FIRM AND INDUSTRY LEVEL FACTORS THAT AFFECT THE GROWTH OF SMEs: EVIDENCE FROM TURKEY

Özgür Ahmet Tarakçı

Boğaziçi University

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Özgür Ahmet Tarakçı

Boğaziçi University

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Thesis Abstract

Özgür Ahmet Tarakçı, “Firm and Industry Level Factors That Affect the Growth of SMEs: Evidence from Turkey”

Big majority of the total labor force in Turkey is being held by Small and Medium Enterprises (SMEs), as in almost all other countries. Therefore, steps taken to help growth of the SMEs are very important for the whole economy. The objective of this study is to investigate the firm and industry level factors that affect the growth of SMEs.

In this study, firms are grouped as high-growth and low-growth ones based on their sales data and this classification is made for both nominal and industry adjusted sales growth rates. Additionally, analyses have been repeated for different growth criteria. Main hypotheses of this study are, there are statistically significant differences between the financial ratios (firm level factors) of high growth and low growth firms and the characteristics of the industries (industry level factors) that the firms are operating in, have effects on the growth of the firms.

Aforementioned hypotheses have been tested on a wide sample covering 2004-2006 period. This sample is constructed by (i) the firm-level data of 2,256 SMEs which are provided by Central Bank of the Republic of Turkey (CBRT), (ii) the industry-level data showing the characteristics of the industries that these SMEs are operating in which are collected from various resources. As a result of the analyses, it has been found that age and size of the SMEs have no significant effect on their growth, but there are statistically significant differences between some of the financial ratios of high and low-growth SMEs suggesting that high-growth firms (i) carry more debt compared to their assets, (ii) use shorter-term debt, (iii) are more profitable, (iv) use more maturity matching, (v) have less trade receivables, (vi) have less short term receivables than low-growth firms. Additionally, it has been found that the characteristics of the industry that an SMEs operates in affect its growth. Specifically, high growth SMEs are found in industries where we observe high growth rates, low competition and high innovativeness.

Tez Özeti

Özgür Ahmet Tarakçı, "KOBİ'lerin Büyümesine Etki Eden Firma ve Endüstri Seviyeli Faktörler: Türkiye'den Bulgular"

Küçük ve Orta Boy İşletme (KOBİ)'ler hemen hemen tüm ülkelerde olduğu gibi Türkiye'de de toplam işgücünün çok büyük bir kısmını oluşturmaktadır. Dolayısıyla KOBİ'lerin büyümelerini sağlamaya yönelik olarak atılacak olan adımlar tüm ekonomi için büyük önem arz etmektedir. Bu çalışmanın amacı KOBİ'lerin büyümelerine etki eden firma ve endüstri seviyeli faktörleri incelemektedir.

Bu çalışmada, firmalar, satış büyüklükleri temel alınarak, hızlı büyüyen ve yavaş büyüyen firmalar olarak ikiye ayrılmış ve bu sınıflandırma şirketlerin hem nominal hem de endüstriye göre ayarlanmış büyüme oranlarına göre yapılmıştır. Ayrıca farklı büyüme kriterleri seçilerek analizler tekrar edilmiştir. Çalışmanın ana hipotezleri ise hızlı büyüyen firmalar ile yavaş büyüyen firmaların finansal rasyoları (firma seviyeli faktörler) arasında istatistiksel olarak anlamlı farklılıklar olduğu ve firmaların içlerinde bulundukları endüstrilerin karakteristiklerinin (endüstri seviyeli faktörler) firmaların büyümeleri üzerinde etkilerinin olduğudur.

Bahse konu hipotezler 2004-2006 yılları arasındaki dönemi kapsayan geniş bir örnek üzerinde test edilmiştir. Söz konusu örnek (i) 2,256 adet KOBİ'nin Türkiye Cumhuriyet Merkez Bankası (TCMB)'nca sağlanmış olan firma bazlı verilerinden ve (ii) bu KOBİ'lerin içinde yer aldıkları endüstrilerin karakteristiklerini gösteren çeşitli kaynaklardan toplanmış olan verilerden oluşturulmuştur. Analiz neticeleri KOBİ'lerin yaş ve büyüklüklerinin büyümeleri üzerinde etkileri olmadığını, ancak hızlı büyüyen firmalarla yavaş büyüyen firmaların bazı finansal rasyoları arasında istatistiksel olarak anlamlı bulunan farklılıklar bulunduğunu, hızlı büyüyen firmaların yavaş büyüyenlere kıyasla, (i) varlıklarına kıyasla daha çok borçlandıklarını, (ii) borçlarının kısa vadeli olduğunu, (iii) daha karlı olduklarını, (iv) daha çok vade eşleme yaptıklarını, (v) daha az ticari ve (vi) daha az kısa vadeli alacakları olduğuna göstermektedir. Ayrıca, KOBİ'lerin bulundukları endüstrilerin büyümeleri üzerinde etkisi olduğu ve yüksek büyüme hızına sahip, az rekabetçi ve çok yenilikçi endüstrilerdeki KOBİ'lerin hızlı büyüdükleri tespit edilmiştir.

CURRICULUM VITAE

NAME OF AUTHOR: Özgür Ahmet Tarakçı
PLACE OF BIRTH: Istanbul, Turkey
DATE OF BIRTH: 26 August 1977

GRADUATE AND UNDERGRADUATE SCHOOLS ATTENDED:
Yeditepe University
Boğaziçi University
Yıldız Technical University

DEGREES AWARDED:
Doctor of Philosophy in Business Administration, 2010, Boğaziçi University
Master of Business Administration, 2004, Yeditepe University
Master of Science in Electrical and Electronics Engineering, 2002, Boğaziçi University
Bachelor of Science in Electrical and Communications Engineering, 1999, Yıldız Technical University

AREAS OF SPECIAL INTEREST:
Sports, Arts, History and Archeology

PROFESSIONAL EXPERIENCE:

AWARDS AND HONORS:

GRANTS:

PUBLICATIONS:

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CHAPTER 1: INTRODUCTION

Small and medium-sized enterprises (SMEs) are the engines of the economy. According to European Commission[1] , there are more than twenty-three million SMEs in the European Union (EU) member countries, which represent 99.8% of all enterprises in the EU. They provide 67.1% of all private-sector jobs by employing more than one hundred million people. SMEs account for more than 80% of employment in some industrial sectors such as textiles, construction and furniture. Therefore, SMEs are the real giants of the European economy. Especially the micro-businesses dominate employment in countries such as Italy (47%) and Poland (41%).

Small businesses provide half of the private real gross domestic product (GDP) of the US as well as half of the whole employment[2]. The U.S. Small Business Administration (SBA) reports that out of the 1.1 million net new jobs in the first quarter of 2007, 74% of the net new jobs were in small firms with fewer than five hundred employees and 22% were in firms with fewer than twenty employees. SBA also states that small businesses with fewer than five hundred employees constitute 97.3% of identified U.S. exporting companies and their share in 2006 exports is 28.9%.

In Turkey, similarly, SMEs have an important role in terms of the number of businesses, the number of employees and the value-added they create. As in developed economies, SMEs constitute a great majority of all enterprises in Turkey.

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[1] Putting Small Businesses First-2008 Edition. Available online at http://ec.europa.eu/enterprise/newsroom/cf/itemshortdetail.cfm?item_id=3325

[2] The Small Business Economy, 2008 – A Report to the President.

Keskin (2008) reports that SMEs constitute 99.5% of all enterprises and provide 61.1% of total employment in Turkey as of 2003.

Three parameters generally used for the definition of SME are:

i. Number of workers employed

ii. Volume of production or turnover of business

iii. Capital investment on plant and machinery

Though the number of workers employed is the most frequently used parameter, the limits differ from one country and/or study to another. By taking the economic developments and the lessons drawn since 1996 into account, the EU adopted a new recommendation (2003/361/EC) regarding the SME definition and replaced the old one (recommendation 96/280/EC) as of 01 January 2005. The current SME definition in EU is given in the following table.

Table 1 The Current SME Definition in EU

Category	Headcount	Sales Turnover /	Balance Sheet Total
Medium	< 250	≤ € 50 million	/ ≤ € 43 million
Small	< 50	≤ € 10 million	/ ≤ € 10 million
Micro	< 10	≤ € 2 million	/ ≤ € 2 million

The definition of SME in USA is not that simple. Small Business Administration (SBA) uses different SME definitions for different industries. SBA uses either the average annual receipts or the average employment figure in order to decide whether the firm is SME or not. Additionally, the limits for average annual receipts or the average employment figures are different for each industry. The range within a sector can vary extensively, with the number of employees being in the range one hundred to fifteen hundred and turnover in the range €1.5 million to €20.5 million. However, the general SME thresholds are, five hundred employees for most

manufacturing and mining industries, one hundred employees for wholesale trade industries, $7 million of annual receipts for most retail and service industries, $33.5 million of annual receipts for most heavy construction industries, $14 million of receipts for all special trade contractors and $0.75 million of receipts for most agricultural industries.

There have been several SME definitions in Turkey used by various institutions which caused many problems in obtaining government and/or EU subsidies and funds. In order to solve these problems and use a definition that shall be taken as a basis in the implementations of all institutions and organizations, the SME definition was aligned with the EU and the legal infrastructure was defined by Law 5331. In accordance with Law 5331, the Ministry of Industry and Trade prepared the "Regulation Concerning the Definition, Characteristics and Classification of Small and Medium-Sized Enterprises" which was published in the Official Gazette on 18 November 2005 and entered into force one year later. Table 2 gives the classification of SMEs in Turkey according to this regulation.

Table 2 SME Definition in Turkey (TMIT Definition)

Category	Headcount	Net Sales Revenue or Balance Sheet Total
Medium	< 250	≤ 25 million TL
Small	< 50	≤ 5 million TL
Micro	< 10	≤ 1 million TL

Since SMEs play a critical role for the creation of employment, their rate of growth shall help reduce the unemployment rate by creating more jobs. However, SMEs face many difficulties during their life cycle and their growth is not that simple due to several reasons. EU reports that administrative and regulatory burden together with access to finance are the most important factors that affect the growth

of SMEs. In this study, the financial aspects of SME growth shall be focused on and the regulatory burden in determining the effects of entry barriers of an industry on firm growth shall be also mentioned. Specifically, the purpose of this study is;

i. To address the key factors that affect the growth of SMEs and investigate the financial and non-financial characteristics of high-growth firms.

ii. To investigate the characteristics of the industry that the firm operates in on its growth.

The study is structured as follows: Chapter 2 gives the summary of the previous research related to the SME growth and the effects of industry that the firm operates in on its growth. Chapter 3 presents the empirical research design, Chapter 4 provides data and sample for the study, and Chapter 5 gives the results of the empirical research. Finally, Chapter 6 concludes and discusses the findings.

CHAPTER 2: LITERATURE SURVEY

Growth and Finance

SMEs differ in their financial structure. Small businesses, in general, have lower fixed assets to total assets ratio, a higher ratio of debt to total assets, a higher proportion of current liabilities to total assets, heavily reliant on retained profits to fund their investments, thus assumed to be more risky (Cressy and Olofsson, 1997a). Cressy and Olofsson (1997b) show that the most important constraint on SMEs is not simply finance as such, but the package of finance and expertise, including the provision of management skills and market knowledge. The main constraints are found to be management, labor skills, access to finance and information flow.

The role of finance has been viewed as a critical element for the development of SMEs. Previous studies have highlighted the limited access to financial resources available to smaller enterprises compared to larger organizations and the consequences for their growth and development (Levy, 1993). Typically, smaller enterprises face higher transaction costs than larger enterprises in obtaining credit (Saito and Villanueva, 1981). Poor management and accounting practices have hampered the ability of smaller enterprises to raise finance. Information asymmetries associated with lending to small scale borrowers have restricted the flow of finance to smaller enterprises. In spite of these claims, however, some studies show a large number of SMEs fail because of non-financial reasons (Liedholm et al., 1994).

Compared to large enterprises, SMEs are more constrained by the availability of internal finance. In fact, some empirical studies (Chittenden et al., 1996; Becchetti and Trovato, 2002; Carpenter and Petersen, 2002) indicate that the availability of financial constraints affects small firm growth. Even though smaller firms seek to

achieve minimum efficient scale, they are more likely to be unable to obtain sufficient capital from external sources in order to expand their businesses.

It is also difficult for SMEs to access to capital markets, and financial constraints are more binding for SMEs. Therefore, internal finance plays an important role in achieving the growth of SMEs by overcoming financial constraints. In addition, capital structure is different among SMEs, and leverage may be related to firm growth. Moreover, a few firms have already gone public among SMEs, and publicly-held firms tend to access to external funds easier than privately-held firms. Therefore, firm growth rates/processes may be different between privately-held and publicly-held firms.

Smaller firms in particular face considerable informational asymmetries in their dealings with creditors. In addition, growth considerations are particularly acute in the case of SMEs as these firms are often overzealous in their growth aspirations with obvious moral hazard consequences (Myers, 1977). Thus, growth may have ambiguous effects on firms concerning their financing ant it may cause variations in the value of a firm and larger variations in the value of the firm are often interpreted as greater risk. This may explain why firms with ample growth opportunities will be considered as risky and face difficulties in raising debt capital on favorable terms. These firms are expected to employ less debt in their capital structure. Furthermore, the cash flows of firms, the values of which are most likely to remain stable in the future, are predictable, and their capital requirements can be financed with debt more easily than those with growth potential (Psillaki and Mondello, 1996). Myers (1977) argues that firms with growth potential will tend to have lower leverage. On the other hand, growth will push firms into seeking external financing, as firms with high-

growth opportunities are more likely to exhaust internal funds and require additional capital. From this point of view, growth is expected to have a positive relationship with leverage (Michaelas et al., 1999). Daskalakis and Psillaki (2007), in their study comparing the capital structure determinants in Greece and France, report that the effect of earnings growth on capital structure is positive and significant for France but not significant for Greece.

While a considerable amount is known about the characteristics and behavior of SMEs, a large number of questions remain unanswered in relation to finance and small enterprise development in developing countries.

The literature on developing countries follows the same division as studies on the industrialized countries, by attempting to distinguish between the external and internal factors that affect SME development. Schmitz (1982), for example, identified a number of factors that affected SME development. These included lack of credit at reasonable cost, lack of working capital, poor infrastructure, and competition from larger and foreign firms.

The research efforts on SMEs in low income countries have specific characteristics that can be classified in three groups (Cook, 2001). First, a considerable amount of time has been spent on gathering baseline information on small firms which mostly involved identifying and constructing samples. Second, information collected tends to be more qualitative than quantitative because of the poor record keeping, as well as the lack of cross-referencing sources through formal channels that can be used to confirm data reliability. Third, surveys are more often conducted on an ad hoc basis and at a point in time. Few compare different points in time and fewer still have attempted to use the same database for follow-up work. As

a result, time series work on the small scale sector is relatively scarce. Cook (2001) reports that a brief review of empirical literature, on finance and SME development in low income countries, does raise a number of issues. The first issue concerns the macroeconomic context in which financial reforms have been implemented. The second issue concerns the assumptions implicit in models of credit supply, in particular bank credit to SMEs in low income countries. The third one is related to the relationship between corporate governance and enterprise finance that is assumed in studies of low income countries.

i. Macroeconomic Context: It was argued that removing controls on interest rates and credit allocation would increase savings and improve the efficiency of investment. Financial repression in low income countries has led banks to underinvest in information capital (Caprio, 1994). Banks are likely to lend relatively small companies, particularly to SMEs, which will ultimately reduce growth. Simply raising real interest rates as part of financial reform will not overcome this problem. In this situation, measures are required that reduce the cost of information capital to the financial sector. These include a wide range of measures to improve legal structures, audit processes, and accounting systems.

ii. Supply of Finance: It is evident that banks play a key role in the financial system by pooling the liquidity risk of depositors and investing a large proportion of their funds in more liquid, but more productive projects (Griffith-Jones, 1998). In much of the financial literature, the principal-agent model has been used to rationalize the low level of bank lending to SMEs relative to larger enterprises. As developed, the application of principal-agent theory argues that banks have less perfect information on smaller firms than larger firms (costs of gathering this

information are higher) and, as a consequence, lending to smaller firms is riskier. The observed outcome from this analysis is less lending to small firms relative to larger ones. In turn, lending institutions are likely to demand higher risk premiums.

In developing country context, however, it may be argued that banks have better information to assess the riskiness of an investment than the small firm itself. This is because they are continually lending to small firms over extended periods of time and have acquired sufficient insights to be able to make sensible and sound judgments over lending decisions. Banks may have more experience about a small venture's survival prospects than they have information on larger firms, since the latter may be in a better position to conceal and manipulate information to their own advantage.

In low income countries, it is widely recognized that an imbalance exists between the demand and supply for finance, with the former exceeding the latter.

Capital markets take a long time to develop and deepen and do not necessarily work in predicted ways in low income countries (Singh and Weisse, 1998). Often, the lack of financial instruments and the number of participants restricts the capacity for financial deepening.

iii. Corporate Governance and Enterprise Finance: SME financing in developed countries such as US and UK is different from SME financing in less developed countries. Financing in US and UK heavily rely on bond and equity markets which is less relevant to smaller enterprises and does not conform to patterns of SME financing in low-income countries where internally generated funds and bank finance are predominantly used.

Indicators of Growth

A long list of internal and external factors have been hypothesized and shown to influence firm growth. When taken individually these factors have been shown to have an impact on firm growth. However, the problem is to develop a model showing the combined effects of these factors on firm growth. In order to deal with this complexity, researchers have developed a set of useful strategies.

i. One strategy is to increase the level of abstraction and regard the many particularities as aspects of more over-riding factors, some of which influence growth directly while others only have an indirect impact, as exemplified by Davidsson (1991) and Wiklund (1998).

ii. Another strategy is to give up ambitions of approaching full explanation but instead enhance our understanding of the interplay between different influences (Wiklund and Shepherd, 2003 and 2005).

iii. Third strategy is to limit the study to a more homogenous empirical context and study the effects of a narrow set of theory-driven and carefully operationalized predictors (Baum and Locke, 2004).

Delmar et al. (2003) indicate that growth can be measured with a range of different indicators; the most frequently suggested being sales, employment, assets, physical output, market share and profits. In within-industry studies more specialized measures can be used, such as the number of seats for restaurants or theatres, and the number of vehicles car rental companies. The researcher has the choice to,

i. Create a multiple indicator index.

ii. Use alternative measures separately.

iii. Find the best indicator.

Ardishvili et al. (1998) and Delmar (1997) arrive at almost identical lists of possible growth indicators: assets, employment, market share, physical output, profits, and sales.

Delmar et al. (2003) empirically show that when the top 10% "high-growth firms" in a large sample of firms were singled out according to six different growth indicators, very few firms were classified as 'high-growth firms' regardless of what criterion was used. Underlying this are very low correlations between some of the growth indicators. By means of cluster analysis they distil seven different types of "high-growth firms", which show markedly different growth patterns and background characteristics. They conclude that firm growth is a multidimensional phenomenon and that different forms of growth may have different determinants and effects.

Delmar et al. (2003) conclude that it would be advantageous to explore the use of many different growth measures in a study of firm growth. The use of multiple measures of firm growth would likely provide a more complete picture of any empirical relationships and would also offer the opportunity to use a measure optimized to the specific purposes of study while allowing comparisons with the results of previous studies using other growth measures.

If only one indicator is used and the study has a cross-industry design there is growing consensus that sales growth should be the preferred choice. It is the most general of the alternatives, as all commercial firms need to have sales to survive. It may be argued that sales often dominates the other indicators; it is the increase in sales that necessitates increases in assets and employees, and results in rising profits or market share (Flamholtz, 1986). These favorable aspects of sales as growth

indicator are reflected with the fact that 30.9% of the studies use sales as documented Delmar (1997). Almost as popular is employment growth, which was the choice in 29.1% of the reviewed studies. Very few managers see growth in employees as a goal in itself because some growing firms outsource heavily employment growth is not always highly correlated with sales growth.

While sales may be the most universally applicable growth indicator it is not always the best one. Sales is not, however, the perfect indicator of growth for all purposes. Sales are sensitive to inflation and currency exchange rates, while employment is not. It is not always true that sales lead the growth process. Biotech companies, for example, are not able to display any growth in sales or revenues for long periods of time. Yet, during this period they might still grow in terms of assets - including knowledge assets such as patents- and employment. When data covers several countries and/or time periods, differences in inflation rates are a complicating factor. Rather than using sales because others have proposed it, researchers are well advised to think seriously about what growth indicator(s) best matches their theory, their research questions, and the type of firms included in their own sample. Employment may be preferable if the focus of interest is on the managerial implications of growth (Churchill and Lewis, 1983; Greiner, 1972).

The diversity of measures used in organizational growth studies severely affects the scholars to compare results. For example, some studies might rely on measuring growth as absolute sales growth measured over a time period of five years (Dunne and Hughes, 1996; McCann, 1991; Merz and Sauber, 1995; Miller, 1987), whereas other studies rely on relative employment growth over a time period of three years. The choice of absolute or relative growth is especially important for the

relationship between size and growth. Absolute measures tend to ascribe higher growth to larger firms whereas smaller firms more easily reach impressive growth in percentage terms.

Determinants of Growth

In their review of the small business growth literature, Dobbs and Hamilton (2006) summarized thirty-four studies published since the mid 1990s which have featured over thirty independent variables. These variables have tended to fall into four categories as identified by Smallbone and Wyer (2000), namely, the characteristics of the firm, characteristics of the entrepreneur, environmental/industry specific factors and management strategies. The researchers also give explanations for each of these four categories and the related independent variables. Due to the complexity of the growth concept and the differences in researches (i.e. the difference in sectors, sample sizes and the periods studied), some variables are significant in some studies whereas the opposite is true for other studies.

Storey (1994) organizes the evidence in the categories (i) the background and access to resources of the entrepreneur(s), (ii) the strategic decisions taken by the firm, (iii) the firm itself. The most important factors associated with the entrepreneur(s) are motivation, education, number of owners, and the number of middle-aged business owners. The most important strategic factors are shared ownership, the ability to identify market niches and introduce new products and the ability to build an efficient management team. Among the factors which belong to the firm itself are the age, size, location and the industry. Storey (1994) argues that

these three components need to be combined appropriately for growth to be achieved.

Mengistae (2006) reports that one of the better known of the main regularities the empirical literature is that smaller businesses are more likely to fail than larger businesses, but will also normally grow faster when they survive. The age of a business seems to influence its dynamics similarly, that is, younger firms are less likely to survive, but the expected growth rate diminishes with age. A second common finding in the literature is that there are significant inter-industry differences in survival probabilities as well as in the pace of growth among survivors. Survival probabilities are higher in some industries than in others, as are growth rates. Thirdly, many studies show that social and demographic characteristics of business owners such as schooling and ethnicity are strongly correlated with the longevity or growth performance of the enterprises they run. Businesses run by entrepreneurs with greater schooling are more likely to survive and have higher average growth rates conditional on survival.

There is compelling evidence that the owner-manager's growth motivation, communicated vision and goals have direct effects on the firm's growth. Small firm owner-managers are generally aware that growth can have both desirable and undesirable effects, and hence growth is something of a dilemma for them. In a recent research, almost all respondents expect both negative and positive outcomes, and that negative expectations are overall somewhat more frequent or pronounced than positive ones (Wiklund et al., 2003). Among the negative ones are: growth would have adverse effects on employee well-being (which they interpret as fear of losing the informal, family-like character of the small organization) and the risk of

being lost if the organization grows larger. Davidsson's (1989) research showed that 40% of the small firm owner-managers in his sample did not believe growth would improve their personal income stream, thus effectively removing one important reason to pursue growth.

Mazzarol (2005) investigates the characteristics of the owner-managers of the high-growth firms. He states that it is likely that the need for greater levels of professional management will be required to operate the firm, along with the need for enhanced planning and the introduction of systems to support the new levels of complexity. The transition from a small, owner-managed firm to a large systems-managed business will require the development of a team-based management approach with greater specialization within the management team. The need for greater quantities of capital is likely to lead the business towards equity finance. As new equity partners are taken into the company the original owner-managers may find their level of control diminished. Taken together the conclusion is that growth is to a considerable extent a matter of willingness and skill, but that fundamental facilitators and obstacles in the environment are very important.

Firm and Industry Level Factors Affecting Firm Growth

Firm Level Factors

The discussion of age and size as determinants of firm growth has a long tradition, following the formulation of Gibrat (1931). Gibrat states that the rate of growth of a firm is independent from its size at the beginning of the period, and that the probability of a given growth rate during a specific time interval is the same for any

firm within the same industry. Some studies have indicated that growth rates are independent of size, other studies have indicated that Gibrat's formulation is applicable only to large organizations and some studies find that growth rates diminish with increasing size. However, empirical studies typically do not find support for the independence of firm growth from size and age (Becchetti and Trovato, 2002). A number of empirical studies suggest a negative relationship between growth and size, indicating that smaller firms have higher and more variable growth rates (Mansfield, 1962; Hall, 1987; Mata, 1994), while other studies (Singh and Whittington, 1975) have found a positive relationship. Though the direction of firm size on growth cannot be determined, it is expected that size has an effect on growth and a firm will expand differently, dependent on its size. However, a more clear relationship is found between firm age and growth, where firm growth rates tend to decline with the age of the firm.

Heshmati (2001) defines growth in employment, sales and assets terms and finds a negative relationship between size and growth in employment model, while it is positive for the sales model. On the other hand, the effect of size on growth is insignificant in the asset model. He also finds a negative relationship between the age and growth of firms predicted by Jovanovic (1982). (Jovanovic proposes the theory of "noisy" selection. This theory emphasizes managerial efficiency and learning by doing as the key factors determining a firm's growth dynamics. Efficient firms grow and survive, while inefficient firms decline and fail. Size differences are explained not only by the fixity of capital but also by the production efficiency of firms. Firm growth and survival are linked to the firm's size, age and initial production

efficiency, implying that younger firms tend to grow faster than older ones.), while it is positive in assets and sales growth models.

The empirical literature indicates that firm characteristics other than size and age may also play important roles in the growth of firms. The characteristic factors include ownership structure (Variyam and Krybill, 1992), research and development activities (Hall, 1987), capital structure (Lang et al., 1996), human capital and export activities (Liu et al., 1999). Cantner et al. (2006) reports that among the firm specific characteristics are the capital intensity and the initial endowments of the firms. Recent findings indicate that firms that grow successfully do so by first securing profitability, and then go for growth. Firms that grow at low profitability apparently often end up in the undesirable state of low-growth and low profits instead. Cowling (2004) concluded that profit and growth tended to move together and Cox et al. (2002) found a positive relationship between sales growth rate and profitability. However, Sexton et al. (2000) found a weak correlation between sales growth and profitability. Davidsson et al. (2005) show that firms originating in the high profit/low-growth category were about two to three times more likely to end up in the desirable high-growth/high profit category as were firms originating in the high-growth/low profit category. The latter category was instead strongly over represented among firms regressing to a low profit/low-growth position. This is strong reason to caution against a universal and uncritical growth ideology and for small firm owner to secure profitability before they go for growth. The idea of growing in order to become profitable seems a much more questionable prospect.

Independent firms are more flexible whereas firms affiliated with a group have access to different and more resources (Barney, 1991; Morris and Trotter, 1990). It is

possible that increased flexibility related to independence leads to a higher probability in identifying opportunities, but a lower probability of exploiting them due to the lack of resources. For firms affiliated to a company, the logic would be the reverse. The increased availability of resources leads to a higher probability of exploiting opportunities, but a lower probability of identifying them due to the lack of flexibility.

Industry Level Factors

Evidence suggests that firm growth is to a certain extent externally determined and industry characteristics may serve to insulate some firms, ensuring them higher than normal return. The industry characteristics can create an environment in which an individual firm may improve its position relative to its competitors by taking advantage of existing opportunities or emerging trends in the industry. However, industries vary along dimensions such as dynamism, heterogeneity, hostility and munificence, and these external factors largely determine how and how much the firm grows. The nature of the industry in which a firm operates offer opportunities for management to apply strategies that lead to growth. Pant (1991) argues that not all industries offer equal opportunities for sustained profitability, and at the same time, a firm can clearly improve or erode its position within an industry. It has been shown that rapidly growing firms are generally found in industries and regions that are more dynamic and in highly innovative industries the failure rate for new entrants is also higher. In more innovative industries, on the other hand, firm growth is higher in the early years of establishment provided that the firm survives. Growth firms in

industries that are stagnant overall are often found in dynamic growth niches within these industries.

Henrekson and Johansson (1999) argue that the size distribution of firms may largely be determined by institutional factors. Conditions have been unfavorable for small firms, start-ups, less capital-intensive firms and family-owned businesses, resulting in a reduction of their growth potential. There are a number of industrial and institutional factors that are unique to each industry and they affect the development of the firms in the studied population. Given this line of reasoning, it is expected that the industry affiliation of a firm affects its growth.

As described in Audretsch et al. (1999), post-entry performance of new firms is thought to be determined either by "deterministic" or "stochastic" approach. The deterministic approach tends to explain the growth of a firm and the process of concentration by firm behavior and observable industry characteristics whereas the stochastic approach assumes that future values of measures of different firms' profit rates, size, market share, and past growth will differ solely by chance. Among industry specific factors are entry and exit barriers, minimum efficient scale (MES) in a given industry, sunk costs, R&D expenditures leading to innovativeness and patent protection holdings, labor market regulations and start-up size of the entrant firms. Klapper et al. (2006) state that (i) financial development, (ii) labor regulation and (iii) protection of intellectual property are other aspects of the business environment that affect firm growth.

Kumar, Rajan and Zingales (2002) find that the average size of firms in human capital and in R&D intensive industries is larger in countries that protect property rights and patents. Claessens and Laeven (2003) find that growth of industries that

rely on intangible assets is disproportionately lower in countries with weak intellectual property rights.

Using two related but distinct indicators of industry competitiveness, Mengistae (2006) finds that both the probability of business survival and the average business growth rate are lower in more competitive industries. Audretsch et al. (1999) find that start-up size is positively correlated with survival in nine industrial sectors out of thirteen and significant (90% of confidence) only in three sectors. Klapper et al (2006) find no clear evidence that the probability of survival tends to be higher in sectors where the start-up size is larger, and there are some sectors (like mining and transformation of metals and rubber and plastics) where a very small start-up size is associated with high survival rates. The substantial variations in survival rates across manufacturing industries are consistent with the findings of previous studies that specific characteristics of an industry shape the post-entry performance of firms in that industry. We shall give more detailed explanation on how the characteristics of an industry affect firm growth in the following paragraphs.

Entry and Exit Barriers

Djankov et al. (2002) state that an entrepreneur has to obtain all necessary permits and licenses, and complete all the required inscriptions, verifications and notifications to enable the company to start operation. Typical procedures associated with setting up a firm procedures are divided into five by their function: (i) screening (a residual category, which generally aims to keep out unattractive projects or entrepreneurs), (ii) health and safety related issues, (iii) labor related issues, (iv) tax related issues, and (v) environmental issues. The cost of entry regulation is calculated

on all identifiable official expenses, such as fees, costs of procedures and forms, photocopies, fiscal stamps, legal and notary charges, etc. Based on entry regulation data in 85 countries, they find that (i) the number of procedures required to start up a firm varies from the low of two in Canada to the high of twenty-one in the Dominican Republic, with the world average of around ten, (ii) the minimum official time for a start-up varies from two business days in Australia and Canada to 152 business days in Madagascar, assuming that there are no delays by either the applicant or the regulators, with the world average of forty-seven business days, (iii) the official cost of following these procedures for a simple firm ranges from under 0.5% of per capita GDP in the US to over 4.6 times per capita GDP in the Dominican Republic, with the worldwide average of 47% of annual per capita income.

Klapper et al. (2006) report the direct costs of setting up a new business as percentage of per capita GNP in US dollars. They find large variations in the cost of entry, varying from a high cost of 86% of GNP per capita in Hungary to a low cost of 1% of GNP per capita in Finland and the UK. They find high entry rates in the computer and communications industries in the United States and low entry rates in industries such as manufacturing of basic metals and machinery. In general, they see higher entry rates in high-tech sector and lower entry rates in basic manufacturing related sectors as well as traditionally more concentrated industries (such as chemicals).

Klapper et al. (2006) state that firms are more likely to enter and receive start-up financing if bankruptcy proceedings are less costly in the case of default. Using the actual cost of bankruptcy proceedings as the percentage of the estate from Djankov et al. (2003), they find that entry is higher in high entry industries in

countries with lower cost of bankruptcy and entry is significantly higher in high entry industries in countries where tax rates on corporate income are much lower than those on personal income.

Klapper et al. (2006) also find that average value added of new firms in high-entry industries is disproportionately higher in countries that have higher entry costs meaning that not only do bureaucratic entry regulations discourage a number of small firms from setting up, they also force others to grow without the protection of limited liability until they get the scale to afford the cost of incorporation.

Pant (1991) states that low industry concentration and low barriers to entry mean that firms in the industry are not insulated from the threat of competition. Sellers are not free to raise prices, to increase profits or offset cost inefficiencies. Mengistae (2006) argues that the more competitive is an industry the lower is the average price-cost margin and the higher the business failure rate in it. Klapper et al. (2006) argue that if entry regulations only serve to protect incumbents and prevent the disciplinary effects of competition, incumbent firms are less likely to be able, or forced, to enhance productivity. Therefore, older incumbents in protected industries rely more on the rents from incumbency than on efficiency gains assuming that lower regulatory barriers allow for more disciplining entry. That is, older firms who have had to survive greater competition in countries with low entry barriers, are becoming relatively more efficient. Their results suggest that (i) entry regulations adversely affect the growth of industries that might be presumed to benefit most by the added selectivity that such regulation might bring, (ii) incumbent firms in naturally high entry industries have relatively less growth in value added when they are in a country with high entry regulations, (iii) incumbent firms in industries with smaller scale tend

to increase productivity more slowly in countries with high regulatory entry barriers. Therefore, low barriers to entry imply that firms in the industry are not able to generate above average existing profits.

Campbell (1996) states that previous research on new firm entry measure barriers to entry by variables such as the advertising to sales ratio, the ratio of spending on research and development to sales, the minimum efficient size of a plant as a percentage of the market size, the amount of capital needed to build a plant of minimum efficient size, and the degree of concentration. Additionally, he states that previous research on new firm entry measure industry profitability by (i) the industry profit rate, (ii) the average industry price-cost margin, and (iii) the growth rate of the industry. Orr (1974) uses net income plus interest payments to total assets as proxy for industry profit rate whereas Mengistae (2006) uses the industry sample mean of the ratio of gross profits to annual sales as proxy for the industry average price–cost margin. A positive relationship between new firm entry and industry profitability and a negative relationship between new firm entry and barriers to entry is found in Campbell (1996).

Klapper et al. (2006) use a measure of dependence on external finance (the industry-level median of the ratio of capital expenditures minus cash flow over capital expenditures) as the industry characteristic. They also calculate an industry level measure of reliance on supplier trade financing, the proxy of which is the average ratio of accounts payable to total assets across all firms in the industry. They use alternative measures of access to financing. First, as a measure of banking development they include the ratio of domestic credit to the private sector to GDP. Second, as a proxy for capital market development they use the ratio of stock market

capitalization to GDP. They find that (i) entry is higher in more financially dependent industries in countries that have higher financial development and (ii) industries with higher dependence on trade credit financing exhibit higher entry rates in countries with greater availability of trade credit.

Minimum Efficient Scale (MES) of the Industry

Variables related to the economic environment are investigated by Audretsch and Mahmood (1994, 1995) and Mata and Portugal (1994). They find that minimum efficient scale (MES) and the intensity of competition generally increase the risk of failure at each point in time, on the condition that the firm had survived up to the previous time period (hazard rate), but the growth of the market tends to reduce the risk of exit. Audretsch (1995) states that performance of firms will be influenced by the degree of scale economies in an industry. Santarelli and Vivarelli (2007) argue that smaller entrants with a suboptimal size are at high risk of early failure and they must grow in order to survive the stringent market selection in operation. From an empirical point of view, this means that smaller entrants should be characterized by both higher failure rates and higher growth rates (conditional on survival), as found in the previous research. In industries where the MES is high, the post-entry growth rates of the surviving firms will be high. However, new firms that do not able to reach the MES level of output will be forced to exit from the industry, resulting in a relatively low likelihood of survival. In industries with low MES lower growth but higher survival rates are expected. Similarly, in industries where the probability of innovation is greater, one would expect that the growth of successful enterprises would be greater, but likelihood of success would be lower.

Audretsch (1991) measures MES as the mean size of the largest plants accounting for one-half of the industry value-of-shipments. Mata (1996) argues that the extent of economies of scale is measured by three variables: (i) MES, (ii) market size (both included in logs to take interactive effects into account), (iii) the extent of *suboptimal* operations (defined as the proportion of total industry employment in plants smaller than MES). Large values of suboptimal signal minor disadvantages of being smaller than the MES and suggest a reduced pressure to start at large scale. Görg et al. (2000) measure MES as the log of average employment size.

R&D Expenditures and Patent Holding

According to Pant (1991), industry growth and R&D may provide a dynamic marketplace where individual firms can improve performance. Industry growth influences entry by new firms and expansion by existing firms which adjust the scale of production to anticipated growth. Investment in R&D can lead to consumer product innovations as well as productivity improvements. Such innovations thus can result in industry disequilibrium allowing some firms to expand their businesses and to improve their competitive market positions.

The innovative environment of the industry has also been hypothesized to influence the post-entry performance of firms with the assumption that less risk-averse entrepreneurs would be attracted to enter industries with high-innovation opportunity. In such industries, one would expect the growth of successful enterprises to be greater, but the likelihood of survival would be correspondingly lower. Audretsch (1991, 1995) suggests that the likelihood of survival tends to decrease as the degree of innovative activity in an industry increases. But the growth

rates of those firms that do survive tend to be positively related to the degree of innovative activity in the industry.

As Del Monte and Papagni (2003) point out, consideration should be given to the fact that one of the main effects of R&D is the creation of entry barriers. The nature of the research activity of incumbent firms is such that it limits the entry of new firms and that obviously affects the concentration of the market.

Strong patent protection could prevent entry of new firms because it protects incumbents and forces new entrants to carve a wide path around existing intellectual property. On the other hand, new entrants do not have the organizational structure, finance, or intellectual capital to create a significant first mover advantage and thus dissuade potential imitators. As a result, they might have a greater incentive to do research if they know their research will be protected legally.

Though it is generally expected that a firm which do research grow faster than those that do not do research with the assumption that the firm which have developed a superior product/technology will be able to obtain extra profits. However, as Del Monte & Papagni (2003) conclude, the length of time over which such advantage may be retained decreases over the years, especially in the sectors with the main opportunities for innovation. Thus, it is necessary to continue innovative actions. These aspects explain why it is not always possible to find a clear relationship between indexes of R&D intensity and indexes of firm profitability.

Del Monte & Papagni (2003) find that firms that have implemented R&D have growth rates that exceed those of other firms. On average, R&D firms have grown more than 56% in terms of sales and almost 18% in terms of employees, as opposed to 47.4% and 10.4% for other firms. This difference in the growth rate

between the sample of firms with R&D and that of firms without R&D is statistically significant. However, their finding that the effect of research on firm growth is greater in the traditional sectors than in the sectors with high research intensity is not in parallel with previous research findings. According to the researchers, Italian firms in traditional sectors enjoy high competitiveness with respect to foreign firms which means Italian firms that do research manage to create patents that allow them to enjoy a comparative advantage not only with respect to Italian firms that do not do research, but also with respect to foreign firms. In other sectors where Italian firms perform less research effort with respect to foreign firms, those firms can only gain advantage over non-R&D Italian firms. Therefore, in sectors with high research intensity, no significant differences are found between the firms that do research and those that do not.

The industry variable, R&D, is a measure of dependence on research and development and equals the industry-level median of the ratio of research and development expenses to sales for firms in the same industry. The numerator and denominator are summed over all years for each firm before dividing.

Del Monte & Papagni (2003) show the results of previous research performed by various authors for the last twenty years. A significant relation between research intensity and firm growth has not always been found but (i) research intensity measured by the R&D/sales ratio has a positive effect on the growth rate of firms in four out of seven works, (ii) index of innovation based on patents has a positive effect on two out of eight works. Literature generally report that though the difference of growth of firms with and without R&D is greater for high-tech industries, that does hold true for the firms in traditional sectors where there are

fewer technological opportunities and R&D investments do not constitute a major barrier for the entry of new imitating firms.

Audretsch (1991) defines total innovation rate as the total number of innovations divided by industry employment. The small firm innovation rate is defined as the number of innovations contributed by firms with fewer than five hundred employees divided by small-firm employment.

The Effects of Advertising

Mueller and Rogers (1980) find that in highly concentrated industries, advertising by a firm either negated the erosion of concentration level or increased the already high concentration level. They also find that in industries with low initial concentration, an increase in advertising increased concentration. This new advertising investment might help firms improve their relative position within an industry while concurrently insulating these firms from the threat of subsequent new entrants.

Audretsch (1991) argues that advertising intensity, measured as industry expenditures on advertising divided by value-of-shipments, is expected to be negatively related to new-firm survival for at least two reasons. First, the effect of advertising on firm revenues is subject to economies of scale that result from the increasing effectiveness of advertising message per unit of output. Second, to the extent that scale economies exist in either production or advertising, the need to obtain funds for advertising will tend to aggravate the inherent size disadvantage of newly established firms.

Ray and Hutchinson (1983) examine the financial records of a sample of thirty-three "super growth" enterprises for ten years before their listing, and for four years after. To provide a benchmark, they also examine a matched sample of small enterprises that did not grow and achieve listing. The provision of historical financial reports did not differ markedly between the growth enterprises and a matched sample of non-growth enterprises.

Thomas and Evanson (1987) report the results of a study of 398 small pharmacies. Using regression analysis, the researchers were unable to demonstrate a significant association between the number and frequency of use of financial ratios and enterprise profitability or survival. Thomas and Evanson (1987) hypothesize that this may have been due to a lack of sophistication in financial ratio interpretation that prevented usage from making a discernible difference to performance.

McMahon and Davies (1994) rejects the null hypothesis that enterprises with different values for the simple financial reporting index come from populations with similar values for the rate of growth in net profit. The evidence shows there is apparently no statistically significant association between rates of growth in turnover and employment achieved by participating enterprises and their historical financial reporting practices. The present results seem to be consistent with Ray and Hutchinson's (1983) finding that provision of historical financial reports did not differ markedly between growth enterprises and a matched sample of non-growth enterprises. He also reports that for the small growth enterprises in the study, there did not appear to be substantial associations between undertaking more

comprehensive historical financial reporting and use of financial ratio analysis and achieved rate of growth and financial performance.

McMahon (2001) tests his hypotheses by producing financial profiles for the low, moderate and high-growth SMEs, and calculating fifteen common financial ratios for each business for each of the four years of investigation. Using typical values for each financial ratio across the relevant businesses, financial profiles are separately produced for each dominant SME development pathway. He finds that the experience of growth has not influenced the return on investment, asset structure, financial structure, liquidity, and solvency ratios of the SMEs studied. Moreover, he found no evidence that higher growth has led to a greater incidence of common financial problems such as over-trading, liquidity crises, and inappropriate financing but he concludes that higher growth SMEs have higher margins and higher growth SMEs have lower activity or asset utilization measures. He reports that these findings represent a departure from much received knowledge in SME financial scholarship to date. Hutchinson (1987, 1989) and Davidson and Dutia (1991), amongst others, believe that the explanation for differences in financial profiles with enterprise size or growth in prior research mainly rests on the existence of a finance gap for SMEs when it comes to medium-to long-term debt or equity capital for development purposes. If this argument is accepted, then the apparently limited influence of enterprise size or growth upon the financial profiles of SMEs in this study could be construed as evidence that any finance gap which may have existed has been gradually closing over time.

Locke and Scrimgeour (2003) find considerable heterogeneity in the financial ratios. Therefore, they suggest that there is potential danger in using broadly based

financial benchmarking figures for comparative purposes and industry grouping data are necessary for all comparative purposes.

Becchetti and Trovato (2002) conclude that empirical tests of the law entail three main short-comings: (i) they only consider size and age as potential variables which may significantly affect firm growth; (ii) they do not adjust their results for market rents and industry effects, (iii) they test the effect of a variable at a time neglecting cross-correlation among potential explanatory variables. Their findings are (i) small surviving firms have higher than average growth potential, (ii) the rent-adjusted rate of growth is not due to chance and is not just affected by size and age, (iii) "growth independence" does not hold both even after correcting for market power and industry characteristics, (iv) firms with higher availability of external finance (high leverage firms) grow much more than low leverage firms with the difference being more than double for firms with less than fifty employees, (v) firms whose budget constraint is softened by state subsidies exhibit a relatively higher growth rate.

CHAPTER 3: EMPIRICAL RESEARCH DESIGN

Research Questions and Hypotheses

Research Questions

The main research questions in this study are:

1. Which financial ratios are most important in determining growth?
2. Does size and age affect the growth of SMEs in Turkey?
3. Which characteristics of the industry affect firm growth?

Hypotheses

The hypotheses regarding these research questions are:

H1. There are statistically significant differences between some of the financial ratios of high-growth firms and those of low-growth firms.

H2. High-growth firms tend to be smaller.

H3. High-growth firms tend to be younger.

H4. Average growth rates of SMEs are lower in industries where there is more competition.

H5. In industries with low minimum efficient scale (MES), the growth rate of the firms shall be low.

H6. The growth rates of firms in R&D intensive industries tend to be low.

H7. The growth rates of firms in innovative industries tend to be high.

Methodology, Research Model and Variables

Methodology

In order to test the aforesaid hypotheses, Repeated Measures ANOVA test shall be used to find the statistically significant financial ratios between high and low-growth firms. Then, to test the firm level effects on growth, the dependent and independent variables shall be defined, firms in the sample shall be grouped according to their industries and regression analyses shall be run by adding the non-financial variables to the financial ratios which are to be found statistically significant between high and low-growth firms. In order to study the effects of industry on firm growth, a series of regression analyses shall be run using the financial ratios, but the industry characteristics shall be proxied by relevant variables. All analyses shall be performed with SPSS 18 statistics program and throughout the analyses, we shall accept .01 significance level as the confidence criteria.

However, the problem of intercorrelation is a limiting factor in this type of study. One expects ratios to be highly multicollinear since many ratios are formed from a common set of financial accounts. In this case, entering the variables to the regression equation through the normal step-wise procedure may limit multicollinearity. In stepwise method, the second and subsequent variables having a significant simple correlation-coefficient with an included variable are excluded from the set of variables. After three or four variables are accepted, the number of variables free to enter the function is substantially reduced because ratios tend to be highly correlated. Although this method is somewhat arbitrary, the most obvious type of pair-wise interdependence is avoided.

Research Model and Variables

Testing the Firm Level Effects

Research Model

It is expected that sales growth of a firm is a function of its financial ratios as well as its non-financial characteristics/specifications. It is also expected that the characteristics of the industry which the firm operates in play significant role in determining its growth. The growth equation that is to be used in testing the firm-level effects employs financial and non-financial characteristics of the firms and it is a mixture of the growth equations proposed by Honjo and Harada (2006), and Becchetti and Trovato (2002). The growth equation that it is to be used in this study is as follows:

$$SALESGROWTH_t = \beta_0 + \beta_1 SIZE_t + \beta_2 AGE_t + \beta_3 INDUSTRY_t + \sum_{j=1}^{n} \beta_{j,t} RATIO_{j,t} \qquad (1)$$

where SALESGROWTH is growth in sales of the firm, SIZE is the number of employees of the firm, AGE is the age of the company from the year of establishment to the data collection year, INDUSTRY is a dummy used for controlling the industry group that the firm operates in according to NACE (Nomenclature statistique des Activités Économiques dans la Communauté Européenne) Rev.1.1 and RATIO is the financial ratio(s) which is (are) shown to be statistically significant for differentiating between high and low-growth firms. In order to assess which financial ratio(s) is(are) statistically significant for

differentiating high and low-growth firms, firms shall be grouped as high and low-growth ones and Repeated Measures ANOVA test shall be performed.

Apart from earlier studies, another growth measure, which is named as industry-adjusted growth rate, ADJ_SALESGROWTH, is used. The assumption in defining this measure is that a firm can grow just because the industry provides the background/opportunity and, in the extreme case, the growth rate of a firm can merely be defined by the industry that the firm operates in. Therefore, it is essential that the growth rate must be adjusted to neutralize the effects of the industry. The second growth equation is as follows:

$$ADJ\_SALESGROWTH_t = \beta_0 + \beta_1 SIZE_t + \beta_2 AGE_t + \sum_{j=1}^{n} \beta_{j,t} RATIO_{j,t} \qquad (2)$$

where *ADJ_SALESGROWTH* is calculated as

$$ADJ\_SALESGROWTH_t = SALESGROWTH_t - INDSALESGROWTH_t \qquad (3)$$

The variable INDSALESGROWTH in the equation is the sales growth rate of the industry group that the firm operates in.

Variables

The Dependent Variable

The dependent variable in this study is the firm growth. However, there is no unique method to measure firm growth for a given period as explained earlier (see, for example, Delmar et al. 2003). There has been an important debate about how to

measure firm growth. Generally used growth rates fall into two categories (Weinzimmer 2000, Delmar et al. 2003), namely, single indicators (sales, assets, employment growth rates) and multiple indicators (the combination of the single indicators). Sales growth rate shall be used as the indicator of firm growth and it shall be calculated as dividing the difference of sales data between the i^{th} and $(i-1)^{th}$ years to the sales data of $(i-1)^{th}$ year.

Similarly, many classifications can be used in order to group firms as high and low-growth ones. According to Storey (2001), high-growth firms are firms that have achieved a sales growth of at least 25% in each of the four years for businesses with current sales of £5–10 million, or of at least 15% for businesses with current sales amounting to £10–100 million. According to the National Commission on Entrepreneurship, high-growth firms increase their headcount by at least 15% per year. According to Birch et al. (1994), high-growth firms achieve sales growth of at least 25% per year. Moreno and Casillas (2007) categorize the firms with a growth rate higher than 100% which takes place in a relatively short period of time (normally a period of three or four years) as high-growth ones. Table 3 gives all growth measures that are used in the analyses.

Table 3 Dependent Variable Measures

Variable	Definition
HG195	Firms achieving a growth rate of at least 95% on average during the 2004-2007 period shall be categorized as High-Growth firms.
HGMedian	Firms achieving a growth rate of more than the median of the average growth rate of all firms during the 2004-2007 period shall be categorized as High-Growth firms.
IND ADJ HG195	Firms achieving an “excess” growth rate (compared to the growth rate of the industry group that they operate in) of at least 95% on average during the 2004-2007 period shall be categorized as High-Growth firms.
IND ADJ Median	Firms achieving a growth rate of more than the median of the average “excess” growth rate of all firms (compared to the growth rate of the industry group that they operate in) during the 2004-2007 shall be categorized as High-Growth firms.

The Independent Variables

Financial Variables

It is expected that financial ratios can be used to predict SME growth. Recent studies showed that a few ratios can be combined to make a discriminant function with a high degree of reliability. Although some ratios are found to be good predictors of firm growth in previous research, these ratios are not common in all studies.

Ratios showing the liquidity, financial position, turnover and profitability of each company shall be included in this study. These ratios are calculated by the Central Bank of the Republic of Turkey (CBRT) using the firm level data and the definitions of these ratios are given in Appendix-A.

Control Variables

Empirical tests have generally adapted the strategy of computing a large group of ratios and then letting statistical methods reduce that set (Keasey and Watson, 1991). Storey et al. (1987), and Keasey and Watson (1988) conclude that qualitative variables provide a useful addition to financial ratios. Keasey and Watson (1987) find that models containing non-financial information were robust and significantly outperformed the models utilizing financial ratios alone. According to Storey et al. (1987), when non-financial variables were used in conjunction with financial ratios, the prediction power is significantly improved.

The control variables shown on Table 4 shall be used in testing the afore-mentioned hypotheses.

Table 4 Control Variables Used in the Analysis

Variable	Definition	Calculation
SIZE	Number of employees	Average number of workers for any given year
AGE	Age of the company	Difference between data collection year and the year of start-up
INDUSTRY	Industry group that the firm operates in	A dummy is used for controlling the industry group. The industry groups are created according to NACE classifications. 1. Food Products, Beverages and Tobacco 2. Textiles and Textile Products 3. Leather and Leather Products 4. Wood and Wood Products 5. Pulp, Paper and Paper Products, Publishing and Printing 6. Coke, Refined Petroleum Products and Nuclear Fuel 7. Chemicals, Chemical Products and Man-Made Fibers 8. Rubber and Plastic Products 9. Other Non-Metallic Mineral Products 10. Basic Metals and Fabricated Metal Products 11. Machinery and Equipment Not Elsewhere Classified 12. Electrical and Optical Equipment 13. Transport Equipment 14. Manufacturing Not Elsewhere Classified

The Effects of Industry Characteristics on SME Growth

Research Model

Testing the industry level effects is similar to testing the firm level effects, but the difference is that instead of using a dummy for each industry group in the regression equation, the variables that characterize the industry environment are used. Therefore, the regression analyses shall be run for the following equations in order to find the industry characteristics that affect the growth rate of the SMEs.

$$SALESGROWTH = \beta_0 + \beta_1 EntryBarrier + \beta_2 MES + \beta_3 Innov + \beta_4 (R\&D) + \sum_{j=1}^{n} \beta_j RATIO_j \quad (4)$$

$$ADJ\_SALESGROWTH = \beta_0 + \beta_1 EntryBarrier + \beta_2 MES + \beta_3 Innov + \beta_4 (R\&D) + \sum_{j=1}^{n} \beta_j RATIO_j \quad (5)$$

The variables other than RATIO represent the characteristics of the industry environment and the details of each variable are given below.

Variables

The Dependent Variable

The dependent variable is firm growth and four different growth measures shall be used as described in Table 3.

The Independent Variables

We shall use entry barriers, minimum efficient scale (MES), innovativeness and R&D intensity of the industry as independent variables. The effects of these variables to the firm growth and how these variables can be measured or proxied have been given the literature survey section. Though all measures of any independent variable mentioned in the literature are not used because of the limitations of the sample, as many measures as possible for each independent variable that the sample allows shall be employed. Table 5 gives the definitions and measurements of the independent variables that shall be used to find out the effects of industry on firm growth. All industry-level measures are calculated using the industry-level data, that is, the data of the firms in a specific industry are grouped according to NACE Rev.1.1 to produce industry-level measures. All measures are calculated using yearly data. The

industry-level data is not limited to the sample of SMEs since large companies dominate in many sectors. Therefore, in order to calculate the industry-level measures, the data of both large companies and SMEs are used.

Table 5 Industry Level Independent Variables

Variable	Definition	Calculation
Entry	Entry Barriers	Industry price-cost margin Industry profit rate Industry growth rate Ratio of advertising cost to sales revenue Degree of concentration (CR_8)
MES	Minimum Efficient Scale of the Industry	Log of average employment in an industry
Innov	Innovativeness of the Industry	Number of patents in industry / Industry employment
R&D	R&D Intensity of the Industry	Industry-level median of the ratio of R&D expenses to sales revenue

As can be seen from the table, calculation of MES, Innov and R&D variables is straightforward. Gross profits to annual sales ratio is used for the industry price-cost margin (Mengistae, 2006), whereas industry profit rate measure is proxied by net income to total assets ratio (Orr, 1974). Industry growth rate shall be calculated by using industry level sales data. For the degree of concentration, ratio of the sales of the biggest eight companies to sales of all companies in that sector shall be used.

CHAPTER 4: DATA AND SAMPLE

Firm-level data is mainly provided by the Central Bank of the Republic of Turkey (CBRT). CBRT conducts a survey yearly and collects the specifications and financial statements of the volunteer firms from different industries. These firms are selected regardless of their age and size and are not limited to manufacturing sector. Though the total number of firms in the database is changing yearly, there are more than 12,000 firms in the database for each year. However, not all firms share their full data; some firms do not disclose the year of establishment data whereas some do not disclose their number of employees, sales and/or balance sheet data. Industry-level data (excluding patents data) are mainly provided by Turkish Statistical Institute (TSI), whereas patents data are obtained from Turkish Patent Institute (TPI). TSI compiles the data from its surveys and administrative registers of the other organizations. Though these institutions publish reports and books on regular basis, they do not disclose firm-level data and their databases are not available to public. However, Ph.D students and scholars are able to reach these databases if they sign contacts with CBRT and TSI which state that data shall be analyzed within these institutions and confidentiality of the data shall be provided. In order to reach these databases, contracts were signed with CBRT and TSI, and it is guaranteed that any firm-level data shall not be disclosed. One interesting thing worth stating here is that using the database of CBRT is free of charge, whereas TSI charges every working hour 12 TL + 18% VAT (value added tax).

Only the firms which are operating in the manufacturing sector are included in the sample. In order to exclude the large firms, the SME definition of Turkish Ministry of Industry and Trade (TMIT) is used. That is, firms having less than 250

people and having annual net sales revenue or a financial balance-sheet of up to twenty-five million TL are classified as SMEs[1].

The sample covers the 2004-2006 period, but the sales growth rates are calculated using also the 2007 sales data. The sample consists only the surviving firms since the data of the non-surviving firms are not available. Therefore, the sample has survivorship bias. The following table gives the number of SMEs without any missing data for each year of the sample. It should be noted that in order to include an SME in the analysis, that particular SME must have full data in the 2004-2007 period. This limits the sample to 2,256 firms.

Table 6 Number of SMEs in the sample (According to TMIT definition)

Year	2004	2005	2006	2007
Number of SMEs	3,560	3,297	2,673	2,436

SMEs in the sample are also divided into sub-groups taking different growth measures (defined in Table 3) into account. Table 7 gives the number of high and low-growth SMEs in the sample for each growth measure.

Table 7 Number of High and Low-Growth SMEs in the Sample

	Growth Measures			
	HG195	HGMedian	IND ADJ HG195	IND ADJ Median
High-Growth Firms	606 (26.86%)	1,128 (50%)	342 (15.16%)	1,128 (50%)
Low-Growth Firms	1,650 (74.14%)	1,128 (50%)	1,914 (84.84%)	1,128 (50%)

[1] Apart from the definitions of EU and TMIT, CBRT takes five hundred as the maximum number of workers for a firm to be classified as SME. Therefore, the numbers of SMEs in the manufacturing sector as well as the key figures of these companies were re-calculated.

The following table gives the average growth rate of SMEs during the 2004-2007 period, where number of employees, total assets and net sales are selected as indicators of growth.

Table 8 Average Annual Growth Rates of SMEs in the 2004-2007 period

	TMIT Definition		
	Avg. Annual Growth Rate	# SMEs > Avg. Growth Rate	% SMEs > Avg. Growth Rate
Number of Employees	1.25	741	32.66
Total Assets	1.81	860	37.90
Net Sales	1.95	608	26.80

Table 9 shows the descriptives of the firm-level variables other than ratios, which are AGE and SIZE. As can be seen from the table, the mean values of age and size of the firms in the sample suggest that SMEs in the sample are, in general, mature and medium-sized rather than being young and small-sized.

Table 9 Descriptives of AGE and SIZE variables

	Minimum	Maximum	Mean	Median	Std. Dev.
AGE	2	89	18.18	16.20	9.61
SIZE	1	250	64.32	47.56	49.52

The manufacturing sector is divided into two-digit sub-groups according to NACE Rev. 1.1 classification. Table 10 gives the number of SMEs (according to TMIT definition) in each sub-sector. As stated before, since large firms form important part of the industries, industry-level data are calculated using the data of not only SMEs but also large firms.

Table 10 Number of SMEs in the Each Industry Sub-Sector

Code	Industry Sub-Sector	# of SMEs
DA	Food products, beverages and tobacco	369
DB	Textiles and textile products	509
DC	Leather and leather products	47
DD	Wood and wood products	73
DE	Pulp, paper and paper products, publishing and printing	83
DF	Coke, refined petroleum products and nuclear fuel	9
DG	Chemicals, chemical products and man-made fibers	141
DH	Rubber and plastic products	144
DI	Other non-metallic mineral products	134
DJ	Basic metals and fabricated metal products	231
DK	Machinery and equipment not elsewhere classified	206
DL	Electrical and optical equipment	94
DM	Transport equipment	125
DN	Manufacturing not elsewhere classified	91
TOTAL		2,256

Table 11 shows the price-cost margin for each industry sub-sector. The price-cost margin is highest in sector DI (other non-metallic mineral products) with a value of 0.30 on average and lowest in sector DF (coke, refined petroleum products and nuclear fuel) with a mean value of 0.06.

Table 11 Industry Price-Cost Margin for Each Industry Sub-Sector

Code	Industry Sub-Sector	2004	2005	2006
DA	Food products, beverages and tobacco	0.14	0.15	0.17
DB	Textiles and textile products	0.11	0.09	0.13
DC	Leather and leather products	0.16	0.16	0.17
DD	Wood and wood products	0.16	0.16	0.11
DE	Pulp, paper and paper products, publishing and printing	0.22	0.23	0.24
DF	Coke, refined petroleum products and nuclear fuel	0.07	0.06	0.05
DG	Chemicals, chemical products and man-made fibers	0.24	0.23	0.25
DH	Rubber and plastic products	0.17	0.16	0.17
DI	Other non-metallic mineral products	0.29	0.30	0.31
DJ	Basic metals and fabricated metal products	0.15	0.09	0.14
DK	Machinery and equipment not elsewhere classified	0.23	0.21	0.24
DL	Electrical and optical equipment	0.15	0.13	0.16
DM	Transport equipment	0.14	0.12	0.13
DN	Manufacturing not elsewhere classified	0.13	0.13	0.15

As to the industry profit rates, the sectors with the highest profit rates are DG (chemicals, chemical products and man-made fibers) and DK (machinery and equipment not classified elsewhere) with a mean value of 0.28 and 0.27, respectively. The lowest profit rates are observed in industries DB (textiles and textile products) and DD (wood and wood products) with a mean value of 0.10 and 0.11, respectively.

Table 12 Industry Profit Rate for Each Industry Sub-Sector

Code	Industry Sub-Sector	2004	2005	2006
DA	Food products, beverages and tobacco	0.17	0.19	0.21
DB	Textiles and textile products	0.10	0.08	0.13
DC	Leather and leather products	0.17	0.17	0.18
DD	Wood and wood products	0.12	0.11	0.08
DE	Pulp, paper and paper products, publishing and printing	0.20	0.21	0.23
DF	Coke, refined petroleum products and nuclear fuel	0.19	0.19	0.19
DG	Chemicals, chemical products and man-made fibers	0.27	0.26	0.31
DH	Rubber and plastic products	0.18	0.18	0.19
DI	Other non-metallic mineral products	0.20	0.22	0.25
DJ	Basic metals and fabricated metal products	0.17	0.10	0.17
DK	Machinery and equipment not elsewhere classified	0.27	0.25	0.28
DL	Electrical and optical equipment	0.17	0.15	0.19
DM	Transport equipment	0.24	0.20	0.21
DN	Manufacturing not elsewhere classified	0.22	0.22	0.24

The NACE codes of each industry sub-sector and their relevant average sales growth rates are given in Table 13. The highest growth rate is observed in sector DD (wood and wood products) with a mean value of 84.12%, where lowest growth rate is seen in sector DB (textiles and textile products). As can be observed in Table 12, sector DB (textiles and textile products) also suffers from profit rates. However, the case of sector DD (wood and wood products) seems interesting because this sector is the one of the two sectors with lowest profit rates. Therefore, this result suggests that though a high growth rate is observed in sector DD (wood and wood products), the profit rate is very low.

Table 13 Average Sales Growth Rates of Industry Sub-Sectors (%)

Code	Industry Sub-Sector	2004-05	2005-06	2006-07	2004-07
DA	Food products, beverages and tobacco	14.97	12.22	11.97	44.46
DB	Textiles and textile products	-2.17	16.25	3.43	17.63
DC	Leather and leather products	4.41	23.87	2.68	32.80
DD	Wood and wood products	18.05	24.11	25.67	84.12
DE	Pulp, paper and paper products, publishing & printing	8.76	16.1	10.47	39.49
DF	Coke, refined petroleum products and nuclear fuel	3.45	35.88	2.5	44.08
DG	Chemicals, chemical products and man-made fibers	7.03	19.55	4.58	33.81
DH	Rubber and plastic products	15.27	28.55	12.33	66.45
DI	Other non-metallic mineral products	22.95	27.12	10.52	72.74
DJ	Basic metals and fabricated metal products	3.41	39.7	15.61	67.01
DK	Machinery and equipment not elsewhere classified	9.39	26.56	7.28	48.52
DL	Electrical and optical equipment	6.37	19.75	2.42	30.46
DM	Transport equipment	4.94	18.14	12.1	38.98
DN	Manufacturing not elsewhere classified	27.8	18.4	15.75	75.15

Table 14 shows the advertising to sales ratio for each industry sub-sector. The highest advertising to sales ratio is observed in sector DG (chemicals, chemical products and man-made fibers) with a mean value of approximately 15%, whereas the lowest figure is observed in sector DF (coke, refined petroleum products and nuclear fuel).

Table 14 Advertising to Sales Ratio for Each Industry Sub-Sector (%)

Code	Industry Sub-Sector	2004-05	2005-06	2006-07
DA	Food products, beverages and tobacco	5.49	6.51	7.05
DB	Textiles and textile products	4.20	4.48	4.29
DC	Leather and leather products	6.40	5.85	5.16
DD	Wood and wood products	3.67	4.01	4.35
DE	Pulp, paper and paper products, publishing and printing	8.57	9.20	9.24
DF	Coke, refined petroleum products and nuclear fuel	0.79	0.64	0.92
DG	Chemicals, chemical products and man-made fibers	14.36	15.43	14.52
DH	Rubber and plastic products	6.28	6.19	5.92
DI	Other non-metallic mineral products	8.81	8.49	7.70
DJ	Basic metals and fabricated metal products	3.05	3.06	2.60
DK	Machinery and equipment not elsewhere classified	7.74	7.90	8.06
DL	Electrical and optical equipment	4.18	5.16	4.92
DM	Transport equipment	2.93	3.46	3.55
DN	Manufacturing not elsewhere classified	7.21	7.19	7.28

As mentioned before, degree of concentration ratio for each industry sub-sector is calculated by taking the ratio of the total sales volume of the biggest eight firms in the sector to the total sales volume of all the firms in that sector. Table 15 shows that highest concentration is observed in sector DF (coke, refined petroleum products and nuclear fuel), whereas the lowest concentration is found is sector DA (food products, beverages and tobacco).

Table 15 Degree of Concentration for Each Industry Sub-Sector

Code	Industry Sub-Sector	2004	2005	2006
DA	Food products, beverages and tobacco	0.16	0.13	0.07
DB	Textiles and textile products	0.20	0.15	0.26
DC	Leather and leather products	0.15	0.18	0.16
DD	Wood and wood products	0.26	0.34	0.15
DE	Pulp, paper and paper products, publishing and printing	0.24	0.19	0.28
DF	Coke, refined petroleum products and nuclear fuel	0.77	0.56	0.58
DG	Chemicals, chemical products and man-made fibers	0.11	0.17	0.15
DH	Rubber and plastic products	0.37	0.21	0.17
DI	Other non-metallic mineral products	0.18	0.26	0.20
DJ	Basic metals and fabricated metal products	0.30	0.29	0.23
DK	Machinery and equipment not elsewhere classified	0.15	0.24	0.22
DL	Electrical and optical equipment	0.38	0.46	0.39
DM	Transport equipment	0.23	0.29	0.24
DN	Manufacturing not elsewhere classified	0.34	0.21	0.27

Table 16 gives the MES figures of each industry sub-sector. As can be seen, the highest MES figure is observed in sector DB (textiles and textile products) and the lowest figure is observed in sector DF (coke, refined petroleum products and nuclear fuel).

Table 16 MES Figures of Each Industry Sub-Sector

Code	Industry Sub-Sector	2004	2005	2006
DA	Food products, beverages and tobacco	5.42	5.44	5.46
DB	Textiles and textile products	5.85	5.86	5.85
DC	Leather and leather products	4.58	4.59	4.65

Table 16. continued

Code	Industry Sub-Sector	2004	2005	2006
DD	Wood and wood products	4.44	4.59	4.61
DE	Pulp, paper and paper products, publishing and printing	4.86	4.96	4.95
DF	Coke, refined petroleum products and nuclear fuel	3.80	3.79	3.83
DG	Chemicals, chemical products and man-made fibers	4.90	4.95	4.92
DH	Rubber and plastic products	4.98	4.99	5.05
DI	Other non-metallic mineral products	5.08	5.14	5.19
DJ	Basic metals and fabricated metal products	5.28	5.35	5.39
DK	Machinery and equipment not elsewhere classified	5.16	5.22	5.23
DL	Electrical and optical equipment	4.94	4.98	5.01
DM	Transport equipment	5.09	5.16	5.22
DN	Manufacturing not elsewhere classified	5.02	5.11	5.13

Patents/Employment figures are calculated per 10,000 employee since the number of patents figures in each industry sub-sector are very small. As it is reported in Table 17, the highest figures are observed in sectors DG (chemicals, chemical products and man-made fibers) and DK (machinery and equipment not classified elsewhere), whereas the lowest figure is observed in sector DB (textiles and textile products).

Table 17 Patents/Employment (per 10,000 Employee) for Each Industry Sub-Sector

Code	Industry Sub-Sector	2004	2005	2006
DA	Food products, beverages and tobacco	31.06	43.40	61.08
DB	Textiles and textile products	8.05	8.57	9.74
DC	Leather and leather products	57.92	53.79	55.77
DD	Wood and wood products	46.60	45.58	60.92
DE	Pulp, paper and paper products, publishing and printing	30.19	33.32	35.96
DF	Coke, refined petroleum products and nuclear fuel	144.62	304.92	322.77
DG	Chemicals, chemical products and man-made fibers	802.11	1110.61	1826.10
DH	Rubber and plastic products	270.51	376.76	442.77
DI	Other non-metallic mineral products	100.58	143.49	161.85
DJ	Basic metals and fabricated metal products	177.38	251.91	277.02
DK	Machinery and equipment not elsewhere classified	831.89	957.01	1354.81
DL	Electrical and optical equipment	493.52	669.25	974.75
DM	Transport equipment	160.14	215.40	244.80
DN	Manufacturing not elsewhere classified	197.85	219.36	308.50

R&D/Sales ratio for each industry sub-sector is reported in Table 18. The highest R&D/Sales ratio is observed in sectors DL (electrical and optical equipment) and DG (chemicals, chemical products and man-made fibers), whereas the lowest figure is found to be approximately 0.01% in sectors DF (coke, refined petroleum products and nuclear fuel) and DD (wood and wood products).

Table 18 R&D/Sales Ratio for Each Industry Sub-Sector (%)

Code	Industry Sub-Sector	2004	2005	2006
DA	Food products, beverages and tobacco	0.14	0.14	0.16
DB	Textiles and textile products	0.09	0.12	0.13
DC	Leather and leather products	0.06	0.09	0.14
DD	Wood and wood products	0.01	0.01	0.02
DE	Pulp, paper and paper products, publishing and printing	0.31	0.12	0.12
DF	Coke, refined petroleum products and nuclear fuel	0.01	0.01	0.01
DG	Chemicals, chemical products and man-made fibers	0.61	0.51	0.45
DH	Rubber and plastic products	0.22	0.20	0.19
DI	Other non-metallic mineral products	0.25	0.34	0.26
DJ	Basic metals and fabricated metal products	0.07	0.07	0.05
DK	Machinery and equipment not elsewhere classified	0.76	0.75	0.77
DL	Electrical and optical equipment	0.78	0.92	0.86
DM	Transport equipment	0.77	1.13	0.66
DN	Manufacturing not elsewhere classified	0.04	0.06	0.08

CHAPTER 5: ANALYSES AND RESULTS

Before starting with the analyses, the correlations between the growth measures are calculated. As explained before, there are four different growth measures in the study (see Table 3). Therefore, if there are any correlations between different growth measures, this fact shall be used making comments about the analyses results. Table 19 shows the Pearson correlations between these growth measures.

Table 19 Correlations Between Growth Measures

		HG195	HGMedian	IND ADJ HG195	IND ADJ Median
HG195	Pearson Correlation	1	.606**	.698**	.606**
	Sig. (2-tailed)		.000	.000	.000
	N	2,256	2,256	2,256	2,256
HGMedian	Pearson Correlation	.606**	1	.423**	.793**
	Sig. (2-tailed)	.000		.000	.000
	N	2,256	2,256	2,256	2,256
IND ADJ HG195	Pearson Correlation	.698**	.423**	1	.423**
	Sig. (2-tailed)	.000	.000		.000
	N	2,256	2,256	2,256	2,256
IND ADJ Median	Pearson Correlation	.606**	.793**	.423**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	2,256	2,256	2,256	2,256
**. Correlation is significant at the 0.01 level (2-tailed).					

As can be seen from the table, all correlation values are significant at .01 level and the correlations between “HG195 and IND ADJ HG195” and “HGMedian and IND ADJ Median” are 0.698 and 0.793, respectively. Though these figures

represent high correlations between the growth measures, they shall not be grouped and the results shall be reported separately for each growth measure.

Repeated Measures ANOVA Test Results

In order to test H1 (there is statistically significant difference among some financial ratios of high-growth and low-growth firms), Repeated Measures ANOVA test is performed for different growth measures defined in Table 3. The term repeated measures refers to data sets with multiple measurements of a response variable on the same experimental unit or subject (Girden, 1992). In repeated measures designs, two types of variability are often concerned with: (i) between-subjects variability associated with different groups of subjects that are treated differently (equivalent to between groups effects in one-way ANOVA), (ii) within-subjects variability associated with measurements made on each individual subject. Since the main concern of the study is to find the ratios which are statistically significant between high and low-growth firms, between-subject test results shall be reported.

Table 20 gives the F-statistics and significance levels of the financial ratios which are found statistically significant between high and low-growth SMEs at .01 significance level. F-statistics and significance levels of the financial ratios which are found statistically significant between high and low-growth SMEs at .05 significance level are reported in Appendix-C. The results are also double-checked with univariate analysis (t-tests) and no significant difference is observed between the results. The ratios are classified according to their group, that is, liquidity, financial position, turnover and profitability ratios are separated in the table. As can be seen from Table 20, there is statistically significant difference among some financial ratios

between high-growth and low-growth firms that leads to accept H1. Specifically, fourteen out of forty-seven ratios seem to differentiate between high and low-growth firms for at least one growth measure at .01 significance level. As can be seen from Appendix-C, seventeen out of forty-seven ratios are found to be statistically significant between high and low-growth firms for at least one growth measure. The results shall be reported in three ways. First, the group of ratios (liquidity, financial position, turnover and profitability) shall be focused and their power of differentiation between high and low-growth firms shall be discussed. Then, the ratios which are most important in differentiating high and low-growth firms shall be mentioned. Finally, the differences between the ratios of high and low-growth firms for different growth measures shall be given.

Discrimination Power of the Group of Ratios

Out of eight liquidity ratios, there is only one ratio which is statistically significant for just one growth measure, HG195. Six out of seventeen ratios of financial position are statistically significant for at least one growth measure and more importantly four of these ratios are statistically significant for all growth measures. Three out of eight turnover ratios are statistically significant and they can only discriminate between high and low-growth firms when the growth measure is HG195 and/or IND ADJ HG195. Four out of fourteen profitability ratios are statistically significant between high and low-growth firms for at least two growth measures. More importantly, three of these ratios is significant for all growth measures. Therefore, it may concluded that ratios of financial position and turnover ratios are the most important ones in discriminating between high and low-growth firms.

Table 20 Repeated Measures ANOVA Test Results

			Growth Measures			
Ratio Type	Ratio	Definition	HG195	HGMedian	IND ADJ HG195	IND ADJ Median
Liquidity	X8	Short-Term Receivables to Total Assets	F=7.932 p=.005			
Financial Position	X9	Total Loans to Total Assets	F=15.276 p=.000	F=8.428 p=.004	F=14.476 p=.000	F=6.227 p=.013
	X10	Own Funds to Total Assets	F=15.623 p=.000	F=8.583 p=.004	F=14.381 p=.000	F=6.239 p=.013
	X12	Short-Term Liabilities to Total Liabilities			F=7.845 p=.005	
	X13	Long-Term Liabilities to Total Liabilities	F=12.522 p=.000	F=7.679 p=.006		F=7.534 p=.006
	X16	Tangible Fixed Assets to Long-Term Liabilities	F=20.523 p=.000	F=13.195 p=.000	F=11.823 p=.001	F=9.782 p=.002
	X20	Short-Term Liabilities to Total Loans	F=19.895 p=.000	F=14.505 p=.000	F=9.775 p=.002	F=8.394 p=.004
Turnover	X27	Receivables Turnover	F=6.754 p=.010			
	X28	Working Capital Turnover			F=6.741 p=.009	
	X33	Total Assets Turnover	F=8.754 p=.003		F=12.468 p=.000	
Profitability	X36	Profit Before Interest and Tax to Total Liabilities		F=26.293 p=.000		F=26.169 p=.000
	X37	Net Profit to Total Assets	F=9.965 p=.002	F=42.167 p=.000	F=6.453 p=.010	F=35.307 p=.000
	X38	Operating Profit to Assets Used in Carrying out the Operations	F=7.456 p=.007	F=40.656 p=.000	F=6.441 p=.010	F=33.635 p=.000
	X39	Cumulative Profitability Ratio	F=20.965 p=.000	F=20.341 p=.000	F=7.348 p=.007	F=10.747 p=.001

Discrimination Power of Individual Ratios

In this section, it shall be shown that which ratios are more “powerful” in differentiating between high and low-growth firms. The more the number of growth measures a ratio is statistically significant between high and low-growth firms, the more powerful that ratio is. The descriptives of these ratios for high and low-growth firms shall be dealt with in the next section.

i. Table 21 shows the financial ratios which are statistically significant for all growth measures. As can be seen, there are seven ratios in the table, since X9 (total loans to total assets) and X10 (own funds to total assets) are perfectly correlated. As mentioned before, all ratios in the table are financial position and profitability ratios. It should be noted that three of these ratios (X9, X10 and X16) relate assets (total or tangible fixed assets) to liabilities, one ratio (X20) shows the debt maturity of the firm, two of the ratios (X37 and X38) relate assets to profits and one ratio (X39) relates assets to reserves from retained earnings.

Table 21 Ratios Statistically Significant for All Growth Measures

			Growth Measures			
Ratio Type	Ratio	Definition	HG195	HGMedian	IND ADJ HG195	IND ADJ Median
Financial Position	X9	Total Loans to Total Assets	F=15.276 p=.000	F=8.428 p=.004	F=14.476 p=.000	F=6.227 p=.013
	X10	Own Funds to Total Assets	F=15.623 p=.000	F=8.583 p=.004	F=14.381 p=.000	F=6.239 p=.013
	X16	Tangible Fixed Assets to Long-Term Liabilities	F=20.523 p=.000	F=13.195 p=.000	F=11.823 p=.001	F=9.782 p=.002
	X20	Short-Term Liabilities to Total Loans	F=19.895 p=.000	F=14.505 p=.000	F=9.775 p=.002	F=8.394 p=.004
Profitability	X37	Net Profit to Total Assets	F=9.965 p=.002	F=42.167 p=.000	F=6.453 p=.010	F=35.307 p=.000
	X38	Operating Profit to Assets Used in Carrying out the Operations	F=7.456 p=.007	F=40.656 p=.000	F=6.441 p=.010	F=33.635 p=.000
	X39	Cumulative Profitability Ratio	F=20.965 p=.000	F=20.341 p=.000	F=7.348 p=.007	F=10.747 p=.001

ii. Table 22 shows that only one financial ratio, X13 (long-term liabilities to total liabilities), is statistically significant between high and low-growth firms for three different growth measures. This is a ratio of financial position showing the maturity of the liabilities. Therefore, it can be stated that the maturity of the liabilities

of high and low-growth firms are statistically significant for all growth measures except IND ADJ HG195.

Table 22 Ratios Statistically Significant for Three Growth Measures

			Growth Measures			
Ratio Type	Ratio	Definition	HG195	HGMedian	IND ADJ HG195	IND ADJ Median
Fin. Pos.	X13	Long-Term Liabilities to Total Liabilities	F=12.522 p=.000	F=7.679 p=.006		F=7.534 p=.006

iii. Table 23 shows the financial ratios which are statistically significant between high and low-growth firms for two different growth measures. As can be seen, X33 (total assets turnover) and X36 (profit before interest and tax to total liabilities) are turnover and profitability ratios, respectively. It can be concluded that X33 (total assets turnover) is statistically significant between high and low-growth firms when the growth measure is selected HG195 and IND ADJ HG195. Similarly, X36 (profit before interest and tax to total liabilities) is significant for the HGMedian and IND ADJ Median growth measures.

Table 23 Ratios Statistically Significant for Two Growth Measures

			Growth Measures			
Ratio Type	Ratio	Definition	HG195	HGMedian	IND ADJ HG195	IND ADJ Median
Turn over	X33	Total Assets Turnover	F=8.754 p=.003		F=12.468 p=.000	
Prof.	X36	Profit Before Interest and Tax to Total Liabilities		F=26.293 p=.000		F=26.169 P=.000

iv. As can be seen in Table 24, there are four ratios which are statistically significant for only one growth measure. Two of these ratios, X8 (short-term receivables to total assets) and X27 (receivables turnover), are significant for HG195

growth measure, whereas the other two, X12 (short-term liabilities to total liabilities) and X28 (working capital turnover) are significant for IND ADJ_HG195 growth measure. As we have stated earlier, X13 (long-term liabilities to total liabilities) is significant for all growth measures except IND ADJ HG195, but its complementary ratio, X12 (short-term liabilities to total liabilities), is significant only for IND ADJ HG195 growth measure. Therefore, taken together, the maturity of the liabilities is a very important phenomenon in differentiating high and low-growth firms. This issue shall be elaborated in the next section where we are dealing with the descriptives of each ratio.

Table 24 Ratios Statistically Significant for One Growth Measure

			Growth Measures			
Ratio Type	Ratio	Definition	HG195	HGMedian	IND ADJ HG195	IND ADJ Median
Liq.	X8	Short-Term Receivables to Total Assets	F=7.932 p=.005			
Fin. Pos.	X12	Short-Term Liabilities to Total Liabilities			F=7.845 p=.005	
Turnover	X27	Receivables Turnover	F=6.754 p=.010			
	X28	Working Capital Turnover			F=6.741 p=.009	

Summary Statistics of Significant Ratios for Each Growth Measure

In order to comment on the differences between the ratios of high and low-growth firms when the growth measure is “nominal”, Table 25 which shows the descriptive statistics of the ratios statistically significant for HG195 and HGMedian growth measures is used along with Table 20. In a similar manner, when the growth measure is “industry adjusted”, Table 26 which shows the descriptive statistics of the ratios

statistically significant for IND ADJ HG195 and IND ADJ Median growth measures is used along with Table 20.

i. When the growth measure is selected as HG195, mean values of five ratios are higher for high-growth firms (Table 25). These ratios are X9 (total loans to total assets), X13 (long term liabilities to total liabilities), X27 (receivables turnover), X37 (net profit to total assets) and X38 (operating profit to assets used in carrying out the operations). On the contrary, the mean values of the other ratios on the table are higher for low-growth firms. As the mean values of X9 (total loans to total assets) and X10 (own funds to total assets) dictate, high-growth firms carry more debt compared to their assets. Besides carrying more equity, low-growth firms are more secure and have higher reserves to total asset ratios as the mean values of X39 dictate. The mean values of X13 (long term liabilities to total liabilities) and X20 (short term liabilities to total loans) show that liabilities of high-growth firms are longer term than that of low-growth firms. Additionally, mean value of X16 (tangible fixed assets to long term liabilities) suggests that high-growth firms have more long term liabilities compared to their tangible fixed assets, that is, they use more maturity matching than low-growth firms. The mean value of X27 (receivables turnover) of high-growth firms is twice as much as that of low-growth firms suggesting that high-growth firms manage their receivables better than low-growth firms. Similarly, the only liquidity ratio on the table is X8 (short term receivables to total assets) and it shows that high-growth firms has less short term receivables than low-growth firms.

Interestingly, mean value of X33 (total assets turnover) shows that low-growth firms have better asset turnover figures compared to high-growth firms. Therefore, it can be concluded that low-growth firms are more efficient in asset

management than high-growth firms. However, mean values of X37 (net profit to total assets) and X38 (operating profit to assets used in carrying out the operations) show that net profit and operating profit to asset ratios of high-growth firms are higher compared to those of low-growth firms, that is, high-growth firms produce more profit using their assets.

ii. When the growth measure is selected as HGMedian, the ratios X8 (short term receivables to total assets), X27 (receivables turnover) and X33 (total assets turnover) do not differentiate between high and low-growth firms, but X36 (profit before interest and tax to total liabilities) is able to do so (see Table 20). Though the descriptives of other ratios change slightly, they remain in the list. Since X8 (short term receivables to total assets) and X27 (receivables turnover) are dropped from the list and these ratios are the only ratios related to receivables when the growth measure is HG195, it may be concluded that the management of receivables has no longer a discriminating power between high and low-growth firms. As can be seen in the previous paragraphs, mean values of the statistically significant profitability ratios of high-growth firms are higher than those of low-growth firms and this finding also applies to X36 (Profit Before Interest and Tax to Total Liabilities) suggesting that high-growth firms are covering their liabilities with profits more than the low-growth firms do.

Table 25 Descriptive Statistics of the Ratios Statistically Significant for Nominal Growth Measures

		HG195						HGMedian					
		High-growth			Low-growth			High-growth			Low-growth		
Ratio	Definition	Mean	Std.Dev.	N	Mean	Std.Dev.	N	Mean	Std.Dev.	N	Mean	Std.Dev.	N
X8	Short-Term Receivables to Total Assets	0.25	0.15	606	0.28	0.15	1650						
X9	Total Loans to Total Assets	0.61	0.23	606	0.56	0.26	1650	0.59	0.23	1128	0.55	0.27	1128
X10	Own Funds to Total Assets	0.39	0.23	606	0.44	0.26	1650	0.41	0.23	1128	0.45	0.27	1128
X13	Long-Term Liabilities to Total Liabilities	0.09	0.14	606	0.06	0.14	1650	0.08	0.14	1128	0.06	0.14	1128
X16	Tangible Fixed Assets to Long-Term Liabilities	386,183.60	468,068.48	606	477,369.84	429,365.33	1650	420,414.98	421,040.34	1128	485,336.35	427,809.41	1128
X20	Short-Term Liabilities to Total Loans	0.85	0.18	606	0.89	0.16	1650	0.86	0.17	1128	0.89	0.15	1128
X27	Receivables Turnover	20,903.13	122,430.95	606	9,699.10	78,134.18	1650						
X33	Total Assets Turnover	0.013	0.00	606	0.015	0.01	1650						
X36	Profit Before Interest and Tax to Total Liabilities							0.07	0.08	1128	0.05	0.08	1128
X37	Net Profit to Total Assets	0.03	0.08	606	0.02	0.07	1650	0.04	0.07	1128	0.02	0.07	1128
X38	Operating Profit to Assets Used in Carrying out the Operations	0.07	0.08	606	0.05	0.08	1650	0.07	0.08	1128	0.04	0.09	1128
X39	Cumulative Profitability Ratio	0.04	0.09	606	0.08	0.17	1650	0.06	0.11	1128	0.09	0.19	1128

iii. As can be seen in Table 20, when the growth measure is selected IND ADJ HG195, the significant ratios are generally the same as the ones when growth measure is selected HG195 with some exceptions. Only X8 (short-term receivables to total assets) is eliminated where X12 (short-term liabilities to total liabilities) and X28 (working capital turnover) have newly entered the analysis. Therefore, there is no liquidity ratio that can differentiate between high and low-growth firms when the growth measure is selected IND ADJ HG195. Addition of X28 (working capital turnover) to the differentiating ratios shows that net sales to current assets ratio of low-growth firms are slightly more that that of high-growth firms since mean value of X28 (working capital turnover) of low-growth firms are higher than that of high-growth firms (see Table 26). Similar to the case of X33 (total assets turnover), it may be concluded that low-growth firms are more "productive" than high-growth firms. Additionally, since mean value of X12 (short-term liabilities to total liabilities) is higher for high-growth firms, this fact suggests that among the firms that grow faster than the industry those in the top 15% use more short term debt. As approached to the median, the tendency to use long-term debt increases as observed from the mean values of X13 (long-term liabilities to total liabilities) for high and low-growth firms when the growth measure is IND ADJ Median.

iv. Same ratios seem to be statistically significant, when the growth measures are IND ADJ Median and HGMedian, though there are slight differences in significance values. This result is not interesting since the correlation between these two growth measures is .793 (see Table 19).

Table 26 Descriptive Statistics of the Ratios Statistically Significant for Industry Adjusted Growth Measures

		IND ADJ HG195						IND ADJ Median					
		High-growth			Low-growth			High-growth			Low-growth		
Ratio	Definition	Mean	Std.Dev.	N	Mean	Std.Dev.	N	Mean	Std.Dev.	N	Mean	Std.Dev.	N
X9	Total Loans to Total Assets	0.62	0.22	342	0.56	0.26	1914	0.59	0.24	1128	0.56	0.27	1128
X10	Own Funds to Total Assets	0.38	0.22	342	0.44	0.26	1914	0.41	0.24	1128	0.44	0.27	1128
X12	Short-Term Liabilities to Total Liabilities	0.53	0.23	342	0.49	0.23	1914						
X13	Long-Term Liabilities to Total Liabilities							0.08	0.14	1128	0.06	0.14	1128
X16	Tangible Fixed Assets to Long-Term Liabilities	380,165.09	403,323.18	342	465,867.84	428,243.03	1914	424,905.74	419,221.66	1128	480,845.59	430,223.54	1128
X20	Short-Term Liabilities to Total Loans	0.85	0.18	342	0.88	0.16	1914	0.87	0.18	1128	0.89	0.16	1128
X28	Working Capital Turnover	0.021	0.01	342	0.027	0.01	1914						
X33	Total Assets Turnover	0.012	0.00	342	0.015	0.01	1914						
X36	Profit Before Interest and Tax to Total Liabilities							0.07	0.09	1128	0.05	0.09	1128
X37	Net Profit to Total Assets	0.03	0.08	342	0.02	0.07	1914	0.04	0.07	1128	0.02	0.08	1128
X38	Operating Profit to Assets Used in Carrying out the Operations	0.07	0.09	342	0.05	0.09	1914	0.07	0.09	1128	0.05	0.09	1128
X39	Cumulative Profitability Ratio	0.04	0.09	342	0.08	0.16	1914	0.06	0.16	1128	0.08	0.17	1128

Regression Analyses Results

In order to test H2-H7, several regression analyses are run with different variable selection criteria (primarily the selection of ratios entering into the regression equations). The ratio selection criteria can be grouped into two: (i) all ratios are entered into the equation selecting stepwise method as reported in Tables 28-30, (ii) the ratios which were found statistically significant in the previous sub-section are entered into the regression equations (since there were four different growth measures in the previous subsection, four different sets of financial ratios are entered into the equations) as reported in Table 31. All regression equations are calculated by entering the mean values of AGE and SIZE variables in "enter" method, whereas mean values of all ratios are entered in "stepwise" method. Additionally, when testing the effects of industry, since there are more than one measure for the entry barrier variable as described in Table 5, each of them is entered separately into the regression equations with other industry-level variables (that is, minimum efficient scale of the industry, innovativeness of the industry and R&D intensity of the industry). In order to meet the assumptions of regression analysis, data are checked in terms of normality, heteroscedasticity and linearity. The first-order serial correlation in the residuals of the regression equations are tested with Durbin-Watson. It is observed that none of the assumptions of the regression analysis is violated.

Testing the Effects of Age and Size

In order to test the effects of age and size on firm growth (H2 and H3), Equation 1 is regressed. However, INDUSTRY variable is re-organized since some of the sub-

groups have less than one hundred firms as can be seen in Table 7. After having merged some of the sub-groups, the "new" INDUSTRY variable has nine sub-groups as can be seen in Table 27.

Table 27 The Categories of the Industry Variable

Category	Code	Name	# of SMEs
1	DA	Food products, beverages and tobacco	369
2	DB	Textiles and textile products	509
3	DC	Leather and leather products	203
	DD	Wood and wood products	
	DE	Pulp, paper and paper products, publishing and printing	
4	DF	Coke, refined petroleum products and nuclear fuel	150
	DG	Chemicals, chemical products and man-made fibers	
5	DH	Rubber and plastic products	144
6	DI	Other non-metallic mineral products	134
7	DJ	Basic metals and fabricated metal products	231
8	DK	Machinery and equipment not elsewhere classified	300
	DL	Electrical and optical equipment	
9	DM	Transport equipment	216
	DN	Manufacturing not elsewhere classified	

The table below shows the results of Equation 1 which is constructed using the first selection criterion (all ratios entered in stepwise method) described above.

Table 28 First Regression Results with All Ratios Entered

Variable	Coefficient	Sig.	VIF
Constant	.270	.000	
AGE	-.016	.444	1.089
SIZE	-.012	.672	1.059
INDUSTRY.1	.098	.000	1.650
INDUSTRY.2	-.116	.000	1.100
INDUSTRY.3	-.044	.049	1.317
INDUSTRY.4	.064	.004	1.275
INDUSTRY.5	.088	.000	1.252
INDUSTRY.6	.064	.003	1.211
INDUSTRY.7	.109	.000	1.400

Table 28. continued

Variable	Coefficient	Sig.	VIF
INDUSTRY.8	.146	.000	1.470
INDUSTRY.9	-.037	.098	1.314
X37	.581	.000	10.019
X44	.131	.000	1.417
X10	-177	.000	1.494
X36	-.425	.000	12.275
X38	.193	.000	4.508
X11	-.288	.021	40.512
X42	-.873	.000	15.125
X20	-.967	.001	1.074
X17	-.613	.000	56.555
X39	-.065	.002	1.155
X45	-.088	.000	1.359
X8	-.057	.007	1.148
X33	-.059	.008	1.303
Adjusted R^2	.146 (F=18.535, p=.000)		

The final result is reached after 14 steps and the adjusted-R^2 is 0.146. However, VIF figures of some variables are more than the threshold level of 10. Therefore, X11 and X17 variables are omitted from the list since they have the highest VIF figures indicating multicollinearity and the results are reported in Table 29.

Table 29 First Regression Results with All Ratios Entered (Revised)

Variable	Coefficient	Sig.	VIF
Constant	.159	.000	
AGE	-013	.533	1.153
SIZE	-.001	.960	1.118
INDUSTRY.1	.073	.004	1.557
INDUSTRY.2	-.113	.000	1.101
INDUSTRY.3	.053	.022	1.318
INDUSTRY.4	.067	.003	1.271
INDUSTRY.5	.092	.000	1.250

Table 29. continued

Variable	Coefficient	Sig.	VIF
INDUSTRY.6	.067	.003	1.230
INDUSTRY.7	.105	.000	1.395
INDUSTRY.8	.161	.000	1.464
INDUSTRY.9	.039	.092	1.316
X37	.461	.000	8.603
X44	.133	.000	1.126
X10	-.229	.000	2.025
X36	-.438	.000	10.689
X38	.189	.000	4.357
X25	.080	.000	1.177
X32	-.062	.000	1.508
X39	-.052	.017	1.150
X6	-.148	.000	1.043
Adjusted R^2	.094 (F=13.301, p=.000)		

Table 29 shows that only one variable (X36) has slightly higher VIF figure, but it is not problematic. The adjusted-R^2 is 0.094 and it is lower than the previous value of 0.146 since two variables have been omitted. Additionally, the coefficients of SIZE and AGE variables are not statistically significant and they are not included in the equations. In order to test the effects of age and size with industry-adjusted growth variable, Equation 2 is also regressed. Table 30 shows the results of this regression equation.

Table 30 Second Regression Results with All Ratios Entered

Variable	Coefficient	Sig.	VIF
Constant	.352	.000	
AGE	008	.716	1.110
SIZE	.007	.717	1.022
X37	.367	.000	9.426
X43	-.137	.000	1.126
X39	-.060	.005	1.121

Table 30. continued

Variable	Coefficient	Sig.	VIF
X20	-.066	.002	1.090
X45	-.070	.002	1.291
X10	-.140	.000	1.534
X36	-.297	.000	12.168
X38	.131	.002	4.524
X25	.067	.002	1.193
X6	-.055	.007	1.020
Adjusted R^2	.094 (F=20.489, p=.000)		

Table 30 shows that the coefficients of AGE and SIZE are again not statistically significant at .01 significance level. As described above, four different regression equations have been calculated using the variables which are found statistically significant for each growth measure. Table 31 shows the results of these regression equations which are calculated using the statistically significant ratios for each growth measure.

Table 31 Regression Results with Statistically Significant Ratios for Each Growth Measure

Variables Significant with HG195				Variables Significant with HGMedian				Variables Significant with IND ADJ HG195				Variables Significant with IND ADJ Median			
Variable	Coeff.	Sig.	VIF	Variable	Coeff.	Sig.	VIF	Variable	Coeff.	Sig.	VIF	Variable	Coeff.	Sig.	VIF
Constant	.155	.000		Constant	.443	.000		Constant	.112	.005		Constant	.197	.000	
AGE	-.041	.052	1.070	AGE	-.028	.183	1.083	AGE	-.006	.786	1.091	AGE	.006	.766	1.106
SIZE	-.001	.976	1.123	SIZE	-.006	.773	1.13	SIZE	.007	.717	1.013	SIZE	.013	.521	1.015
INDUSTRY.1	.098	.000	1.640	INDUSTRY.21	.077	.002	1.549	X37	.226	.000	1.100	X37	.444	.000	8.282
INDUSTRY.2				INDUSTRY.22				X20	-.108	.000	1.200	X20	-.079	.000	1.016
INDUSTRY.3	.051	.029	1.314	INDUSTRY.23	.049	.034	1.314	X12	.076	.001	1.325	X39	-.053	.014	1.113
INDUSTRY.4	.072	.002	1.265	INDUSTRY.24	.069	.003	1.270	X39	-.062	.004	1.116	X10	-.113	.000	1.395
INDUSTRY.5	.108	.000	1.234	INDUSTRY.25	.090	.000	1.252					X36	-.388	.000	10.457
INDUSTRY.6	.088	.000	1.200	INDUSTRY.26	.082	.000	1.205					X38	-.186	.000	4.257
INDUSTRY.7	.121	.000	1.386	INDUSTRY.27	.104	.000	1.392								
INDUSTRY.8	.180	.000	1.453	INDUSTRY.28	.168	.000	1.460								
INDUSTRY.9	.051	.028	1.306	INDUSTRY.29	.043	.052	1.310								
X37	.140	.000	1.202	X37	.395	.000	8.484								
X10	-.098	.000	1.177	X10	-.173	.000	1.737								
X33	-.071	.001	1.159	X36	-.391	.000	10.725								
X27	.056	.007	1.040	X38	.139	.000	4.336								
X13				X20	-.145	.000	2.976								
X33				X13	-.109	.000	3.595								
Adj. R^2	0.060 (F=11.266, p=.000)			Adj. R^2	0.075 (F=12.504, p=.000)			Adj. R^2	0.056 (F=23.327, p=.000)			Adj. R^2	0.073 (F=22.066, p=.000)		

As can be seen from the results, adjusted-R^2 figures are lower than the previously calculated ones, but VIF figures are better. As in the model constructed with all ratios, SIZE and AGE variables are not statistically significant at .01 significance level and they are not included in the equations. However, SIZE variable is statistically significant at .05 significance level in the regression equation constructed with the ratios statistically significant for HG195 growth measure. Therefore, H2 and H3 are rejected at 99% confidence level and it can be concluded that size and age do not have any effect on the growth of SMEs in Turkey. Additionally, the coefficients of INDUSTRY variables (there is no INDUSTRY variable for the equations constructed with the significant ratios of the industry-adjusted growth measures) are statistically significant at .01 level except for those of INDUSTRY.3 and INDUSTRY.9 variables. However, the coefficients of these variables are statistically significant at .05 level. As mentioned before, some industry sub-groups were merged due to the limitations of our sample (see Table 27). INDUSTRY.3 is the combination of three industry sub-groups, which are leather and leather products, wood and wood products, and pulp, paper and paper products, publishing and printing. Similarly, INDUSTRY.9 is the combination of two industry sub-groups, which are transport equipment and manufacturing not elsewhere classified. In other words, these industries are not as "pure" as the other ones and especially INDUSTRY.9 contains many firms from different sectors which are not classified elsewhere. Therefore, it is not very interesting that the coefficients of these industry sub-groups are not significant at .01 significance level. Nevertheless, it can be concluded that the characteristics of the industry that the firm operates in affect its

growth. The next section investigates the effects of industry characteristics on firm growth and tests the remaining hypotheses, i.e. H4-H7.

Testing the Effects of Industry Characteristics

In order to test the effects of industry characteristics on firm growth, Equations 4 & 5 are regressed. As in the previous sub-section, the ratios are entered into the equations in two ways: (i) all ratios are entered selecting stepwise method, (ii) the ratios which are found statistically significant in the previous subsection are included selecting enter method. Since there were five different measures for the entry barrier variable, only one of them is included in each regression. Therefore, there are five different regression equations associated with the same set of ratios. All industry-level variables are entered into the regression equations using enter method and firm-level variables (ratios) are entered into the regression equations using stepwise method. Taking this fact into account, twenty-five different regression equations are reached. All of these equations are statistically significant at .001 level with F-values higher than 15 and none of the VIF figures in the equations exceeds 10. Therefore all regression equations are statistically significant and they do not suffer from multicollinearity. Since the primary concern of the study is to test the effects of industry-level variables on firm growth, the coefficients and significance levels of the industry-level variables shall be reported in Tables 32 through 36 (the adjusted-R^2 figures show the goodness-of-fit of the whole functions containing the ratios entering the equations).

Table 32 Coefficients and Significance Level of the Industry-Level Variables (All Ratios Entered)

		Model 1		Model 2		Model 3		Model 4		Model 5	
		Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.
Entry Barriers	PRICECOST	-0.082	0.548								
	INDPROFITRATE			-0.144	0.406						
	INDGROWTHRATE					0.531	0.001				
	ADV/SALES							-0.648	0.007		
	CR8									0.114	0.278
Minimum Efficient Scale of the Industry	MES	0.062	0.001	0.066	0.001	0.005	0.830	0.071	0.000	0.051	0.004
Innovativeness of the Industry	PATENTS/EMP	7.06	0.000	7.47	0.000	4.76	0.008	8.37	0.000	6.79	0.000
R&D Intensity of the Industry	R&D/SALES	-3.770	0.206	-3.238	0.292	1.943	0.578	-4.425	0.138	-3.724	0.212
Adj R^2		0.087		0.087		0.091		0.091		0.088	

Table 33 Coefficients and Significance Level of the Industry-Level Variables (Ratios Significant for HG195 Entered)

		Model 6		Model 7		Model 8		Model 9		Model 10	
		Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.
Entry Barriers	PRICECOST	0.064	0.654								
	INDPROFITRATE			0.018	0.922						
	INDGROWTHRATE					0.739	0.000				
	ADV/SALES							-0.919	0.002		
	CR8									0.183	0.098
Minimum Efficient Scale of the Industry	MES	0.048	0.014	0.058	0.004	0.015	0.529	0.068	0.000	0.056	0.004
Innovativeness of the Industry	PATENTS/EMP	6.27	0.008	5.65	0.030	5.29	0.023	5.3	0.000	5.43	0.027
R&D Intensity of the Industry	R&D/SALES	0.704	0.822	0.836	0.796	6.150	0.065	-2.189	0.506	0.875	0.781
Adj R^2		0.051		0.050		0.050		0.058		0.054	

Table 34 Coefficients and Significance Level of the Industry-Level Variables (Ratios Significant for HGMedian Entered)

		Model 11		Model 12		Model 13		Model 14		Model 15	
		Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.
Entry Barriers	PRICECOST	0.083	0.557								
	INDPROFITRATE			0.050	0.777						
	INDGROWTHRATE					0.689	0.000				
	ADV/SALES							-0.822	0.006		
	CR8									0.131	0.231
Minimum Efficient Scale of the Industry	MES	0.051	0.008	0.053	0.009	0.015	0.550	0.063	0.001	0.047	0.014
Innovativeness of the Industry	PATENTS/EMP	4.83	0.000	4.94	0.055	4.90	0.034	4.77	0.000	5.62	0.016
R&D Intensity of the Industry	R&D/SALES	0.913	0.769	0.745	0.816	5.781	0.079	-1.810	0.578	0.824	0.791
Adj R^2		0.067		0.067		0.074		0.070		0.068	

Table 35 Coefficients and Significance Level of the Industry-Level Variables (Ratios Significant for IND ADJ HG195 Entered)

		Model 16		Model 17		Model 18		Model 19		Model 20	
		Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.
Entry Barriers	PRICECOST	0.094	0.512								
	INDPROFITRATE			0.083	0.644						
	INDGROWTHRATE					0.891	0.000				
	ADV/SALES							-1.105	0.000		
	CR8									0.198	0.075
Minimum Efficient Scale of the Industry	MES	0.063	0.001	0.063	0.002	0.024	0.328	0.075	0.000	0.053	0.007
Innovativeness of the Industry	PATENTS/EMP	5.33	0.031	5.29	0.043	5.32	0.023	5.35	0.000	6.28	0.008
R&D Intensity of the Industry	R&D/SALES	1.951	0.537	1.643	0.614	8.162	0.077	-1.721	0.603	1.83	0.562
Adj R^2		0.030		0.030		0.043		0.045		0.036	

Table 36 Coefficients and Significance Level of the Industry-Level Variables (Ratios Significant for IND ADJ Median Entered)

		Model 21		Model 22		Model 23		Model 24		Model 25	
		Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.
Entry Barriers	PRICECOST	0.090	0.524								
	INDPROFITRATE			0.065	0.715						
	INDGROWTHRATE					0.701	0.000				
	ADV/SALES							-0.805	0.007		
	CR8									0.131	0.234
Minimum Efficient Scale of the Industry	MES	0.052	0.007	0.053	0.009	0.015	0.552	0.064	0.000	0.049	0.012
Innovativeness of the Industry	PATENTS/EMP	4.85	0.046	4.91	0.057	4.95	0.032	4.75	0.001	5.68	0.015
R&D Intensity of the Industry	R&D/SALES	0.872	0.778	0.644	0.840	5.831	0.077	-1.792	0.583	0.792	0.799
Adj R^2		0.064		0.064		0.072		0.067		0.064	

The findings can be summarized as follows:

(i) The coefficients of two entry barriers (industry growth rate and advertising to sales ratio) are statistically significant at .01 level in all the models they are included. For the other three entry barrier measures (industry price-cost margin, industry profit rate and degree of concentration), no statistically significant coefficients are found. The coefficients of industry growth rate are positive whereas those of advertising to sales ratio are negative. The positive coefficients of industry growth implies that SMEs in high growth industries tend to grow faster than those in industries with low industry growth rates. The negative sign of the coefficient of advertising to sales ratio implies that the growth rates of the SMEs in industries with high advertising to sales ratio are lower. The higher advertising to sales ratio is possibly the result of high competition in the industry. Therefore, it can be stated that (i) in industries where high industry growth rates are observed, the growth rates of the SMEs are high, and (ii) in industries where high advertising to sales ratios are observed because of high competition, the growth rates of the SMEs are low. The second conclusion allows to accept H4 (average growth rates of SMEs are lower in industries where there is more competition).

One might argue that the coefficient of the degree of concentration (CR_8) is insignificant, which implies that competition level in an industry does not affect the growth of firms in that industry. However, this is not so true in the case of SMEs since highly concentrated sectors are generally beneficial for the large firms. Low competition in these sectors does not help the growth of SMEs except for those that occupy market niches. Similarly, when the degree of concentration is low not only the SMEs but also the large firms situation suffer from the high competition in the

industry. It is expected that only moderate levels of degree of concentration is beneficial for both large companies and SMEs and degree of concentration, by itself, is not a true representative of competition in an industry at least as true as the advertising to sales ratio.

(ii) The coefficients of minimum efficient scale (MES) variable is positive and its coefficient is significant in all models except those including industry growth rate as the entry barrier. Interestingly, when industry growth rate is selected as the entry barrier measure, the coefficient of MES becomes insignificant. However, since the coefficient of MES is positive whenever it is included in the equations, concluding that in industries with low MES, the growth rate of the SMEs are low or vice versa, H5 (in industries with low minimum efficient scale (MES), the growth rate of the firms shall be low) can be accepted.

(iii) The coefficients of R&D to sales measure are insignificant in all models suggesting that R&D intensity of the sector do not have any effect on the growth of SMEs. It may be argued that SMEs in Turkey generally do not invest too much in R&D and R&D efforts are taking too much time to take a patent that the firm shall benefit. Since the "end result" of R&D activities is to hold a patent, the coefficients of patents per employment measure have to be checked. As expected, the coefficients of patents per employment measure are positive and significant in all models. It may be concluded that R&D intensity of the industry does not affect the growth of SMEs. However, one might argue that SMEs in more innovative industries (i) are away from the threat of competition that leads to higher growth rates since they are holding patents after successful R&D efforts, (ii) are copying the products invented or created by other firms as they become available in the market, (iii) are

importing from other companies that produce cheaper or do the research. Therefore, H6 (the growth rates of firms in R&D intensive industries tend to be low) is rejected and H7 (the growth rates of firms in innovative industries tend to be high) is accepted.

CHAPTER 6: CONCLUSION

The purpose of this study was to investigate the firm and industry level factors that affect the growth of SMEs in Turkey.

The literature suggests that post-entry performance of new firms is thought to be determined either by "deterministic" or "stochastic" approach. The deterministic approach tends to explain the growth of a firm and the process of concentration by firm behavior and observable industry characteristics whereas the stochastic approach assumes that future values of measures of different firms' profit rates, size, market share, and past growth will differ solely by chance. The route of the deterministic approach was followed in this study.

Firm growth can be measured with a range of different indicators, such as sales, employment, assets, physical output, market share, and profits. In within-industry studies more specialized measures can be used, such as the number of seats for restaurants or theatres, and the number of vehicles for car rental companies. Therefore, the researcher has the choice to create a multiple indicator index, to use alternative measures separately or to find the best indicator.

Recent studies report that the determinants of firm growth generally fall into three categories, namely, the characteristics of the firm, environmental/industry specific factors, characteristics of the entrepreneur. The most important factors which belong to the firm itself are the age, size and location. The industry specific factors are the existence of entry barriers, minimum efficient scale (MES), innovativeness and R&D intensity. Among the factors associated with the entrepreneur(s) are motivation, education, number of owners and the number of middle-aged business owners. However, due to the complexity of the growth concept and the differences in

researches (i.e. the difference in sectors, sample sizes and the periods studied), some variables are significant in some studies whereas the opposite is true for other studies.

In this study, as the name stands, firm and industry level factors were focused. In terms of firm level characteristics, age and size of the firm were used. It is also expected that growth of a firm is a function of its financial ratios as well as its non-financial characteristics/specifications. The discussion of age and size as determinants of firm growth has long tradition. Gibrat (1931) states that the growth rate of a firm is independent from its size at the beginning of the period, and that the probability of a given growth rate during a specific time interval is the same for any firm within the same industry. A number of empirical studies suggest a negative relationship between growth and size, indicating that smaller firms have higher and more variable growth rates, while other studies have found a positive relationship. Though the direction of firm size on growth is not determined, it is expected that size has an effect on growth and a firm will expand differently, dependent on its size. However, a more clear relationship is found between firm age and growth, where firm growth rates tend to decline with the age of the firm. Recent studies showed that a few ratios can be combined to make a discriminant function between high and low-growth firms with a high degree of reliability.

Literature suggests that firm growth is to a certain extent externally determined and industry characteristics can create an environment in which an individual firm may improve its position relative to its competitors by taking advantage of existing opportunities in the industry. However, industries vary along dimensions such as dynamism, heterogeneity, hostility and munificence, and these

external factors largely determine how and how much the firm grows. It has been clearly demonstrated that rapidly growing firms are more often found in industries and regions that are more dynamic and in highly innovative industries the failure rate for new entrants is also higher. In more innovative industries, on the other hand, firm growth is higher in the early years of establishment provided that the firm survives. In this study, entry and exit barriers, minimum efficient scale (MES), innovativeness and R&D intensity represent industry characteristics.

The growth indicator was the sales growth of the company and four different criteria were used in classifying high-growth firms: (i) firms achieving a growth rate of at least 95% on average in three years were categorized as High-Growth firms, (ii) firms achieving a growth rate of more than the median of the average growth rate of all firms in three years were categorized as High-Growth firms, (iii) firms achieving an industry-adjusted growth rate at least 95% on average in three years were categorized as High-Growth firms, (iv) firms achieving a growth rate of more than the median of the average industry-adjusted growth rate of all firms were categorized as High-Growth firms.

The age and size variables were the number of years after the establishment of the company and number of employees, respectively. Financial ratios (totally forty-seven) showing liquidity, financial position, turnover and profitability were calculated from company records.

The sample covered the 2004-2006 period but the sales growth rates were calculated using also the 2007 sales data. Only the SMEs in the manufacturing sector without any missing data in this period were included in the sample. This limited the sample to 2,256 firms. The manufacturing sector was divided into two digit sub-

groups according to NACE Rev. 1.1 classification which yielded in fourteen sub-groups. The sample contained only the surviving firms since the data of the non-surviving firms were not available. Therefore, the sample had survivorship bias. The average size and age of the firms in the sample were 64.32 and 18.18, respectively, suggesting that SMEs in the sample were, in general, mature and medium-sized rather than being young and small-sized.

The research questions were (i) which financial ratios are most important in determining growth, (ii) does size and age affect the growth of SMEs in Turkey, (iii) which characteristics of the industry affect firm growth. The hypotheses based on these research questions were: (i) there are statistically significant differences between some of the financial ratios of high-growth firms and those of low-growth firms, (ii) high-growth firms tend to be smaller, (iii) high-growth firms tend to be younger, (iv) average growth rates of SMEs are lower in industries where there is more competition, (v) in industries with low minimum efficient scale (MES), the growth rate of the firms shall be low, (vi) the growth rates of firms in R&D intensive industries tend to be low, (vii) the growth rates of firms in innovative industries tend to be high.

Repeated Measures ANOVA test was used to find the statistically significant financial ratios between high and low-growth firms. Then, to test the firm level effects on growth, firms in the sample were grouped according to their industries and regression analyses were run by adding the non-financial variables to the financial ratios which were found statistically significant between high and low-growth firms. In order to study the effects of industry on firm growth a series of regression analyses were run using the financial ratios, but the industry characteristics were proxied by

relevant variables. Throughout the analyses, .01 significance level was accepted as the confidence criteria. Though the problem of correlation between the ratios was a limiting factor in this study, step-wise method was used for the regression equations with all ratios entered.

The statistically significant differences found between the ratios of high and low-growth firms led to accept H1 (there are statistically significant differences between some of the financial ratios of high-growth firms and those of low-growth firms). Therefore, it can be conclude that (i) high-growth firms carry more debt compared to their assets and among the firms that grow faster than the industry those are in the top 15% use more short term debt (Boardman et al., 1981; Hutchinson, 1987 and 1989; Heshmati, 2001; Honjo and Harada, 2006), but as approached to the median, the tendency to use long-term debt increases, (ii) high-growth firms use maturity matching (Myers, 1977), (iii) low-growth firms are more "productive" than high-growth firms, but high-growth firms produce more profit using their assets (Hutchinson, 1987, Pant, 1991, McMahon, 2001). (iv) high-growth firms have lower asset utilization measures (Moreno and Casillas, 2007; McMahon, 2001). The results also provided new evidence to the literature that (i) high-growth firms manage their receivables better than low-growth firms, (ii) high-growth firms use much less trade receivables. Since the sample covered the 2004-2006 period that corresponds to the times right after the 2001 crisis, one possible explanation might be that firms which had used less trade receivables during crisis times when many firms went into bankruptcy managed their receivable better and benefited from this decision by experiencing growth.

The findings showed that age and size did not have any significant effect on the growth of SMEs in Turkey and H2 (high-growth firms tend to be smaller) & H3 (high-growth firms tend to be younger) were rejected. The finding that age and size did not have any significant effect on the growth of SMEs supported Gibrat (1931), Kumar (1985), Wagner (1992), Audretsch et al. (2002), Piergiovanni et al. (2002), but rejected Barkham et al. (1996), Becchetti and Trovato (2002) and Honjo and Harada (2006) which concluded that small and young firms grow faster than large ones. Current empirical literature on firm dynamics in developed and developing economies are almost alike in terms of the effects of age and size on firm growth (McPherson, 1996; Ramachandran and Shah, 1999; Mengistae, 2006). However, Fajnzylber et al. (2008) partly reject Gibrat's law in their study with Mexican data stating that firm size but not age affects firm growth. Additionally, as Mansfield (1962) and Becchetti and Trovato (2002) state Gibrat's law may hold if the sample is constructed only with the surviving firms (survivorship bias). Mengistae (2006) mentions that with the exception of McPherson (1996), all firm level growth equation estimates for sub-Saharan Africa based on data on surviving businesses only. Since the sample had survivorship bias, the results might also be biased towards accepting the independence of size and age on the growth of SMEs. Additionally, as Pasanen (2003) concludes in his study with Finnish firms, long-lived SMEs (more than twenty years of age) have many characteristics that can be explained by their longer time of operation. They are bigger in size and many of them have grown through acquisitions and mergers, which is rare among young firms (less than eight years of age). In some cases the fact that a long-lived firm is still an SME and has not reached the scale of a large company may refer to limited organic

growth opportunities in the markets. Therefore, samples with younger firms might help to explore the effects of age on firm growth better.

As in almost all studies including both developed and developing countries, it was also concluded that the industry that the firm operates in affected its growth (Audretsch et al., 1999; Mengistae, 2006; Klapper et al., 2006). As to the industry level variables, it is found that, in industries, (i) where we observe high competition, the growth rates of the SMEs are low (Mengistae, 2006; Klapper et al., 2006), (ii) with low minimum efficient scale (MES), the growth rate of the SMEs are low (Mahmood, 1994; Audretsch, 1995; Santarelli and Vivarelli, 2007), (iii) with high innovativeness, the growth rates of SMEs are high (Pant, 1991; Kumar et al., 2002; Claessens and Laeven, 2003). H4 (average growth rates of SMEs are lower in industries where there is more competition), H5 (in industries with low minimum efficient scale (MES), the growth rate of the firms shall be low) and H7 (the growth rates of firms in innovative industries tend to be high) were accepted with the help of these findings. However, no evidence was found to support H6 (the growth rates of firms in R&D intensive industries tend to be low), but it was concluded that the growth rates of the SMEs were high in industries with high growth rates (Campbell, 1996; Klepper et al, 2006). No evidence was also found that industry price-cost margin, industry profit rate, degree of concentration affect the growth of SMEs. As stated before, high degree of concentration is generally beneficial for the large firms and low competition in these sectors does not help the growth of SMEs except for those that occupy market niches (Pant, 1991). Similarly, when the degree of concentration is low not only the SMEs but also the large firms suffer from the high competition in the industry and do not find enough room to grow. The finding of

industry price-cost margin and industry profit rate did not have any effect on the growth of SMEs might suggest that large companies are more profitable than the SMEs in the same sector. It is probably because they are selling in higher volumes coupled with minimized marginal costs of production.

The coefficients of R&D intensity and innovativeness suggested that R&D intensity in a sector did not have any significant effect on the growth of SMEs until patents are hold. Del Monte and Papagni (2003) state that patents create entry barriers for the new firms and firms in more innovative industries are away from the threat of competition. However, as Audretsch (1995) concludes, it is necessary to have continuous introduction of further innovative products, but even in sectors with high technological opportunities, it is not certain that the firms which have the capacity to introduce new technologies and deliver new products at a pace the market requires will obtain a competitive advantage. Therefore, it may be argued that SMEs in more innovative industries (i) are away from the threat of competition that leads to higher growth rates since they are holding patents after successful R&D efforts, (ii) are copying the products invented or created by other firms as they become available in the market, (iii) are importing from other companies that do research or produce cheaper.

Though a comprehensive sample was used in the study, it had some limitations. First, the sample was constructed with the surviving firms only, therefore it had survivorship bias. Second, as the mean values of age and size of the SMEs in sample suggested, the firms were, in general, mature and medium-sized rather than being young and small-sized. Though the age of a firm is not a criterion for that firm to be classified as SME, a firm with older age is assumed to be at their maturity

stages with low potential to grow. Third, since industry variable was grouped according to two-digit NACE Rev 1.1 classification, some of the industry sub-groups suffered from limited number of firms. In order to overcome this problem, some of the sub-groups were merged, but the results were possibly altered. To have a more robust sample that each sub-sector contains at least two hundred firms, total number of firms should exceed five thousand, twice the size of this sample. Besides to have much more reliable results industry variable must be clustered according to four-digit classification of any standard. However, to supply each four-digit sub-group with at least one or two hundred firms requires a much bigger sample.

As explained earlier, big majority of the total labor force in Turkey is being held by SMEs as in almost all other countries and steps taken to help growth of the SMEs are very important for the whole economy. Though the growth of SMEs is a very important research area for both academic and social life, there is much more to do, especially in the developing countries. Almost all of the studies in this field focus on USA, UK and Japan, with the exceptions of France and Greece (Daskalakis and Psillaki, 2007), Italy (Del Monte and Papagni, 2003; Audretsch, 1999), Canada (Orr, 1974), Finland (Pasanen, 2003), Sweden (Heshmati, 2001), Australia (Hutchinson, 1989; McMahon, 2001), New Zealand (Locke and Scrimgeour, 2003), Mexico (Fajnzylber et al., 2008), Ethiopia (Mengistae, 2006), Southern-Africa (McPherson, 1996), Sub-Saharan Africa (Ramachandran and Shah, 1999). As can be seen, number of studies with emerging market data is very limited and this fact applies also to Turkey. Though there may be many reasons for fewer studies, lack of data seems to be most important issue. This study fills one of the gaps and provides Turkey evidence to the SME growth literature. The results have some important implications

not only for scholars but also for the professionals. The findings show that managers of the SMEs should use debt (especially short term debt) instead of equity in order to grow more. They should also match the maturities of debt and assets, and focus on profitability rather than selling in high volumes with limited profit margin. Additionally, they should use less trade receivables but more short term receivables in order to reduce the default risk of their counterparts.

This study aimed to explore the firm and industry level factors affecting the growth of SMEs, but did not take into account the background of the entrepreneurs and the strategic decisions taken by them since the names of the firms, their managerial actions and the background of the entrepreneurs were unknown to us. We believe that including this dimension in the future studies may help our understanding of SME growth.

APPENDICES

APPENDIX-A: Financial Ratios Used in the Analysis

ID	RATIO	CALCULATION
	A- LIQUIDITY RATIOS	
X1	1- Current Ratio	$= \frac{\text{Current Assets}}{\text{Short-Term Liabilities}}$
X2	2- Quick (Acid-Test) Ratio	$= \frac{\text{Current Assets - (Inventories + Prepayments and Accrued Income for the Next Months + Other Current Assets)}}{\text{Short-Term Liabilities}}$
X3	3- Cash Ratio	$= \frac{\text{Liquid Assets + Marketable Securities}}{\text{Short-Term Liabilities}}$
X4	4- Inventories to Current Assets	$= \frac{\text{Inventories}}{\text{Current Assets}}$
X5	5- Inventories to Total Assets	$= \frac{\text{Inventories}}{\text{Total Assets}}$
X6	6- Inventory Dependency Ratio	$= \frac{\text{Short-Term Liabilities - (Liquid Assets + Marketable Securities)}}{\text{Inventories}}$
X7	7- Short-Term Receivables to Current Assets	$= \frac{\text{Short-Term Trade Receivables + Other Short-Term Receivables}}{\text{Current Assets}}$

ID	RATIO	CALCULATION
X8	8- Short-Term Receivables to Total Assets	$= \frac{\text{Short-Term Trade Receivables + Other Short-Term Receivables}}{\text{Total Assets}}$
	B- RATIOS OF FINANCIAL POS.	
X9	1- Total Loans to Total Assets (Leverage Ratio)	$= \frac{\text{Short-Term Liabilities + Long-Term Liabilities}}{\text{Total Assets}}$
X10	2- Own Funds to Total Assets	$= \frac{\text{Own Funds}}{\text{Total Assets}}$
X11	3- Own Funds to Total Loans	$= \frac{\text{Own Funds}}{\text{Short-Term Liabilities + Long-Term Liabilities}}$
X12	4- Short-Term Liabilities to Total Liabilities	$= \frac{\text{Short-Term Liabilities}}{\text{Total Liabilities}}$
X13	5- Long-Term Liabilities to Total Liabilities	$= \frac{\text{Long-Term Liabilities}}{\text{Total Liabilities}}$
X14	6- Long-Term Liabilities to Long-Term Liabilities and Own Funds	$= \frac{\text{Long-Term Liabilities}}{\text{Long-Term Liabilities + Own Funds}}$
X15	7- Tangible Fixed Assets to Own Funds	$= \frac{\text{Tangible Fixed Assets (Net)}}{\text{Own Funds}}$
X16	8- Tangible Fixed Assets to Long-Term Liabilities	$= \frac{\text{Tangible Fixed Assets (Net)}}{\text{Long-Term Liabilities}}$

ID	RATIO	CALCULATION
X17	9- Fixed Assets to Total Loans	$= \frac{\text{Fixed Assets}}{\text{Short-Term Liabilities + Long-Term Liabilities}}$
X18	10- Fixed Assets to Own Funds	$= \frac{\text{Fixed Assets}}{\text{Own Funds}}$
X19	11- Fixed Assets to Long-Term Liabilities and Own Funds	$= \frac{\text{Fixed Assets}}{\text{Long-Term Liabilities + Own Funds}}$
X20	12- Short-Term Liabilities to Total Loans	$= \frac{\text{Short-Term Liabilities}}{\text{Total Loans}}$
X21	13- Bank Loans to Total Assets	$= \frac{\text{Short-Term Bank Loans + Principal Installments and Interest Payments of Long-Term Loans + Long-Term Bank Loans}}{\text{Total Assets}}$
X22	14- Short-Term Bank Loans to Short-Term Liabilities	$= \frac{\text{Short-Term Bank Loans + Principal Installments and Interest Payments of Long-Term Loans}}{\text{Short-Term Liabilities}}$
X23	15- Bank Loans to Total Loans	$= \frac{\text{Short-Term Bank Loans + Principal Installments and Interest Payments of Long-Term Loans + Long-Term Bank Loans}}{\text{Total Loans}}$
X24	16- Current Assets to Total Assets	$= \frac{\text{Current Assets}}{\text{Total Assets}}$

ID	RATIO	CALCULATION
X25	17- Tangible Fixed Assets to Total Assets	$= \frac{\text{Tangible Fixed Assets (Net)}}{\text{Total Assets}}$
	C- TURNOVER RATIOS	
X26	1- Inventory Turnover	$= \frac{\text{Cost of Goods Sold (Current Year)}}{\text{(Previous Year's Inventory + Current Year's Inventory)/2}}$
X27	2- Receivables Turnover	$= \frac{\text{Net Sales}}{\text{Short-Term Receivables + Long-Term Receivables}}$
X28	3- Working Capital Turnover	$= \frac{\text{Net Sales}}{\text{Current Assets}}$
X29	4- Net Working Capital Turnover	$= \frac{\text{Net Sales}}{\text{Current Assets – Short-Term Liabilities}}$
X30	5- Tangible Fixed Assets Turnover	$= \frac{\text{Net Sales}}{\text{Tangible Fixed Assets (Net)}}$
X31	6- Fixed Assets Turnover	$= \frac{\text{Net Sales}}{\text{Fixed Assets}}$
X32	7- Own Funds Turnover	$= \frac{\text{Net Sales}}{\text{Own Funds}}$
X33	8- Total Assets Turnover	$= \frac{\text{Net Sales}}{\text{Total Assets}}$

ID	RATIO	CALCULATION
	D- PROFITABILITY RATIOS	
	1- Ratios Relating Profit to Capital	
X34	a- Net Profit to Own Funds	$= \frac{\text{Net Profit (Profit After Tax)}}{\text{Own Funds}}$
X35	b- Profit Before Tax to Own Funds	$= \frac{\text{Profit Before Tax}}{\text{Own Funds}}$
X36	c- Profit Before Interest and Tax to Total Liabilities	$= \frac{\text{Profit Before Tax + Financing Expenses}}{\text{Total Liabilities}}$
X37	d- Net Profit to Total Assets	$= \frac{\text{Net Profit (Profit After Tax)}}{\text{Total Assets}}$
X38	e- Operating Profit to Assets Used in Carrying out the Operations	$= \frac{\text{Operating Profit}}{\text{Total Assets – Financial Fixed Assets}}$
X39	f- Cumulative Profitability Ratio	$= \frac{\text{Reserves from Retained Earnings}}{\text{Total Assets}}$
	2- Ratios Relating Profit to Sales	
X40	a- Operating Profit to Net Sales	$= \frac{\text{Operating Profit}}{\text{Net Sales}}$
X41	b- Gross Profit to Net Sales	$= \frac{\text{Gross Profit}}{\text{Net Sales}}$
X42	c- Net Profit to Net Sales	$= \frac{\text{Net Profit (Profit After Tax)}}{\text{Net Sales}}$
X43	d- Cost of Goods Sold to Net Sales	$= \frac{\text{Cost of Goods Sold}}{\text{Net Sales}}$

ID	RATIO	CALCULATION
X44	e- Operating Expenses to Net Sales	$= \frac{\text{Operating Expenses}}{\text{Net Sales}}$
X45	f- Interest Expenses to Net Sales	$= \frac{\text{Financing Expenses}}{\text{Net Sales}}$
	3- Ratios Relating Profit to Financial Obligations	
X46	a- Profit Before Interest and Tax to Interest Expenses	$= \frac{\text{Profit Before Tax + Financing Expenses}}{\text{Financing Expenses}}$
X47	b- Net Profit and Interest Expenses to Interest Expenses	$= \frac{\text{Net Profit + Financing Expenses}}{\text{Financing Expenses}}$

APPENDIX-B: Descriptive Statistics of the Financial Ratios

	Minimum	Maximum	Mean	Std. Deviation
X1.1	0.07	258.91	2.12	6.30
X1.2	0.10	1043.32	3.29	28.48
X1.3	0.00	1000000.00	1336.63	36450.21
X2.1	0.00	221.46	1.16	5.16
X2.2	0.00	1042.98	1.96	23.94
X2.3	0.00	1000000.00	1335.45	36450.25
X3.1	0.00	78.61	0.35	2.03
X3.2	0.00	966.30	0.81	20.40
X3.3	0.00	1000000.00	1333.70	36450.29
X4.1	0.00	1.00	0.43	0.22
X4.2	0.00	1.00	0.42	0.22
X4.3	0.00	1.00	0.40	0.23
X5.1	0.00	0.97	0.29	0.18
X5.2	0.00	0.96	0.28	0.18
X5.3	0.00	0.94	0.28	0.18
X6.1	-134.68	1000000.00	4879.01	69672.33
X6.2	-474.01	1000000.00	6224.07	78548.46
X6.3	-677.37	1000000.00	4466.62	66458.78
X7.1	0.00	0.98	0.39	0.21
X7.2	0.00	1.00	0.41	0.21
X7.3	0.00	1.00	0.42	0.22
X8.1	0.00	0.89	0.26	0.16
X8.2	0.00	1.00	0.27	0.17
X8.3	0.00	1.00	0.28	0.18
X9.1	0.00	3.10	0.56	0.27
X9.2	0.00	4.34	0.58	0.28
X9.3	0.00	4.44	0.57	0.27
X10.1	-2.10	1.00	0.44	0.27
X10.2	-3.34	1.00	0.42	0.28
X10.3	-3.44	1.00	0.43	0.27
X11.1	-0.68	333.67	1.92	9.35
X11.2	-0.77	4665.42	4.22	100.03
X11.3	-0.77	10447.31	7.36	223.90
X12.1	0.00	2.12	0.50	0.26
X12.2	0.00	3.32	0.50	0.26
X12.3	0.00	3.47	0.49	0.25
X13.1	0.00	2.64	0.07	0.14
X13.2	0.00	3.73	0.08	0.17
X13.3	0.00	3.57	0.08	0.16
X14.1	-5.90	15.82	0.13	0.45
X14.2	-7.37	417.39	0.33	8.79

	Minimum	Maximum	Mean	Std. Deviation
X14.3	-11.97	48.99	0.17	1.24
X15.1	-119.44	275.14	0.95	9.16
X15.2	-74.07	120.72	0.80	4.02
X15.3	-72.16	77.59	0.73	3.30
X16.1	0.00	1000000.00	496229.70	499896.12
X16.2	0.00	1000000.00	451418.70	497578.53
X16.3	0.00	1011633.00	410978.61	491773.62
X17.1	0.00	193.80	1.19	5.19
X17.2	0.00	3623.11	2.73	76.40
X17.3	0.00	2650.65	2.10	55.81
X18.1	-231.12	333.78	1.07	11.45
X18.2	-96.53	156.68	0.96	5.28
X18.3	-79.97	192.03	0.99	5.85
X19.1	-231.12	277.91	0.81	8.60
X19.2	-155.97	2101.97	1.63	44.39
X19.3	-44.12	111.39	0.73	2.96
X20.1	0.01	1.00	0.89	0.19
X20.2	0.00	1.00	0.87	0.20
X20.3	0.00	1.00	0.87	0.20
X21.1	0.00	2.64	0.17	0.17
X21.2	0.00	3.73	0.19	0.18
X21.3	0.00	3.57	0.20	0.19
X22.1	0.00	0.99	0.27	0.24
X22.2	0.00	0.99	0.28	0.25
X22.3	0.00	1000000.00	1330.09	36450.06
X23.1	0.00	0.99	0.30	0.24
X23.2	0.00	1.00	0.31	0.25
X23.3	0.00	1.00	0.34	0.26
X24.1	0.03	1.00	0.66	0.20
X24.2	0.01	1.00	0.66	0.20
X24.3	0.00	1.00	0.68	0.19
X25.1	0.00	0.96	0.30	0.20
X25.2	0.00	0.95	0.28	0.19
X25.3	0.00	0.97	0.26	0.18
X26.1	0.00	1000000.00	3102.95	55628.95
X26.2	0.00	1000000.00	3546.70	59456.60
X26.3	0.00	1000000.00	1773.14	42079.57
X27.1	0.00	1000000.00	18176.96	133609.28
X27.2	0.00	1000000.00	11525.59	106757.06
X27.3	0.00	1000000.00	8423.55	91404.23
X28.1	0.00	0.58	0.03	0.02
X28.2	0.00	0.24	0.02	0.01
X28.3	0.00	0.35	0.02	0.01
X29.1	-94.97	208.31	0.05	5.18
X29.2	-82.94	644.62	0.32	13.84
X29.3	-893.90	60.44	-0.30	18.88

	Minimum	Maximum	Mean	Std. Deviation
X30.1	0.00	1000000.00	1330.72	36450.05
X30.2	0.00	1000000.00	887.38	29767.95
X30.3	0.00	1000000.00	2216.58	47035.93
X31.1	0.00	34.87	0.11	0.77
X31.2	0.00	9.12	0.10	0.32
X31.3	0.00	23.66	0.13	0.73
X32.1	0.00	1000000.00	25266.02	156967.47
X32.2	0.00	1000000.00	25266.01	156967.08
X32.3	0.00	1000000.00	25266.01	156967.53
X33.1	0.00	0.29	0.02	0.01
X33.2	0.00	0.15	0.01	0.01
X33.3	0.00	0.17	0.01	0.00
X34.1	-87.89	1000000.00	25265.94	156967.03
X34.2	-16.74	1000000.00	25265.99	156967.38
X34.3	-28.92	1000000.00	25266.02	156967.11
X35.1	-87.89	1000000.00	25265.97	156967.35
X35.2	-16.74	1000000.00	25266.02	156967.95
X35.3	-28.92	1000000.00	25266.04	156967.72
X36.1	-1.04	1.23	0.06	0.12
X36.2	-1.12	0.74	0.05	0.10
X36.3	-0.96	1.74	0.08	0.11
X37.1	-1.23	0.71	0.02	0.10
X37.2	-1.22	0.74	0.02	0.09
X37.3	-0.97	0.86	0.04	0.09
X38.1	-0.93	1.00	0.05	0.11
X38.2	-1.98	0.74	0.04	0.11
X38.3	-0.91	1.74	0.08	0.11
X39.1	0.00	3.35	0.08	0.17
X39.2	0.00	3.25	0.07	0.16
X39.3	0.00	3.45	0.07	0.15
X40.1	-16.27	1.00	0.02	0.36
X40.2	-2.75	1.00	0.02	0.15
X40.3	-26.93	0.79	0.03	0.64
X41.1	-1.18	1.00	0.16	0.12
X41.2	-2.11	1.00	0.16	0.14
X41.3	-22.24	1.00	0.16	0.51
X42.1	-12.31	3.33	0.00	0.32
X42.2	-2.99	1.36	0.01	0.14
X42.3	-75.62	5.57	-0.02	1.63
X43.1	0.00	2.18	0.84	0.12
X43.2	0.00	3.11	0.84	0.14
X43.3	0.00	23.24	0.84	0.51
X44.1	0.00	16.48	0.14	0.37
X44.2	0.00	3.06	0.13	0.14
X44.3	0.00	5.83	0.14	0.24
X45.1	0.00	4.74	0.03	0.10

	Minimum	Maximum	Mean	Std. Deviation
X45.2	0.00	2.21	0.03	0.08
X45.3	0.00	4.35	0.04	0.15
X46.1	-12153.81	1000000.00	166742.52	372733.24
X46.2	-13896.15	1000000.00	153524.12	360395.38
X46.3	-41877.60	1000000.00	131792.33	338177.41
X47.1	-12153.81	1000000.00	166727.50	372739.27
X47.2	-13896.15	1000000.00	153480.34	360395.62
X47.3	-41877.60	1000000.00	131760.11	338172.34

APPENDIX-C: Statistically Significant Ratios at .05 Significance Level

			Growth Measures			
Ratio Type	Ratio	Definition	HG195	HGMedian	IND ADJ HG195	IND ADJ Median
Liq.	X8	Short-Term Receivables to Total Assets	F=7.932 p=.005		F=5.115 p=.024	
Financial Position	X9	Total Loans to Total Assets	F=15.276 p=.000	F=8.428 p=.004	F=14.476 P=.000	F=6.227 p=.013
	X10	Own Funds to Total Assets	F=15.623 p=.000	F=8.583 p=.004	F=14.381 p=.000	F=6.239 p=.013
	X12	Short-Term Liabilities to Total Liabilities			F=7.845 p=.005	
	X13	Long-Term Liabilities to Total Liabilities	F=12.522 p=.000	F=7.679 p=.006	F=4.957 p=.026	F=7.534 p=.006
	X16	Tangible Fixed Assets to Long-Term Liabilities	F=20.523 p=.000	F=13.195 p=.000	F=11.823 p=.001	F=9.782 p=.002
	X20	Short-Term Liabilities to Total Loans	F=19.895 p=.000	F=14.505 p=.000	F=9.775 p=.002	F=8.394 p=.004
	X24	Current Assets to Total Assets	F=4.247 p=.039		F=4.247 p=.039	
	X25	Tangible Fixed Assets to Total Assets	F=4.373 p=.037		F=4.373 p=.037	
Turnover	X27	Receivables Turnover	F=6.754 p=.010			
	X28	Working Capital Turnover			F=6.741 p=.009	
	X30	Tangible Fixed Assets Turnover			F=5.931 p=.014	
	X33	Total Assets Turnover	F=8.754 p=003		F=12.468 p=.000	
Profitability	X36	Profit Before Interest and Tax to Total Liabilities		F=26.293 p=.000		F=26.169 p=.000
	X37	Net Profit to Total Assets	F=9.965 p=.002	F=42.167 p=.000	F=6.453 p=.010	F=35.307 p=.000
	X38	Operating Profit to Assets Used in Carrying out the Operations	F=7.456 p=.007	F=40.656 p=.000	F=6.441 p=.010	F=33.635 p=.000
	X39	Cumulative Profitability Ratio	F=20.965 p=.000	F=20.341 p=.000	F=7.348 p=.007	F=10.747 p=.001

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