki vardır. Ayrıca göreli üretkenlik düzeyi hem hayatta kalma hem de büyümeyi pozitif ve anlamlı bit şekilde etkilemektedir. Bu durum, sanayi ortalamasına göre daha üretken firmaların diğer firmalara göre daha hızlı büyüdüklerini göstermektedir. Dolayısıyla tahmin sonuçları, pasif ve aktif öğrenme kuramlarını doğrulamaktadır. Sermaye yoğunluğu firma büyümesini artırmasına karşın, sermaye-yoğun firmalar daha az hayatta kalmaktadır. Buradan hareketle başlangıç sermaye maliyetinin sermaye-yoğun firmalar için çok önemli olduğu ve bu firmaların sermayeyi işgücü ile ikame etme esnekliklerinin olmadığı sonucuna ulaşılmaktadır. Reklam harcamalarının büyümeyi artırdığı ve bu etkinin hayatta kalma seçimi kontrol edildiğinde daha da fazla olduğu görülmektedir. Hatta reklam harcamalarının firmaların hayatta kalma olasılığını artırdığı bulgusuna da ulaşılmıştır. Finansal kısıtlarla karşı karşıya olan firmaların hayatta kalmaları ve büyümeleri daha zor olduğu görülmektedir.

Sanayi özelliklerinin firma büyümesine etkisine bakıldığında, daha az yoğun sanayilerdeki firmaların ve daha az giriş oranına sahip sanayilerdeki firmaların daha hızlı büyüdükleri sonucuna ulaşılmıştır. Minimum etkin ölçeği yüksek olan sanayilerdeki firmaların da daha hızlı büyüdükleri görülmektedir. Ayrıca sektörel ve bölgesel istihdam artışının firma büyümesini artırdığı ve bu etkinin hayatta kalma seçiminin kontrol edildiği tahminlerde daha yüksek olduğu bulgusuna ulaşılmıştır.

Firma büyüme oranı tahminlerinin her yaş grubu için tekrarlandığı ve bu anlamda sözkonusu etkilerin firma yaşına göre değişip değişmediğine bakıldığında, yaşla birlikte büyümenin azaldığı sonucuna ulaşılmıştır. Ancak hayatta kalma seçimi kontrol edildiğinde bu etkinin 1 yaşından sonra kaybolduğu görülmektedir. Dolayısıyla hayatta kalma etkisinin firma yaşının önemini ortaya çıkarmada son derece önemli bir rolü vardır. Büyüklük, her yaş grubu için büyüme üzerinde negatif bir etkiye sahiptir ama bu etki yaş ile birlikte azalmaktadır. Hatta bu etkinin firmaların ilk yıllarında çok güçlü olduğu söylenebilir. Hayatta kalma seçimi kontrol edildiğinde ise yaşlara göre büyüklük etkisinin daha hafif bir şekilde azaldığı sonucuna ulaşılmaktadır. Üretkenliğin firma büyümesine pozitif katkısının da ilk yıllarda daha önemli olduğu görülmektedir. Hayatta kalma seçimi kontrol edildiğinde ise, hayatta kalan genç firmaların büyümek için daha üretken olmaları gerektiği sonucuna ulaşılmaktadır. Son olarak, hayatta kalma seçimi etkisini zayıflatsa bile sermaye yoğunluğunun büyüme etkisi yaşla birlikte azalmakta olduğu görülmektedir.

Geleneksel firma büyüme regresyonlarında gözardı edilen firma büyüme sürecindeki heterojenliği ortaya çıkarmak için, özgün bir yöntemle 10 büyüme örüntüsü tespit edilmiştir. Örüntüleri saptanan firmaların çoğunun uzun dönem istihdam büyümesine sahip olmadıkları ve bunun da yazında vurgulanan temel bulguyla tutarlı olduğu görülmektedir.

1980-2001 dönemi Türkiye imalat sanayi firmalarının başarısız olmaktan ziyade tespit edilen 10 örüntüye sahip olma olasılıkları kuruluş büyüklükleri ile doğru orantılı olarak artmaktadır. Ancak bu etkinin, azalan örüntülere sahip firmalarda büyüyen örüntülere sahip firmalara kıyasla daha yüksek olduğu sonucuna ulaşılmıştır. Daha üretken firmaların azalan bir örüntüye değil, büyüyen bir örüntüye sahip olma olasılıkları daha yüksektir. Bu bulgu, yazındaki öğrenme modellerinin vurguladığı hayatta kalma ve büyüme ilişkisinin önemine işaret etmektedir. Öte yandan sermaye-yoğun firmaların büyüyen örüntüye sahip olma olasılığı daha azdır. Dolayısıyla sermaye-yoğun firmaların büyümek için daha fazla sermayeye ihtiyaçları vardır. Diğer bir deyişle büyüyen örüntülere sahip sermaye-yoğun firmalar kolaylıkla hayatta kalırken, küçülen örüntülere sahip sermaye-yoğun firmalar esnek bir sermaye yoğunluğuna sahip olmadıklarından dolayı piyasadan çıkmak zorunda kalmaktadırlar. Yukarıda belirtilen önemli çıkarımlardan hareketle, örüntü seçim modelinin büyüme örüntülerini belirleyen etmenleri saptamada önemli oranda başarılı olduğu söylenebilir.

Son olarak, firma büyümesini belirleyen etmenler örüntü seçim yanlılığını dikkate alarak incelenmektedir. Örüntü seçimi düzeltme regresyonuna dayanan bir firma büyüme modeli çerçevesinde, Türkiye imalat sanayiinde firmaya özgü, sektörel ve bölgesel karakterlerin etkisi analiz edilmektedir. Buna göre, kuruluş büyüklüğünün tüm küçülen örüntüler için büyümeye anlamlı ve negatif bir etkisi bulunurken, büyüyen örüntülerdeki firmalar için aynı etki anlamlı ve pozitif ya da anlamsız bulunmuştur. Bu bulgu, firma büyümesini belirleyen etmenlerin etki yönlerinin örüntülere göre değişmekte olduğunu göstermekte ve büyüme sürecinde örüntülerin önemini ortaya koymaktadır. İki aşamalı tahmin sonuçları sadece seçim yanlılığının yönünü değil, aynı zamanda bu yanlılığın kaynağını konusunda da bilgi vermektedir. Örüntü seçiminden kaynaklanan yanlılığın düzeltilmesi sonucunda, aslında tahmin denklemlerine dâhil edilmeyen (gözlenemeyen) değişkenlerin önemi de ortaya çıkmaktadır. Bu karakteristikler firmaya, sektöre ya da bölgeye has olabilir. En önemlisi de girişimci nitelikleriyle ilgili olabilir.

Sonuç olarak büyüme örüntülerinin analizi, geleneksel yaklaşımda ele alınan firma büyüme oranlarının firmaların aynı dağılımdan geldikleri varsayımının yanlış olduğunu ortaya koymaktadır. Firmaların sahip oldukları örüntüleri sadece gözlenebilen değişkenler (örneğin girişimci özelliklerinin modellerde yer almaması) çerçevesinde ortaya çıkarmak zor olsa da, firma büyüme örüntüleri vardır ve tespit edilebilir.

Örüntü seçimi etkisinden dolayı firmaların büyüme dinamikleri örüntüler arasında farklılık göstermektedir. Örneğin bu anlamda ampirik yazında sıkça vurgulanan bir husus olan firma büyüklüğünün firma büyümesine negatif etkisinin sadece küçülen örüntülerdeki firmalar için geçerli olabileceği saptanmıştır. Ancak büyüyen örüntülerdeki firmalarda pozitif bir etki bulunmuş ya da kuruluş büyüklüğünün firma büyümesine etkisi anlamsız olduğu bulunmuştur. Dolayısıyla, büyüklüğün büyümeye etkisi örüntülere göre değiştiğinden, Gibrat yasasının sadece bazı örüntülerde geçerli olabileceği görülmüştür.

Firma büyüme yazınında oldukça fazla sayıda ampirik çalışma olmasına rağmen, önceki çalışmalar firma büyümesinin ayrıntıları hakkında tartışmasız bir bulgu ortaya koyamamaktadır. Bu açıdan bakıldığında, firma büyüme sürecinde bazı önemli boyutların hesaba katılması gerekmektedir. Örneğin firmaların ve girişimcilerin özellikleri ayrı ayrı önemlidir. Ayrıca firma büyümesini belirleyen etmenleri incelemek için her firmanın hangi büyüme örüntüsüne sahip olduğunu saptamak gerekmektedir. Çünkü sözkonusu etmenler örüntülere göre farklılık gösterebilir. Öte yandan, ampirik çalışmalardaki hakim yaklaşım firma büyüme kuramlarının test edilmesi için uygun bir çerçeve çizememektedir. Bunun temel nedeni muhtemelen her bir kuramın ayrı boyutlara odaklanması ve bazı varsayımlar yaparak öngörülerde bulunmasıdır. Buradan hareketle, ampirik çalışmalar ve kuramlar arasında uygun bir bağın kurulabilmesi için firma büyümesinin örüntülere göre ele alınması ve kuramların da farklı örüntülere göre test edilmesi gerektiği söylenebilir. Başka bir deyişle kuramsal öngörüler sadece bazı örüntülere sahip firmalar için geçerli olabilir. Dolayısıyla büyüme örüntülerine odaklanmak firma büyüme süreci için daha fazla fikir verici olacaktır.

KOBİ'ler için destek ve büyüme politikaları tasarlanırken firma büyüme örüntülerinde varolan bu heterojen yapının hesaba katılması ve dolayısıyla politika yapıcıların bu örüntüleri ve firmaların yaşam döngülerini dikkate alması gerekmektedir. Yirmi yıllık dönemi ele alan bu çalışmanın önemli sonuçlarından birisi, hayatta kalan firmaların çoğunun sabit bir istihdam büyüklüğüne yakınsadıklarının görülmesidir. Dolayısıyla büyüme gereksinimi olmayan ya da büyüyemeyen küçük firmalara uygulanacak kamu politikaları tasarlanırken bu hususlar hesaba katılmalıdır.

Bu tezde firma büyümesinin ampirik örüntülerini saptamak amacıyla daha uygun bir yöntem önerilmektedir. Dolayısıyla sonraki çalışmalara bu anlamda ışık tutulmaktadır. Hatta bu çalışmada önerilen yöntem, ampirik çalışmaların çoğunda kolaylıkla uygulanabilir. Tezin diğer önemli vurgularından birisi, firma büyüme sürecinde heterojenliğin önemli bir rolü olduğu ve firma büyümesinin büyüme örüntülerinden bağımsız olarak ele alınamayacağıdır. Bunun temel nedeni, firma büyümesinin doğası gereği örüntülere bağlı olmasıdır. Dolayısıyla sonraki çalışmalar için yapılacak bir diğer öneri, firma büyümesini belirleyen etmenler araştırılırken örüntüler bağlamında daha homojen örneklemler kullanılmasıdır. Firma büyümesinin güncel yazınında girişimci özellikleri özel bir öneme sahiptir (Davidsson vd., 2006; Raposo vd.., 2011 ve Davidsson ve Wiklund, 2013). Hatta güncel tartışmalardan bağımsız olarak girişimcinin firma büyümesi, sanayi büyümesi ve nihayet iktisadi büyüme açısından önemli rolü olduğu zaten bilinmektedir (bu bağlamda kuramsal modellerin kapsamlı bir tartışması için bkz. Audretsch vd., 2006). Bu çalışmada kullanılan veride girişimci özellikleri olmadığı için ampirik modellerde ilgili değişkenler yer almamaktadır. Dolayısıyla ileride yapılacak çalışmalar için yapılabilecek muhtemel en iyi öneri, firma özellikleri ve dışsal faktörlerin yanı sıra girişimci özelliklerinin de örüntü seçimine dayanan firma büyüme modellerine dâhil edilmesidir. Bu çalışmada, 1980-2001 dönemi imalat sanayii için TÜİK'in işyeri düzeyindeki verileri kullanılmıştır. Ancak TÜİK, 2002 yılında anket yaklaşımını daha fazla kuruluş verisi elde etmek için değiştirmiş ve 2003 yılından itibaren sanayi ve hizmet sektörleri için girişim düzeyinde veri toplamaya başlamıştır. Öte yandan, 2003 ve sonrasını kapsayan veride yer alan kuruluşları, 2001 ve öncesine ait veride takip etme imkânı bulunmamaktadır. 2003 ve sonrasını kapsayan veride bir firmanın en fazla 10 yıllık bilgisine ulaşılabilir. Ama yine de bu çalışmadaki analizlerin 2003 ve sonrasını kapsayan yeni veri kullanılarak güncellenmesi mümkün olabilir. Bu tezde firma büyüme örüntüleri sadece imalat sanayi için ele alınmıştır. Diğer yandan, hizmet sektörleri imalat sanayiine göre çok farklı özelliklere sahiptir. Dolayısıyla firma büyüme süreçleri, sonraki çalışmalarda büyüme örüntüleri bağlamında hizmet sektörleri için incelenebilir.

APPENDIX F

CURRICULUM VITAE

PERSONAL INFORMATION

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EDUCATION

2015: Ph.D. in Economics, Department of Economics, Middle East Technical University, Ankara, Turkey.
Supervisor: Erol Taymaz
Thesis Title: "Patterns of Firm Growth in the Turkish Manufacturing Industry"

2006: M.Sc. in Economics, Department of Economics, Middle East Technical University, Ankara, Turkey.
Supervisor: Erol Taymaz
Term Project Title: "Evaluation the Efficiencies of R&D Processes in OECD Countries using Stochastic Frontier Analysis"

2000: B.Sc. in Economics, Department of Economics, Faculty of Political Science, Ankara University, Ankara, Turkey.

1996: High School, İnönü High School, Aydınlıkevler, Ankara, Turkey.

AWARDS

2007: Young Researcher Promotion Prize (Third place), with the paper "Evaluation the Efficiencies of R&D Processes in OECD Countries using Stochastic Frontier Analysis", presented at and published in the proceedings of The 8th Econometrics and Statistics Congress of Turkey, May 24-25, İnönü University, Malatya, Turkey.

EMPLOYMENT RECORD

2002 - Present: Teaching and Research Assistant, Department of Economics, Middle East Technical University, Ankara, Turkey.

RESEARCH EXPERIENCE

2012: Researcher, in the project "Socio-demographic and Economic Assessment of Six Villages: Çöpler, Bağıştaş, Bahçecik, Dostal, Yakuplu, Sabırlı", funded by Anatolia Minerals Co., commissioned by METU Centre for Blacksea and Central Asia Studies.

2011-2012: Researcher, in the project “The Impact of FDI on Firm Survival and Employment: A Comparative Analysis for Turkey and Italy”, funded by European Union - FEMISE Research Program, Research n°FEM34-12.

2010-2011: Research Assistant, in the project “State Planning Organization Province Coordination and Monitoring System”, funded by Public Research Group of Turkish Science & Technological Research Council of Turkey and commissioned by Software and Data Engineering Department (G222) of Turkish Science & Technological Research Council of Turkey.

2009-2010: Research Assistant, in the project “Environmental Innovations in the Manufacturing Small and Medium Sized Enterprises: A Case of Turkey”, funded by Economic Research Forum (ERF, Egypt) Research project.

2009-2010: Research Assistant, in the project “The Impact of Agricultural Enterprises on Productivity and Efficiency of Agricultural Production in Turkey and Chaotic Dynamic Analysis of Selected Products: Problems, Solutions and Policy Proposals”, funded by Social Sciences Research Group of Turkish Science & Technological Research Council of Turkey.

2009: Researcher, in the project “Erzincan Çöpler Gold Mine Socio-Economic Impact Analysis”, funded by Anatolia Minerals Co., commissioned by METU Centre for Blacksea and Central Asia Studies and Environmental Resources Management Consulting.

2008: Research Assistant, in the project “Regional Innovations Systems”, funded by Social Sciences Research Group of Turkish Science &Technological Research Council of Turkey.

2007-2010: Researcher, in the project “Innovation activities in Turkey in the age of science and technology”, funded by Social Sciences Research Group of Turkish Science & Technological Research Council of Turkey.

PUBLICATIONS

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Töngür, Ü. and Elveren, A. Y. (2013), “The Impact of Military Spending and Income Inequality on Economic Growth in Turkey, 1963-2008”, paper presented at and published in the proceedings of EY International Congress on Economics I: Europe and Global Economic Rebalancing, Ekonomik Yaklaşım (EY) Journal of Department of Economics, Gazi University, October 24-25, Ankara, Turkey.

Töngür, Ü. and Elveren, A. Y. (2013), “OECD Ülkelerinde Sendikasızlaşma ve Ücret Eşitsizliği: Panel Granger Yaklaşımı”, paper presented at Harran Economics Seminars, October 4, Harran University, Şanlıurfa, Turkey.

Töngür, Ü. and Taymaz, E. (2013), “Patterns of Firm Growth in Turkish Manufacturing Industry”, paper presented at Anadolu International Conference in Economics (Econ Anadolu 2013), June 19-21, Anadolu University, Eskişehir, Turkey.

Töngür, Ü., Elveren, A. Y. and Hsu, S. (2013), “Military Expenditures and Political Regimes: An Analysis for Global Data, 1963-2001”, paper presented at Anadolu International Conference in Economics (Econ Anadolu 2013), June 19-21, Anadolu University, Eskişehir, Turkey.

Taymaz, E. and Töngür, Ü. (2013), “Türkiye İmalat Sanayiinde Firma Büyüme Yörüngeleri”, paper presented at The Workshop on Turkish Economy, organized in the honours of Yakup Kepenek and Oktar Türel, April 25-26, METU Northern Cyprus Campus, Güzelyurt, Turkish Republic of Northern Cyprus.

Töngür, Ü. (2012), "Türkiye'de Bölgelerin Patent Alma Eğilimleri", paper presented at METU Department of Economics Seminar, February 27, METU, Ankara.

Töngür, Ü. (2011), "Türkiye'de Bölgelerin Patent Alma Eğilimleri", paper presented at Ekonomik Yaklaşım Congress Series VII- The Dynamics of Turkish Economy, December 22-23, Department of Economics- Gazi University, Ankara, Turkey.

Töngür, Ü. (2011), "Firm Size, R&D Activities and Innovation", paper presented at and published in the proceedings of Anadolu International Conference in Economics (Econ Anadolu 2011), June 15-17, Anadolu University, Eskişehir, Turkey.

Töngür, Ü. (2010), "R&D Activities, Innovation and Efficiency of R&D Process: A Case of Turkey", paper presented at and published in the proceedings of International Conference in Economics, ICE-TEA, Turkish Economic Association, September 01-03, Girne, Turkish Republic of Northern Cyprus.

Töngür, Ü. (2007), "Evaluation the Efficiencies of R&D Processes in OECD Countries using Stochastic Frontier Analysis", paper presented at and published in the proceedings of The 8th Econometrics and Statistics Congress of Turkey, May 24-25, İnönü University, Malatya, Turkey.

PROFESSIONAL ACTIVITIES

2015, Member of Program Committee, Econ World 2015: World Economic Society Second International Conference in Economics, Torino, Italy, 18-20 August.

2014, Member of Program Committee, Econ Harran: Harran National Conference in Economics, Şanlıurfa, Turkey, 23-24 October.

2014, Member of Program Committee, Econ World 2014: World Economic Society International Conference in Economics, Prague, Czech Republic, 3-5 September.

2014 - Present, Member of International Editorial Board, *Panoeconomicus*.

Peer Reviews:

Defence and Peace Economics
Economic Modelling
Ekonomik Yaklaşım
İktisat İşletme ve Finans
METU Studies in Development
Panoeconomicus
World Journal of Applied Economics

LINGUISTIC SKILLS

Turkish: Native
English: Fluent

COMPUTER SKILLS

STATA, E-views, MicroFit, SPSS, FRONTIER, DEAP, SAS.
MS Office Programs, Website Design Programs.

APPENDIX G

TEZ FOTOKOPİSİ İZİN FORMU

<u>ENSTİTÜ</u>

Fen Bilimleri Enstitüsü ☐

Sosyal Bilimler Enstitüsü ☒

Uygulamalı Matematik Enstitüsü ☐

Enformatik Enstitüsü ☐

Deniz Bilimleri Enstitüsü ☐

<u>YAZARIN</u>

Soyadı : Töngür
Adı : Ünal
Bölümü : İktisat

<u>TEZİN ADI</u> (İngilizce): Patterns of Firm Growth in the Turkish Manufacturing Industry

<u>TEZİN TÜRÜ</u> : Yüksek Lisans ☐ Doktora ☒

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir. ☐
2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir. ☐
3. Tezimden bir (1) yıl süreyle fotokopi alınamaz. ☒

<u>TEZİN KÜTÜPHANEYE TESLİM TARİHİ</u>: