Are the Determinants of Young SMEs Profitability Different?

Empirical Evidence Using Dynamic Estimators

Abstract:

Based in two sub-samples of Portuguese SMEs: 1) 495 young SMEs; and 2) 1350 old SMEs, we conclude that age is a determinant factor in the relationships formed between determinants and profitability. Age, size, liquidity and long-term debt are of greater relative importance for the increased profitability of young SMEs, while risk is of greater relative importance for the diminished profitability of this type of SME, compared to the case of old SMEs. R&D expenditure is of greater relative importance for increased profitability in old SMEs, this type of SME having more persistent profitability, compared to the case of young SMEs.

Keywords: Panel Data Models; Profitability; SMEs; Survival; Two-step Estimation Method.

Jel Classifications: C23, D22, G32, L25

1. Introduction

Various fields of knowledge have concentrated on the study of possible determinants of firm performance. In fact, Industrial Economics, Strategic Management and Accountancy and Finance are areas of knowledge that have devoted some time to the determinants of firm performance.

For example, in the area of Industrial Economics, Bain (1956), Porter (1980) and Slater and Olsen (2002), based on the paradigm of Structure – Conduct – Results (S-C-R), concern themselves with studying variations in firm performance. The authors main concern is studying whether economies of scale and barriers to firms' entry and exit are relevant for persistent firm performance. Besides studying firm persistence, the authors are fundamentally concerned with investigating the influence of size on firm performance.

In the field of Strategic Management, the main focus of study is analysis of the influence of organizational structure and management of internal resources on firm performance. Teece (1981), Peteraf (1993), Levinthal (1995) and Barney (2001) study the influence of organizational structure, risk, asset structure and size on firm performance.

Finally, in the sphere of Accountancy and Finance, studies (Jensen and Meckling, 1976; Myers, 1977; Stulz, 1990; Callen et al., 1993; Chan et al., 2003) deal above all with the influence of capital structure on firm performance. In the context of research into firm performance in the field of Accountancy and Finance, study of the influence of debt and liquidity on firm performance is particularly relevant.

One of the most frequently used measures of firm performance is profitability. In this study, just as Adams and Buckle (2003), Amato and Amato (2004), Goddard et al. (2005), Gschwandtner (2005), Galbreath and Galvin (2008), Maçãs Nunes et al. (2010),

we use firm profitability as the measure of performance, measured by the ratio of operational results to assets.

As explanatory variables of profitability, just as Maçãs Nunes et al. (2010), we consider: 1) Age; 2) Intensity of Expenditure on Research and Development; 3) Size; 4) Liquidity; 5) Long-term Debt; and 6) Risk.

The various studies about determinants of profitability (Adams and Buckle, 2003; Amato and Amato, 2004; Goddard et al., 2005; Gschwandtner, 2005; Galbreath and Galvin, 2008; Serrasqueiro and Maçãs Nunes, 2008; Maçãs Nunes et al., 2009; Maçãs Nunes et al., 2010) have neglected study of the influence of firm age on the relationships between determinants and profitability.

SMEs being more vulnerable to changes in the economic climate and also to stronger competition they may face with ever-increasing market globalization, it is important to understand firstly: 1) the determinants which can stimulate SME profitability and those which can restrict profitability; and 2) given the importance of young SMEs in stimulating employment and economic growth, it is worth knowing if the greater or lesser age of SMEs is a relevant factor for the existence of significant differences in the factors that promote and restrict profitability.

In Portugal, SMEs represent around 99.6% of businesses (IAPMEI, 2008) and are highly relevant in stimulating employment and the country's economic growth. The importance of SMEs in the context of industrial activity in Portugal justifies studying the influence of age on the determinants of profitability in Portuguese SMEs, to understand if policies emphasizing the sustainability of SME profitability should be of a different nature according to the subject of analysis being young or old SMEs.

Methodologically, we consider a panel made up of 1845 Portuguese SMEs for the period 1999-2006. We consider as young SMEs those of 10 years of age or less in 2006, considering the remainder of SMEs included in the database as old SMEs.

We use the two-step estimation method proposed by Heckman (1979), so as to solve the problem of possible bias of estimated results, as a consequence of the matter of survival. At a first stage, we estimate probit regressions for young and old SMEs with all surviving and non-surviving SMEs. At a second stage, based on the previously estimated probit regressions, we calculate the Mill's inverse ratio and add it as an explanatory variable of profitability in young and old SMEs. In this second phase, we use dynamic panel estimators, namely GMM (1991), GMM system (1998) and LSDVC (2005) estimators. It should be noted that in the second phase of estimation, just as Heckman (1979), we only use the surviving SMEs. Use of dynamic panel estimators, just as in Gschwandtner (2005) and Maçãs Nunes et al. (2009), allows us to determine the persistence of profitability in young and old SMEs, i.e. we check for a relationship between profitability in the current period and in the previous period for young and old SME, also checking whether age is a fundamental characteristic for the magnitude of profitability persistence.

The empirical evidence obtained lets us make the following contribution to the literature: age is a determinant factor for the relationships formed between determinants and profitability. More specifically, we ascertain that: 1) age, liquidity and long-term debt influence positively young SMEs profitability, and in old SMEs context age influence negatively SMEs profitability and liquidity and long-term do not influence SMEs profitability; 2) size influence positively young and old SMEs profitability, but the positive influence is greater in young SMEs than in old SMEs; 3) risk has a negative influence in young SMEs profitability, and do not influence the old SMEs profitability;

4) R&D influence positively old SMEs profitability, and do not influence the young SMEs profitability; and 5) persistence of profitability is greater in old SMEs than in young SMEs. In addition, use of the two-step estimation method allowed an additional contribution: significant differences are found in the determinants of young and old SME survival.

After this introduction, the study is structured as follows: 1) section 2 presents the literature review and hypotheses for investigation: 2) section 3 presents the database, variables and the estimation method used; 3) section 4 presents the results obtained; 4) section 5 goes on to discuss the results; and 5) finally, section 6 presents the conclusions and implications of the study.

2. Literature Review and Investigation Hypotheses

2.1. Age

There is no consensus on the influence of age on firm performance. On one hand, Jovanovic (1982) concludes it takes time for firm owners and/or managers to understand their real business possibilities. According to Jovanovic (1982), only as the years pass do firm owners and/or managers begin to be more efficient at choosing the best of alternative investment opportunities. Based on this argument, Jovanovic (1982) concludes that at more advanced stages of their life-cycle firms are more able to obtain higher rates of financial performance.

Lumpkin and Dess (1996), Lumpkin (1998) and Shane and Venkataraman (2000) state that younger firms are normally more proactive, besides having a greater perception of the risk contained in the various investment alternatives that arise. The authors also mention that younger firms are more efficient at choosing the most

profitable investments, compared to what happens in firms at more advanced stages of their life-cycle, since young firms are particularly concerned about survival and are therefore quite careful in choosing investments. Lumpkin and Dess (1996), Lumpkin (1998) and Shane and Venkataraman (2000) conclude we can expect young SMEs to have higher levels of profitability than old SMEs.

SMEs are associated with considerable business risk, compared to the case of large firms. In the first years of their life, high business risk associated with possible difficulty in obtaining credit can lead to SMEs being unable to take advantage of the investment opportunities that arise. In addition, Jovanovic (1982) concludes that firms in the first years of their life-cycle have the main concern of reaching a minimum scale of efficiency that allows them to survive. The smaller size of SMEs, compared to large firms, means greater relative importance of the need to obtain a minimum scale that allows survival, since they are particularly exposed to risk and the effects of competition.

Based on the arguments above, we formulate the following hypothesis:

H1: Age is of greater relative importance for increased profitability in young SMEs than for increased profitability in old SMEs.

2.2. Other Determinants

2.2.1. Research and Development

Andries and Debackere (2007) conclude that expenditure on Research and Development is a fundamental aspect for an increased tendency in firms to innovate. According to Andries and Debackere (2007), SMEs with more intensive expenditure on Research and Development have a greater innovative capacity and consequently more strategic

flexibility to diversify their investments, which may contribute decisively to increasing their levels of profitability.

The benefits of SME investment in Research and Development are also stated by other authors. Rogers (2004) concludes that SMEs with higher investment in Research and Development have greater organizational flexibility, a greater flexibility which may contribute to more efficient use being made of growth opportunities. Taking greater advantage of growth opportunities can mean increased SME profitability. Beise-Zee and Rammer (2006) claim that diversification of activities, as a consequence of SMEs' greater investment in Research and Development, can mean greater export capacity. Less risk in SME activity, as a consequence of greater export capacity, may contribute to increased profitability. Finally, according to Rickne (2006), SMEs that invest more in Research and Development have a greater tendency to establish collaboration networks with other SMEs. Establishing collaboration networks can contribute to greater diversification of SME activities, which the author claims can contribute to increasing their levels of profitability.

However, investment in Research and Development may contribute to diminished SME profitability, since: 1) investment in Research and Development contains quite a high risk, which together with the high risk associated with SME activities in general, can lead to difficulties in managing financial resources when internal financing is insufficient (Yasuda, 2005; Müller and Zimmermann, 2009); 2) if SMEs do not have a long learning period in managing investment in Research and Development, this can imply inefficient use of investment opportunities (Müller and Zimmermann, 2009); and 3) for SMEs to finance their Research and Development activities, in many situations they need to turn to external finance, since internal finance may be clearly insufficient for this purpose. The added difficulties SMEs face in most situations when accessing

external finance can mean problems in managing firms' financial resources and taking advantage of growth opportunities (Tanabe and Watanabe, 2005; Gomez and Vargas, 2009; Müller and Zimmermann, 2009).

The youngest SMEs have the main concern of attaining a minimum scale of efficiency that allows them to survive (Jovanovic, 1982). Therefore, diversification of their productive activities, as a consequence of greater investment in Research and Development, can be fundamental in fulfilling that objective. However, diversification of activities can also be fundamental for the growth and sustainability of old SMEs, since they can stagnate somewhat if beyond a certain moment in their life-cycle they do not invest in Research and Development, because they may exhaust their profitable investment opportunities.

The fact of age contributing to increased SME reputation (Diamond, 1989), and diminished probability of bankruptcy (Müller and Zimmermann, 2009), can contribute to old SMEs getting easier access to alternative sources of finance. When internal finance is insufficient, access to alternative sources of finance can be fundamental for them being able to finance their Research and Development activities with less difficulty in managing their financial resources, so contributing to increased profitability. What is more, the effect of experience in managing innovation processes (Müller and Zimmermann, 2009), as a consequence of greater age, can contribute to investment in Research and Development by old SMEs meaning greater increases in profitability, compared to the case with young SMEs.

Based on the arguments above, we formulate the following hypothesis:

H2: Expenditure on Research and Development is of greater relative importance for increased profitability in old SMEs than for increased profitability in young SMEs.

2.2.2. Size

Various authors (Winter, 1994; Hardwick, 1997; Wyn, 1998; Gschwandtner, 2005) state that firm size is fundamental for increased levels of profitability. According to the authors, greater firm size contributes to them having: 1) greater ability to take advantage of economies of scale; 2) greater capacity to diversify activities and products; and 3) greater ability to implement strategies aiming to increase barriers to the entry of potential competitors.

However, other authors (Pi and Timme, 1993; Goddard et al., 2005) state that greater firm size can contribute to owners reducing their ability to control managers' actions. Less control of managers' actions by owners can mean investment by managers in projects that increase their own prestige, such as projects that make firms grow beyond the desirable size and which can contribute to diminished firm profitability.

In the context of SMEs, given that in many situations ownership and management are in the hands of the same individuals, the negative impacts of increased size on profitability can be minimal, and so we can expect greater SME size to contribute to increasing their profitability levels.

However, we can expect the size of young SMEs to be more relevant for increasing their levels of profitability, compared to the case of old SMEs. Since young SMEs as a rule can be far from the minimum size that allows survival (Jovanovic, 1982, Lotti et al., 2009), greater size can have greater relative importance for young SMEs to have: 1) greater ability to take advantage of economies of scale; 2) greater capacity to diversify activities and products; and 3) greater capacity to raise barriers to the entry of potential competitors, compared to the case of old SMEs.

Based on the above arguments, we formulate the following hypothesis:

H3: Size is of greater relative importance for increased profitability in young SMEs than for increased profitability in old SMEs.

2.2.3. Liquidity

Fama and Jensen (1983) and Myers and Rajan (1995) conclude that when firms have excessive liquidity, managers can invest in projects that maximize their own personal benefits, but which mean reduced levels of firm profitability. However, Ang (1991) concludes that the negative effects of excessive liquidity on SME profitability are minimal as a consequence of ownership and management, in most cases, being concentrated in the same individuals.

Higher liquidity levels mean a greater possibility for firms to be more effective in facing up to possible changes in their operating markets as a consequence of increased competition (Goddard et al., 2005). This happens because firms with higher levels of liquidity are more able to react in the short term to increased competition, as a consequence of the lesser stress in managing their financial resources.

In the SME context, higher levels of liquidity can be particularly relevant for firms making efficient use of the various investment opportunities that arise, contributing to increased profitability (Honjo and Harada, 2006). Deloof (2003) concludes that the importance of SME liquidity for increased SME profitability can arise from the diminished risk of not meeting short-term commitments entered into, which allows management with a more efficient orientation of financial resources to take advantage of good investment opportunities. Fagiolo and Luzzi (2006) reinforce the conclusions of Deloof (2003), claiming that the information asymmetry inherent in the relationship formed between SME owners and creditors can cause a situation of excessive

dependence by firms on recourse to short-term debt, giving rise to situations of great financial stress, due to the need to pay debt charges over a very short period.

The youngest SMEs have greater difficulty in accessing external financing than old SMEs. Indeed, the lesser reputation of young SMEs (Diamond, 1989) and the greater possibility of bankruptcy (Müller and Zimmermann, 2009) contribute to the situation that young SMEs find it more difficult to obtain external finance on advantageous terms, compared to the case with old SMEs. For example, creditors can grant more short-term credit, and less long-term credit, so as to monitor repayment of the debt by SMEs more easily. In this context, Serrasqueiro and Maçãs Nunes (2010) conclude that when internal finance is insufficient, young SMEs are excessively dependent on short-term debt, whereas old SMEs are more able to access long-term debt. This being so, we can expect liquidity to be particularly important for increased profitability in young SMEs.

Based on the arguments above, we formulate the following hypothesis:

H4: Liquidity is of greater relative importance for increased profitability in young SMEs than for increased profitability in old SMEs.

2.2.4. Long-term Debt

In the context of conflicts between owners/managers and creditors, the conclusions of Jensen and Meckling (1976) are quite relevant. The authors conclude that firm owners/managers may be interested in resorting to debt with the aim of financing highly profitable projects, but ones which may also contain a high level of risk. When successful, owners/managers are the main beneficiaries. On the contrary, in the case of failure, it is creditors who bear most of the cost. Therefore, creditors make it difficult for

firms to access credit when they suspect a high risk in the projects firms wish to finance through recourse to debt.

Myers (1977) concludes that creditors hinder the granting of long-term debt to firms when the projects to be financed imply a high level of risk. In situations of high risk associated with investment projects, Myers (1977) concludes that creditors prefer to grant short-term debt so as to monitor repayment of the debt and its charges more easily.

Fagiolo and Luzzi (2006) conclude that when internal finance is insufficient, recourse to debt by SMEs can be fundamental, so that they can finance all good investment opportunities that arise. Nevertheless, the authors conclude that excessive dependence on short-term debt by SMEs, when internal finance is insufficient, can contribute to reduced liquidity, which will lead to excessive stress in managing financial resources, and which in turn may mean less than efficient use of the good investment opportunities which SMEs are presented with.

For Fagiolo and Luzzi (2006), when internal finance is insufficient, if SMEs have greater access to long-term debt, rather than excessive recourse to short-term debt, this can contribute to increased SME profitability. According to these authors, this happens because SMEs can manage their financial resources with less stress, which can be fundamental for taking advantage of all good investment opportunities that arise.

Serrasqueiro and Maçãs Nunes (2010) conclude that when internal finance is insufficient, young SMEs are excessively dependent on short-term debt, whereas old SMEs, in the same circumstances, are more able to obtain long-term debt. The greater reputation gained with greater SME age (Diamond, 1989), as well as the lesser possibility of bankruptcy in older SMEs (Müller and Zimmermann, 2009), may be determinant factors for older SMEs having easier access to long-term debt.

When internal finance is insufficient, SMEs' excessive dependence on short-term debt and consequent financial stress in managing their financial resources can lead to considerable relative importance of long-term debt to stimulate profitability, since this can allow reduction of the excessive financial stress young SMEs may experience in managing their financial resources.

Based on the arguments above, we formulate the following hypothesis:

H5: Long-term debt has greater relative importance for increased profitability in young SMEs than for increased profitability in old SMEs.

2.2.5. Risk

Various authors (Fama and Jensen, 1983; Titman and Wessels, 1988; Lamm-Tennant and Starks, 1993; Adams and Buckle, 2003) state that firms with highly volatile operational results are more exposed to situations of risk. Such results are associated with situations of strong competition in the markets in which firms operate.

Pettit and Singer (1985) conclude that SMEs with high operational risk have considerable difficulty in accessing credit. In fact, for creditors it is sometimes difficult to assess the exact nature of SME assets, since the great flexibility of SMEs' organizational structure can lead in the short-term to considerable changes in the nature of their assets. Besides, in high-risk situations, SME owners/managers can begin investing in projects that maximize their immediate short-term benefits, and cease to invest in projects that contribute to increased profitability.

From the above, we can expect greater operational risk in SMEs to mean diminished levels of profitability. However, considering that SMEs starting out, since often they have not yet reached a minimum scale that allows them to survive in their operating markets (Jovanovic, 1982), are more exposed to risk, we can expect the greater risk to

mean a more accentuated reduction in the profitability of this type of SME, compared to the case of SMEs at later stages of their life-cycle.

Based on the arguments set out, we formulate the following hypothesis:

H6: Level of risk has greater relative importance for diminished profitability in young SMEs than for diminished profitability in old SMEs.

2.2.6. Profitability in the Previous Period

According to Mueller (1986), there is a tendency to find persistence of firm profitability over time, i.e. a tendency to find a statistically significant relationship between firm profitability in the previous period and firm profitability in the present period. The author argues this happens because small divergences which can occur between profitability in the previous and present periods are immediately cancelled out by the entry and exit of firms in the market.

In the context of persistence of firm profitability, the conclusions of Gschwandtner (2005) are quite relevant. The author concludes that the greater level of risk associated with firm activities, and the consequently greater likelihood of bankruptcy, contribute to diminished persistence of profitability.

Considering that SMEs are more exposed to risk, and are consequently more likely to go bankrupt than large firms, SMEs can be expected to have less persistent profitability than large firms.

It is also probable that young SMEs have less persistent profitability than old SMEs. This may happen because of the higher risk associated with young SMEs and consequently greater likelihood of bankruptcy, compared to the case of old SMEs.

Based on these arguments, we formulate the following hypothesis:

H7: Persistence of profitability is greater in old SMEs than in young SMEs.

3. Methodology

3.1. Database

This study uses the SABI (Sistema de Balanços Ibéricos - System Analysis of Iberian Balance Sheets) database supplied by Bureau van Dijk, for the period between 1999 and 2006. We select SMEs on the basis of the European Union's recommendation L124/36 (2003/361/CE). According to this recommendation, a firm is considered small and medium-sized when it meets two of the following criteria: 1) fewer than 250 employees; 2) assets under 43 million euros; 3) business turnover under 50 million euros.

According to Arellano and Bond (1991), use of dynamic panel estimators implies that cross-sections are included in the database for at least four consecutive years, so as to be considered in the econometric analysis, namely in the second order autocorrelation tests. These tests are fundamental to confirm the robustness of the empirical results obtained. Since dynamic panel estimators are used in this study, we eliminate firms that do not belong to the database for at least four consecutive years in the period 1999 – 2006.

Aiming to solve the problem of possible bias in the results, and simultaneously aiming to have a more representative database of the actual state of Portuguese SMEs, we consider three types of SMEs: 1) SMEs in the market for the whole period of analysis; 2) SMEs entering the market during the period of analysis; and 3) SMEs leaving the market during the period of analysis.

Since our objective is to study the influence of age on the profitability of Portuguese SMEs, we consider two sub-samples of data: 1) 495 young SMEs, of which 236 enter the market during the period of analysis and 36 leave the market during that time; and 2) 1350 old SMEs, of which 162 leave the market during the period of analysis. We

consider as young SMEs those in existence up to a maximum of 10 years at the end of the analysis period[1], considering as old SMEs all those over 10 years old at the end of the analysis period[2].

Table 1 presents the structure of the database considered in this study.

(Insert Table 1 About Here)

In order to test the robustness of the empirical evidence obtained, namely if it depends on the criterion of classification used, we consider an alternative classification criterion for young and old SMEs. According to the alternative criterion, we consider as young SMEs those entering the market in the period 1999-2006, considering the remainder as old SMEs[3]. In appendix, we present the results.

3.2. Variables

The following table presents the variables used in this study, together with their corresponding measure.

(Insert Table 2 About Here)

[1] Which corresponds to 2006.

[2] Hyytinen and Pajarien (2004), Oliveira and Fortunato (2006), Ferrando et al. (2007) and La Rocca et al. (2009) consider the same criterion for classifying young and old SMEs.

[3] According to the alternative criterion, we consider as young SMEs those up to 7 years old, considering as old SMEs those over 7 years old. Robb and Robinson (2009) consider SMEs to be young up to a maximum of 5 years of age. In this study, use of dynamic estimators, with the consequent need for SMEs to be in the sample for at least four consecutive years to validate the second order autocorrelation tests, recommends use of an alternative criterion with a higher maximum age for classifying young SMEs. However, the alternative criterion we use is similar to that used by Robb and Robinson (2009) since, by considering as young SMEs those entering in the period 1999-2006, they are no more than 7 years old. The alternative criterion used in this study is also quite similar to the one used by Steffens et al. (2009), these authors classifying as young SMEs those up to 8 years old, classifying as old SMEs those over 8 years old.

The dependent variable is profitability, given by the ratio of operational results to assets. As independent variables, we consider: 1) age; 2) R&D intensity; 3) size; 4) a liquidity; 5) long-term debt; and 6) risk.

3.3. Estimation Method

Studying the determinants of SME profitability without correcting possible sample bias as a consequence of not considering the situation of firms that left the market during the period of analysis could lead to bias in the results obtained, given the omission of the situation of firms with survival difficulties. That situation could be different from the one presented by firms with good survival possibilities.

The best way to solve this problem is use of the two-step estimation method proposed by Heckman (1979). At the first stage, considering all firms, both surviving and non-surviving, we estimate a probit regression in which the dependent variable has the value of 1 if the firm is in the market, and the value of 0 if it has left the market. As independent variables we consider the profitability determinants used in this study.

At a second stage, when estimating the regressions relating to the profitability determinants, we only consider surviving firms, adding the Mill's inverse ratio as another explanatory variable so as to control for possible data bias as a consequence of survival.

The probit regression estimated in the first step lets us calculate the additional explanatory variable, the Mill's inverse ratio, a variable that allows us to control for possible sample bias.

The probit regression to estimate, corresponding to the first step, is given by:

$$\Pr(\delta_{i,t} = 1) = \tau_0 + \kappa PROF_{i,t-1} + \sum_{K=1}^{6} \tau_K X_{K,i,t} + S_S + d_t + z_{i,t}, \qquad (1)$$

where: $PROF_{i,t-1}$ is profitability in the previous period; $X_{K,i,t}$ is the vector of the profitability determinants K considered in this study[4]; S_S are sector dummy variables[5]; d_t are annual dummy variables measuring the impact of changes in the economic situation on the likelihood of bankruptcy; and $z_{i,t}$ is the error.

After determining the Mill's inverse ratio[6] for each of the observations, we consider it as an additional explanatory variable of profitability.

At the second stage, in order to estimate the regressions relating to the profitability determinants, we use dynamic panel estimators, namely the GMM (1991), GMM system (1998) and LSDVC (2005) estimators. Using dynamic estimators has the following advantages over traditional panel methods (random effect panel model and fixed effect panel model): 1) greater control of endogeny; 2) greater control of possible collinearity of explanatory variables; and 3) more effectiveness in controlling effects caused by the absence relevant independent variables for explaining the dependent variable. In addition, use of dynamic estimators allows us to correctly determine, i.e. without result bias, the persistence of profitability in Portuguese SMEs.

The regressions to estimate using the various dynamic panel estimators are expressed as follows:

$$PROF_{i,t} = \beta_0 + \delta PROF_{i,t-1} + \sum_{K=1}^{6} \beta_K X_{k,i,t} + \beta_\lambda \lambda_{i,t} + S_S + d_t + v_i + e_{i,t}, \qquad (2)$$

[4] As mentioned before, we consider as determinants of the profitability of young and old Portuguese SMEs: 1) age; 2) R&D intensity; 3) size; 4) liquidity; 5) long-term debt; and 6) risk.

[5] We consider sector dummy variables representing the main sectors of activity: 1) primary sector (I) which includes agriculture and fishing; 2) secondary sector (II) including industry and construction; and 3) tertiary sector (III) including services and commerce.

[6] The inverse Mill´s ratio is the ratio between cumulative density function and the density function. The designation of inverse Mill´s ratio is due to the fact that Mill´s ratio considers the inverse of Hazard ratio (also known as force of mortality). For a detailed description of calculation of the inverse Mill´s ratio, see Heckman (1979).

where : $\lambda_{i,t}$ is the Mill's inverse ratio; v_i are non-observable individual effects; and $e_{i,t}$ is the error which assumes normal distribution.

Estimating equation (2) through traditional panel models, namely through random and fixed effect panel models, we would obtain biased estimates of the parameters estimated, due to the existence of correlation between v_i and $PROF_{i,t-1}$, and between $e_{i,t}$ and $PROF_{i,t-1}$.

Arellano and Bond (1991) recommend estimation of equation (2) with the variables in first differences, using the lagged profitability and determinants at level. By estimating equation (2) in first differences, non-observable individual effects (v_i) are eliminated, eliminating the correlation between v_i and $PROF_{i,t-1}$. Use of the lags of profitability and lags of the determinants creates orthogonal conditions between e_{it} and $PROF_{i,t-1}$, eliminating their correlation.

However, Blundell and Bond (1998) state that in situations of persistence of the dependent variable, i.e. when high correlation is found between the dependent variable in the previous and current periods, and the number of periods is not particularly high, the GMM (1991) estimator leads to inefficient results because the instruments are weak, leading to bias of the estimated results. This bias is particularly relevant concerning the estimated parameter measuring the relationship between the dependent variable in the previous and current period. In situations of high persistence of the dependent variable, Blundell and Bond (1998) propose use of an alternative estimator, considering a system of variables at levels in first differences. For the variables at level, the instruments are given in first differences. For the variables in first differences, the instruments are given in levels.

For the results obtained from using the GMM (1991) and GMM system (1998) estimators to be considered robust, two conditions must be verified: 1) the restrictions created from use of the instruments have to be valid; and 2) there can be no second order autocorrelation. To test validity of the restrictions created from use of the instruments, we use the Sargan test in the case of the GMM (1991) estimator and the Hansen test in the case of the GMM system (1998) estimator. In both cases, the null hypothesis is validity of the restrictions created by using the instruments used, the alternative hypothesis being non-validity of use of the restrictions created by use of the instruments. We also test for the existence of first and second order autocorrelation. The null hypotheses indicate non-existence of first and second order autocorrelation, the alternative hypotheses indicating the existence of first and second order autocorrelation. In the case of not rejecting the null hypotheses of validity of the restrictions created by the instruments and non-existence of second order autocorrelation, we conclude the results obtained from using the GMM (1991) and GMM system (1998) estimators are robust.

Bruno (2005) concludes that in situations where neither the number of cross-sections nor the number of observations is very high, given the relatively high number of instruments compared to the number of observations, this can cause bias of the results obtained using the GMM (1991) and GMM system (1998) estimators. Considering that the number of cross-sections, and consequently the number of observations, is not very high, mainly concerning young SMEs, this study also uses the estimator by Bruno (2005), Least Squares Dummy Variable Corrected – LSDVC, in order to test the robustness of the results previously obtained using the GMM (1991) and GMM system (1998) dynamic estimators.

With the aim of testing differences in the relationships between determinants and profitability for young SMEs and old SMEs, we use the Chow test[7]. We test for possible differences for each of the determinants considered in this study, as well as the overall difference for the set of determinants considered. The null hypothesis is that no differences are found in the estimated parameters relating to relationships between determinants and profitability for young SMEs and old SMEs, the alternative hypothesis being existence of difference in the estimated parameters.

4. Results

4.1. Descriptive Statistics

The following table presents the descriptive statistics of the variables used in this study for the sub-samples of young SMEs and old SMEs.

(Insert Table 3 About Here)

Young SMEs have slightly higher average profitability than old SMEs. Besides, we find some volatility in the profitability of young SMEs and old SMEs, since standard deviations of profitability are above the respective means.

Regarding independent variables, we find that: 1) Research and Development and risk are on average higher in young SMEs than in old SMEs; and 2) age, size, liquidity and long-term debt are on average higher in old SMEs than in young SMEs.

[7] We also use the Chow test to test for differences in the determinants of survival for young SMEs and old SMEs.

4.2. Survival Analysis

The following table presents the results of the survival analysis for young SMEs and old SMEs.

(Insert Table 4 About Here)

The empirical evidence allows us to conclude that[8]: 1) profitability in the previous period, age, size, liquidity and long-term debt contribute to a greater likelihood of survival in young SMEs, whereas risk contributes to a lesser likelihood of survival in this type of SME, and 2) profitability in the previous period, age, R&D expenditure, liquidity and long-term debt contribute positively to the probable survival of old SMEs.

The following table presents the results of the Chow test of differences between the determinants of survival for young SMEs and old SMEs.

(Insert Table 5 About Here)

We find that for each of the variables considered as determinants of the survival of young SMEs and old SMEs, we reject the null hypothesis of equality of estimated parameters regarding the relationships between profitability determinants and probability of survival. The results of the overall Chow test confirm those differences. Therefore, we can conclude there are statistically significant differences between the survival determinants of young SMEs and old SMEs.

[8] In Appendix, Table A1, we present the results relating to the survival analysis of young SMEs and old SMEs, considering the alternative criterion for classifying young and old SMEs previously mentioned in section 3. Methodology. The results obtained, concerning sign, magnitude and statistical significance of the estimated parameters, are relatively similar to those presented in Table 4, which confirms the robustness of the empirical evidence obtained in this study, regarding specifically the survival analysis carried out.

4.3. Dynamic Panel Estimators

The following table presents the regressions referring to the relationships between determinants and profitability in young SMEs and old SMEs, using the GMM (1991), GMM system (1998) and LSDVC (2005)[9] estimators.

(Insert Table 6 About Here)

The results of the Sargan test, irrespective of taking young or old SMEs as the subject of analysis, indicate rejection of the null hypothesis that the restrictions arising from the instruments used are valid. Therefore, and in spite of not being able to reject the null hypothesis of second order autocorrelation, we cannot consider the results obtained with the GMM (1991) estimator as valid.

Whether taking young or old SMEs as the subject of analysis, the results of the Hansen test indicate we cannot reject the null hypothesis of validity of the restrictions, as a consequence of the instruments used. What is more, the results of the second order autocorrelation tests, whether taking young or old SMEs as the subject of analysis, indicate we cannot reject the null hypothesis of absence of second order autocorrelation. Based on the results of the Hansen and second order autocorrelation tests, we can conclude that the results obtained with the GMM system (1998) estimator are robust.

The results obtained with the LSDVC (2005) estimator corroborate, in general, those obtained with the GMM system (1998), concerning sign, magnitude and significance of the estimated parameters.

[9] In Appendix, Table A2, we present the results referring to the determinants of profitability in young SMEs and old SMEs, taking the alternative criterion for classifying young SMEs and old SMEs presented above in section 3. Methodology. As for sign, magnitude and statistical significance of the estimated parameters, the results obtained are relatively similar to those presented in Table 6, which confirms the robustness of the empirical evidence obtained relating to the profitability determinants of young and old SMEs.

Based on the various results obtained, we will consider the empirical evidence from using the GMM system (1998) and LSDVC (2005) estimators as our reference for interpreting the results.

Regarding the relationships between determinants and profitability in young SMEs, we can conclude that: 1) profitability in the previous period, age, size, liquidity and long-term debt influence profitability positively, while risk influences profitability negatively.

For old SMEs, we can conclude that: 1) profitability in the previous period, R&D and size influence profitability positively, while age influences profitability negatively.

Concerning the relationship between the Mill's inverse ratio and profitability, we find negative and statistically significant relationships, irrespective of taking young SMEs or old SMEs as the subject of analysis. This empirical evidence obtained allows us to conclude that using the Mill's inverse ratio was shown to be effective in solving the problem of possible result bias as a consequence of the matter of survival. Indeed, not considering the Mill's inverse ratio in the regressions would lead to overvaluation of estimated parameters.

The following table presents the results of the Chow test of differences in the estimated parameters measuring the relationships between determinants and profitability in young and old SMEs.

(Insert Table 7 About Here)

Whether using the GMM system (1998) estimator or the LSDVC (2005) estimator, we reject the null hypothesis of equality of estimated parameters for the relationships between the determinants considered and profitability in young and old SMEs. The results of the global tests confirm relationships between profitability and determinants are different in the case of young and old SMEs.

5. Discussion of the Results

There is a positive relationship between age and profitability in young SMEs, the relationship being negative in the case of old SMEs. Therefore, age has greater relative importance for increased profitability in young SMEs than for increased profitability in old SMEs, and so we can consider the previously formulated hypothesis H1 as valid.

The arguments of Jovanovic (1982) are not totally corroborated by the empirical evidence obtained in this study. In fact, greater SME age only means increased profitability when SMEs are young, this not happening when they attain more advanced stages of their life-cycle. Indeed, when SMEs are young, the relative marginal importance of age for increased profitability is relevant.

The fact that young SMEs are more proactive and more careful in choosing their investments (Lumpkin, 1998; Shane and Venkataraman, 2000) may contribute to the empirical evidence obtained in this study. The need to survive, and consequent need to be more proactive and careful with investments, together with the marginal effect of one more year's relevant experience in the first years of the life-cycle, may be decisive in age contributing positively to increased profitability in young SMEs, something which does not happen in the case of old SMEs.

The empirical evidence indicates that R&D expenditure is more relevant for increased profitability in old SMEs than in young SMEs. Indeed, we find a statistically insignificant relationship between R&D expenditure and profitability in young SMEs, whereas the relationship between R&D expenditure and profitability in old SMEs is positive and statistically significant. This being so, we can consider the previously formulated hypothesis H2 as valid.

The predicted benefits about the impact of R&D expenditure on SME profitability: 1) greater organizational flexibility and consequently greater efficiency in taking

advantage of good growth opportunities (Rogers, 2004); 2) greater diversification of activities and consequently greater export capacity (Beise-Zee and Rammer, 2006); and 3) greater ability to establish collaboration networks and consequently greater possibility to diversify activities (Rickne, 2006); only seem to be relevant in the case of old SMEs.

The principal concern of young SMEs to reach a minimum scale of efficiency that allows survival (Jovanovic, 1982) can contribute to less efficient use of R&D investment, corroborating the arguments of Müller and Zimmermann (2009) that a significant learning effect is necessary for SMEs to become efficient at managing R&D expenditure. Indeed, the empirical evidence obtained indicates the learning effect can be significant for R&D expenditure to mean increased profitability. In addition, we find that old SMEs have greater average liquidity than young SMEs. Therefore, as forecast by Tanabe and Watanabe (2005), Gomez and Vargas (2009) and Müller and Zimmermann (2009), the greater flexibility in managing financial resources in old SMEs, compared to young ones, may also contribute to old SMEs being more efficient than young SMEs at managing R&D expenditure, since the latter feel greater stress in managing their resources as a consequence of possibly lower liquidity.

For young and old SMEs, a positive and statistically significant relationship is found between size and profitability. However, the positive impact of size on profitability is more significant for young SMEs than for old ones, which is confirmed by the result of the Chow test. Based on the empirical evidence obtained, we can conclude that size takes on greater relative importance for increased profitability in young SMEs than for increased profitability in old SMEs, and so we can accept the previously formulated hypothesis H3 as valid.

The benefits of greater size for profitability forecast by various authors (Winter, 1994; Hardwick, 1997; Wyn, 1998; Gschwandtner, 2005): 1) greater capacity to take advantage of economies of scale; 2) greater capacity to diversify activities and products; and 3) greater ability to implement strategies aiming to raise barriers to the entry of potential competitors, seem to be more relevant for increased profitability in young SMEs than for increased profitability in old SMEs.

The fact of greater size contributing to a more significant increase in the profitability of young SMEs, compared to what happens with old SMEs, may be related to greater proximity to a minimum size of efficiency that allows young SMEs to survive in their operating markets. Greater size of young SMEs, and the consequent approach to a minimum size of efficiency that allows survival, may contribute to young SMEs being able to manage their resources more efficiently. Therefore, size is a greater importance to increased profitability in young SMEs.

As would be expected, given that in most cases SME ownership and management is concentrated in the same individuals, irrespective of taking young or old SMEs as the subject of analysis, greater size does not mean diminished profitability. Therefore, the arguments of Pi and Timme (1993) and Goddard et al. (2005) that greater size can contribute to managers investing in projects that harm profitability, as a consequence of less control of their action by owners, do not appear to be relevant in SMEs.

We find the relationship between liquidity and profitability is positive and statistically significant for young SMEs, but not statistically significant in the case of old SMEs. We can therefore conclude that liquidity has greater relative importance for increased profitability in young SMEs than in old SMEs, and so we can accept the previously formulated hypothesis H4.

The fact that greater liquidity contributes to SMEs being able to manage their financial resources with less stress, letting them deal successfully with possible changes in their operating markets (Goddard et al., 2005), seems to have greater importance for young SMEs having higher levels of profitability, compared to what happens with old SMEs.

The conclusions by Honjo and Harada (2006) seem to be particularly relevant in the context of young SMEs. Indeed, less stress in managing financial resources may be fundamental in the first years in the life of SMEs, so that they can make efficient use of multiple investment opportunities, contributing to increased levels of profitability.

The risk of not meeting short-term commitments, and consequent stress in managing financial resources can be particularly important for SMEs starting out in life. Therefore, greater liquidity may be particularly relevant for reducing the risk of young SMEs not meeting their short-term commitments, leading to less stress in managing their financial resources, which can be decisive for young SMEs having higher levels of profitability. The conclusions of Deloof (2003) and Fagiolo and Luzzi (2006) may be particularly relevant in explaining the relationship between liquidity and profitability in young SMEs. This importance can be greater since: 1) young SMEs have less reputation (Diamond, 1989) and a greater possibility of bankruptcy (Müller and Zimmermann, 2009) than old SME; and 2) young SMEs are more dependent on short-term debt, compared to old SMEs, given that creditors make it difficult for young SMEs to access credit (Serrasqueiro and Maçãs Nunes, 2010).

It should also be noted that, whether taking young or old SMEs as the subject of analysis, greater liquidity does not mean lower levels of profitability. That being so, we do not corroborate the arguments of Fama and Jensen (1983) and Myers and Rajan (1995) that greater liquidity can contribute to managers investing in projects that do not

contribute to increased profitability, but rather to increasing their personal benefits. This will happen, as Ang (1991) states, because in the great majority of cases ownership and management are in the same hands, the agency problems between owners and managers being minimal in the case of SMEs.

We find a positive and statistically significant relationship between long-term debt and profitability in young SMEs, that relationship being statistically insignificant when our subject of analysis is old SMEs. Based on this empirical evidence, we can conclude that long-term debt is of greater relative importance for increased profitability in young SMEs than for increased profitability in old SMEs, and so we can consider the previously formulated hypothesis H5 as valid.

When internal finance is insufficient, access to long-term debt seems to be fundamental for increased profitability in young SMEs. The fact that considerable risk is associated with the activities of young SMEs may mean particularly restrictive terms of credit imposed by creditors (Myers, 1977), and they may become excessively dependent on short-term debt when internal funding is not enough. Given the high dependence on short-term debt when internal financing falls short, the marginal effect of long-term debt on profitability in young SMEs can be particularly relevant.

The empirical evidence obtained in the context of young SMEs seems to corroborate the arguments of Fagiolo and Luzzi (2006), given that use of long-term debt can be fundamental for young SMEs being able to reduce possible excessive stress in managing their financial resources, as a consequence of the need to pay off short-term debts over a short and constant period. Indeed, as Serrasqueiro and Maçãs Nunes (2010) conclude, when internal finance is insufficient, young SMEs are particularly dependent on short-term debt. Greater reputation (Diamond, 1989) and less possibility of bankruptcy (Müller and Zimmermann, 2009), resulting from greater SME age, may

contribute decisively to young SMEs with less reputation and a greater possibility of bankruptcy generally finding it more difficult to access long-term debt.

Given the high dependency on short-term debt in young SMEs, when internal finance is insufficient, the marginal effect of long-term debt on young SME profitability can be particularly relevant, that effect diminishing as SMEs progress in their life-cycle, given the greater possibility of accessing long-term debt, as shown by the results of the descriptive statistics presented previously.

Concerning the relationship between risk and profitability in young SMEs and old SMEs, we find a negative and statistically significant relationship between risk and profitability in young SMEs, whereas the relationship between risk and profitability in old SMEs is not statistically significant. We can consider the previously formulated hypothesis H6 as valid, since risk is of greater relative importance for diminished profitability in young SMEs than it is in old SMEs.

Creditors can make it difficult for SMEs with high levels of risk to obtain credit (Pettit and Singer, 1985). Restrictive credit terms for SMEs can be particularly severe because, besides the greater possibility of bankruptcy, they may find it easier to change their asset composition, compared to the case with old SMEs, contributing considerably to greater risk meaning diminished profitability in young SMEs. In addition, high risk combined with a high possibility of bankruptcy in young SMEs may contribute particularly to owners/managers possibly opting to invest in projects that maximize their immediate benefits but do not mean increased profitability.

The fact that in most cases young SMEs have not yet reached a minimum scale of efficiency that allows them to survive (Jovanovic, 1982) may contribute to high-risk situations not letting them take advantage of good investment opportunities that present

themselves to young SMEs when starting up their activity, contributing to reduced levels of profitability.

Finally, whether taking young SMEs or old SMEs as the subject of analysis, the empirical evidence indicates the relationship between profitability in the previous and present periods is statistically significant. However, for young SMEs the estimated parameter is 0,33652, when using the GMM system (1998) estimator and 0.32838 with the LSDVC (2005) estimator. For old SMEs, the estimated parameter is 0.55662, using the GMM system (1998) estimator and 0.58929, using the LSDVC (2005) estimator. The results of the Chow test show that the estimated parameters are of a different magnitude. Therefore, we find that persistence of profitability is greater in old SMEs than in young SMEs, and so we can consider the previously formulated hypothesis H7 as valid.

We find the empirical evidence obtained in this study corroborates the conclusions of Mueller (1986), since profitability is persistent in the case of young and old SMEs. This may be due to existing market dynamics, whereby small divergences occurring at certain times can be solved by firms entering and leaving the markets.

In addition, the empirical evidence appears to corroborate the conclusions of Gschwandtner (2005), since greater risk, and consequently greater likelihood of bankruptcy in young SMEs, may contribute to less persistence of profitability.

6. Conclusion and Implications

Considering two sub-samples of SMEs: 1) 495 young SMEs; and 2) 1350 old SMEs, using the two-step estimation method in order to solve possible data bias arising from the matter of survival, this study investigates whether the determinants of profitability in young SMEs are different from those in old SMEs.

The multiple empirical evidence obtained indicates that age is a determinant factor in the relationships formed between determinants and profitability in SMEs.

Firstly, age and size are of greater relative importance for increased profitability in young SMEs than for increased profitability in old SMEs. What is more, age and size are also found to be relevant for increased probability of survival in young SMEs. Greater age and size can also be particularly relevant for SMEs being able to diversify activities and products efficiently, attaining more quickly a minimum scale of efficiency that allows them to survive in their operating markets, in this way contributing to increased profitability in young SMEs.

Secondly, liquidity and long-term debt are of greater relative importance for increased profitability in young SMEs than for increased profitability in old SMEs. Liquidity and long-term debt are also found to be particularly important for increased probability of survival in young SMEs. When internal finance is insufficient, less financial stress in managing financial resources, as a consequence of greater liquidity and access to long-term debt, is particularly importance to young SMEs taking advantage of good investment opportunities arising at the start of their life-cycle, which can mean increased profitability.

Thirdly, R&D expenditure is more important for increased profitability in old SMEs than in young SMEs. In addition, R&D expenditure is relevant for increased likelihood of survival in old SMEs. We ascertain that for one thing, R&D expenditure can be particularly relevant for SMEs at advanced stages of their life-cycle being able to diversify their activities, diversification that can mean increased profitability, and for another, young SMEs may not make very efficient use of R&D expenditure, due to particularly adverse financial restrictions in the first years of activity, as well as little experience in managing R&D projects.

Fourthly, risk is of greater relative importance for diminished profitability in young SMEs than for diminished profitability in old SMEs. We also find that risk contributes to less survival in young SMEs. The difficulties in accessing credit by young SMEs with greater risk, the possibility of owners/managers investing in projects that do not maximize profitability, and the possibility of high risk situations meaning not taking advantage of good investment opportunities contributing to reaching a minimum level of efficiency for survival, are all factors which can mean reduced profitability in young SMEs as a consequence of higher levels of risk.

Fifthly, persistence of profitability is greater in old SMEs than in young SMEs. Besides, profitability in the previous period is of greater relative importance for increased probability of survival in young SMEs than for increased probability of survival in old SMEs. The particular difficulties young SMEs may face at the start of their life-cycle, namely possible changes in market conditions and difficulties in managing financial resources, can contribute to less persistence of profitability in this type of SME, compared to the case of old SMEs.

The empirical evidence obtained in this study allows us to make the following suggestions for economic policy in general, and industrial policy in particular.

It is suggested that the Portuguese Government gives effective support to young SMEs, through the creation of special long-term lines of credit, which would mean less stress in managing financial resources, allowing young SMEs to take advantage of good investment opportunities arising at the start of their life-cycle, contributing to increased profitability. For old SMEs, given the importance of R&D expenditure for increased profitability and the probability of survival, we suggest measures that contemplate financial support for investment in R&D so that this type of SME can diversify their activities and products and thereby raise their levels of profitability.

Appendix: Alternative Criterion for Selecting SMEs Based on Age

Table A1: Analysis of Survival – Young SMEs and Old SMEs – Alternative Criterion for Selecting SMEs Based on Age

Dependent Variable: $\Pr(\delta_{i,t} = 1)$		
Independent Variables	Young SMEs	Old SMEs
$PROF_{i,t-1}$	0.58748***	0.16445***
	(0.06758)	(0.04336)
$AGE_{i,t}$	0.11334***	0.05112***
	(0.03456)	(0.01503)
$R\ \&\ D_{i,t}$	0.05998	0.35009***
	(0.11546)	(0.11637)
$SIZE_{i,t}$	0.16112***	0.01114
	(0.03453)	(0.02874)
$LIQ_{i,t}$	0.21123***	0.08544**
	(0.06473)	(0.04221)
$LLEV_{i,t}$	0.26758***	0.10394*
	(0.06758)	(0.05303)
$EVOL_{i,t}$	-0.04993***	-0.00194
	(0.01687)	(0.01599)
$PseudoR^2$	0.4545	0.38394
$Log\ \ Likelihood$	-811.98	-743.
Firms	236	1609
Observations	1228	10543

Notes: 1. Robust Standard Deviations in parenthesis. 2. *** statistically significant at 1% significance; ** statistically significant at 5% significance; and * statistically significant at 10% significance. 3. Estimations include annual dummy variables, but estimated parameters are not presented in the tables.

Table A2: Determinants of Profitability – Young SMEs and Old SMEs – Alternative Criterion for Selecting SMEs Based on Age

Dependent Variable: $PROF_{i,t}$

	Young SMEs			Old SMEs		
Independent Variables	GMM (1991)	GMM system (1998)	LSDVC (2005)	GMM (1991)	GMM system (1998)	LSDVC (2005)
$PROF_{i,t-1}$	0.02839	0.28939***	0.29094***	0.14656***	0.52888***	0.55463***
	(0.04758)	(0.04556)	(0.04778)	(0.04656)	(0.05436)	(0.05553)
$AGE_{i,t}$	0.02009	0.07384***	0.06112***	-0.06473***	-0.03529***	-0.03223***
	(0.02455)	(0.015647)	(0.01454)	(0.01441)	(0.00837)	(0.00777)
$R\ \&\ D_{i,t}$	-0.00453	-0.01546	-0.04098	0.19283***	0.26375***	0.22231***
	(0.05226)	(0.05778)	(0.07512)	(0.05779)	(0.05646)	(0.05449)
$SIZE_{i,t}$	0.02343**	0.06654***	0.06556***	-0.02009	0.01134*	0.02637***
	(0.01133)	(0.01477)	(0.001123)	(0.02736)	(0.05882)	(0.005444)
$LIQ_{i,t}$	0.14838***	0.09066***	0.08737***	-0.00789	0.01099	0.01333
	(0.04304)	(0.02598)	(0.02466)	(0.03545)	(0.04556)	(0.03887)
$LLEV_{i,t}$	0.03453	0.08737***	0.09635***	-0.009839	0.01029	-0.02421
	(0.04666)	(0.01501)	(0.02221)	(0.01637)	(0.02545)	(0.02837)
$EVOL_{i,t}$	-0.01678**	-0.02546***	-0.02442***	0.01287	0.01726	0.00887
	(0.00825)	(0.00453)	(0.00673)	(0.04008)	(0.03551)	(0.03899)
$\lambda_{i,t}$	-0.12938***	-0.14657***	-0.15363***	-0.13948***	-0.13657***	-0.16935***
	(0.03928)	(0.03029)	(0.03848)	(0.02637)	(0.02830)	(0.03453)
$CONS$	0.014536	0.02738		0.03847***	0.03444**	
	(0.04845)	(0.05677)		(0.01112)	(0.01717)	
Firms	236	236	236	1411	1411	1411
Observations	949	1185	1185	7055	8466	8466
$Wald(\chi^2)$	172.43***			156.89***		
$F(N(0,1))$		99.55***			83.37***	
Sargan (χ^2)	44.89***			35.89***		
Hansen (χ^2)		131.93			127.14	
$m_1(N(0,1))$	-6.12***	-6.56***		-5.88***	-5.65***	
$m_2(N(0,1))$	-0.28	-0.22		-0.26	-0.43	

Notes: 1. Robust Standard Deviations in parenthesis. 2. *** statistically significant at 1% significance; ** statistically significant at 5% significance; and * statistically significant at 10% significance. 3. Estimations include annual dummy variables, but estimated parameters are not presented in the tables.

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Table 1: Description of Database

	Young SMEs		Old SMEs	
	Firms	Observations	Firms	Observations
Firms Present for the Whole Period 1999 – 2006	223	1784	1188	9504
Firms Entering the Market in the Period 1999 –2006	236	1420	0	0
Firms Leaving the Market in the Period 1999-2006	36	153	162	647
Total Number of Firms	495		1350	
Total Number of Observations		3357		10151

Table 2: Variables and Measures

Variables	Measures
Dependent Variable	
Profitability ($PROF_{i,t}$)	Ratio of Operational Results before Interest and Tax to Total Assets
Independent Variables	
Age ($AGE_{i,t}$)	Logarithm of the Number of Years in Existence
Intensity of Expenditure on Research and Development ($R\ \&\ D_{i,t}$)	Ratio of Expenditure on Research and Development to Total Assets
Size ($SIZE_{i,t}$)	Logarithm of Total Assets
Liquidity ($LIQ_{i,t}$)	Ratio of Short-term Liabilities to Circulating Assets
Long-term Debt ($LLEV_{i,t}$)	Ratio of Medium and Long-term Liabilities to Total Assets
Risk ($EVOL_{i,t}$)	Absolute Value of the Percentage Variation of Operational Results before Interest and Tax

Table 3: Descriptive Statistics

	Young SMEs					Old SMEs				
Variable	N	Mean	Stan. Deviation	Min.	Max.	N	Mean	Stan. Deviation	Min.	Max.
$PROF_{i,t}$	2961	0.047	0.102	-1.511	0.581	9092	0.045	0.089	-2.034	1.293
$AGE_{i,t}$	2961	1.674	0.316	0	2.302	9092	3.107	0.524	1.791	5.096
$R\ \&\ D_{i,t}$	2961	0.009	0.031	0	0.694	9092	0.009	0.035	0	0.664
$SIZE_{i,t}$	2961	14.36	1.287	10.36	17.37	9092	15.15	1.211	10.62	17.69
$LIQ_{i,t}$	2961	0.277	0.222	0	0.989	9092	0.304	0.210	0	0.993
$LLEV_{i,t}$	2961	0.062	0.159	0	0.771	9092	0.121	0.156	0	0.820
$EVOL_{i,t}$	2961	4.039	16.84	0.0007	38.11	9092	3.003	13.09	0.00012	31.21

Table 4: Analysis of Survival – Young SMEs and Old SMEs

Dependent Variable: $\Pr(\delta_{i,t}=1)$		
Independent Variables	Young SMEs	Old SMEs
$PROF_{i,t-1}$	0.54838***	0.19283***
	(0.05647)	(0.04774)
$AGE_{i,t}$	0.09765***	0.05854***
	(0.02765)	(0.01963)
$R\ \&\ D_{i,t}$	0.08763	0.31838***
	(0.10432)	(0.09674)
$SIZE_{i,t}$	0.13389***	0.02604
	(0.02098)	(0.03001)
$LIQ_{i,t}$	0.17829***	0.08637**
	(0.04472)	(0.04289)
$LLEV_{i,t}$	0.23453***	0.11454**
	(0.05845)	(0.05508)
$EVOL_{i,t}$	-0.04673***	-0.00534
	(0.01508)	(0.01786)
$PseudoR^2$	0.43002	0.39657
$Log\ \ Likelihood$	-806.67	-749.51
Firms	459	1350
Observations	2961	9092

Notes: 1. Robust Standard Deviations in parenthesis. 2. *** statistically significant at 1% significance; and ** statistically significant at 5% significance. 3. Estimations include annual dummy variables, but estimated parameters are not presented in the tables.

Table 5: Chow Test – Differences for Determinants of Survival – Young SMEs and Old SMEs

	Dependent Variable: $\Pr(\delta_{i,t}=1)$
Independent Variables	
$(PROF_{i,t-1})\ \alpha_{YOUNG}-\alpha_{OLD}=0$	27.07***
$F(1,12053)$	(0.0000)
$(AGE_{i,t})\ \tau_{1YOUNG}-\tau_{1OLD}=0$	18.91***
$F(1,12053)$	(0.0000)
$(R\ \&\ D_{i,t})\ \tau_{2YOUNG}-\tau_{2OLD}=0$	32.33***
$F(1,12053)$	(0.0000)
$(SIZE_{i,t})\ \tau_{3YOUNG}-\tau_{3OLD}=0$	21.85***
$F(1,12053)$	(0.0000)
$(LIQ_{i,t})\ \tau_{4YOUNG}-\tau_{4OLD}=0$	23.45***
$F(1,12053)$	(0.0000)
$(LLEV_{i,t})\ \tau_{5YOUNG}-\tau_{5OLD}=0$	25.06***
$F(1,12053)$	(0.0000)
$(EVOL_{i,t})\ \tau_{6YOUNG}-\tau_{6OLD}=0$	24.41***
$F(1,12053)$	(0.0000)
Global Difference	28.38***
$F(7,12053)$	(0.0000)

Notes: 1. *** statistically significant at 1% significance. 2. Probabilities in parenthesis.

Table 6: Determinants of Profitability – Young SMEs and Old SMEs

Dependent Variable: $PROF_{i,t}$

Independent Variables	Young SMEs GMM (1991)	Young SMEs GMM system (1998)	Young SMEs LSDVC (2005)	Old SMEs GMM (1991)	Old SMEs GMM system (1998)	Old SMEs LSDVC (2005)
$PROF_{i,t-1}$	0.05647	0.33652***	0.32838***	0.11928**	0.55662***	0.58929***
	(0.05097)	(0.05377)	(0.05182)	(0.05782)	(0.06283)	(0.06721)
$AGE_{i,t}$	0.01298	0.05647***	0.05093***	-0.08732***	-0.04087***	-0.03723***
	(0.01987)	(0.01488)	(0.01238)	(0.02189)	(0.00956)	(0.00834)
$R\&D_{i,t}$	-0.00783	-0.02839	-0.04536	0.17362***	0.28729***	0.24531***
	(0.05631)	(0.06088)	(0.07827)	(0.05076)	(0.06089)	(0.05821)
$SIZE_{i,t}$	0.00786	0.05529***	0.04973***	-0.02738*	0.01943**	0.02223****
	(0.01332)	(0.01245)	(0.00901)	(0.01407)	(0.0091)	(0.00665)
$LIQ_{i,t}$	0.11889***	0.07998***	0.07453***	-0.00984	0.01342	0.00982
	(0.03006)	(0.02366)	(0.02112)	(0.03118)	(0.03749)	(0.03440)
$LLEV_{i,t}$	0.02832	0.07983***	0.08631***	-0.00654	0.00768	-0.01778
	(0.03098)	(0.01665)	(0.01774)	(0.01449)	(0.02009)	(0.02344)
$EVOL_{i,t}$	-0.01678*	-0.02117***	-0.01672**	0.02298	0.01982	0.00783
	(0.00903)	(0.00568)	(0.00789)	(0.04415)	(0.03844)	(0.03223)
$\lambda_{i,t}$	-0.10983***	-0.12837***	-0.16374***	-0.14783***	-0.13047***	-0.17005***
	(0.02738)	(0.02879)	(0.03098)	(0.02873)	(0.02534)	(0.03228)
$CONS$	0.01234	0.02346		0.02839**	0.02773*	
	(0.03829)	(0.04092)		(0.01367)	(0.01409)	
Firms	459	459	459	1188	1188	1188
Observations	2064	2523	2523	5940	7128	7128
$Wald(\chi^2)$	169.43***			156.04***		
$F(N(0,1))$		97.04***			81.12***	
Sargan (χ^2)	41.02***			38.49***		
Hansen (χ^2)		135.10			126.61	
$m_1(N(0,1))$	-6.04***	-6.35***		-5.32***	-5.11***	
$m_2(N(0,1))$	-0.37	-0.25		-0.32	-0.48	

Notes: 1. Robust Standard Deviations in parenthesis. 2. *** statistically significant at 1% significance; ** statistically significant at 5% significance; and * statistically significant at 10% significance. 3. Estimations include annual dummy variables, but estimated parameters are not presented in the tables.

Table 7: Chow Test – Determinants of Profitability – Young SMEs and Old SMEs

	Dependent Variable: $PROF_{i,t}$	
Independent Variables	GMM system (1998)	LSDVC (2005)
$(PROF_{i,t-1})\,\delta_{YOUNG} - \delta_{OLD} = 0$ $F(1,9651)$	22.78*** (0.0000)	24.55*** (0.0000)
$(AGE_{i,t})\,\beta_{1YOUNG} - \beta_{1OLD} = 0$ $F(1,9651)$	30.98*** (0.0000)	28.98*** (0.0000)
$(R\,\&\,D_{i,t})\,\beta_{2YOUNG} - \beta_{2OLD} = 0$ $F(1,9651)$	32.67*** (0.0000)	30.77*** (0.0000)
$(SIZE_{i,t})\,\beta_{3YOUNG} - \beta_{3OLD} = 0$ $F(1,9651)$	14.89*** (0.0000)	11.43*** (0.0000)
$(LIQ_{i,t})\,\beta_{4YOUNG} - \beta_{4OLD} = 0$ $F(1,9651)$	24.54*** (0.0000)	23.12*** (0.0000)
$(LLEV_{i,t})\,\beta_{5YOUNG} - \beta_{5OLD} = 0$ $F(1,9651)$	25.99*** (0.0000)	27.53*** (0.0000)
$(EVOL_{i,t})\,\beta_{6YOUNG} - \beta_{6OLD} = 0$ $F(1,9651)$	18.58*** (0.0000)	15.67*** (0.0000)
Global Difference $F(7,9651)$	30.53*** (0.0000)	31.04*** (0.0000)

Notes: 1. *** significant at 1% significance. 2. Probabilities in parenthesis.