Chapter 15
High-Growth Firms: What Is the Impact of Region-Specific Characteristics?

Patrícia Bogas and Natália Barbosa

Abstract This chapter analyzes high-growth firms in Portugal and aims at assessing the impact of region-specific characteristics on the probability of the firm being high-growth. Using a sample of active firms registered in the database *Quadros de Pessoal* between 2002 and 2006, the result suggests that high-growth firms is not a random phenomenon and that the region-specific characteristics determine significantly the probability of the firm being high-growth. In particular, industrial diversity, services agglomeration, and diversity of employees' qualifications in a region explain in a significant way the probability of a firm being high-growth.

Keywords High-growth firms • Regional-specific characteristics

15.1 Introduction

High-growth firms have attracted the attention and interest of researchers due to its important contribution to economic growth. This group of firms has higher levels of productivity than average and, according to literature, it also contributes in a disproportionate way to employment growth (BERR 2008). A high-growth firm is not a random phenomenon. Instead, it is linked with a set of factors, behaviors, strategies, and decisions that differentiate those firms to others (Barringer et al. 2005). For this reason, early studies analyze the determinants that have impact on high-growth, as Moreno and Casillas (2007) and Garcia and Puente (2012) to Spain, Falkenhall and Junkka (2009) to Sweden, and Hözl (2011) to Austria. However, these studies focus on firm- and industry-specific characteristics.

Although geographic location might influence firm's performance, little is known about the relationship between region-specific characteristics and the process of firm growth. Audretsch and Dohse (2007) and Barbosa and Eiriz (2011) are two

P. Bogas (✉) • N. Barbosa
University of Minho, Braga, Portugal
e-mail: patriciabogas@hotmail.com; natbar@eeg.uminho.pt

R. Baptista, J. Leitão (eds.), *Entrepreneurship, Human Capital, and Regional Development*, International Studies in Entrepreneurship 31,
DOI 10.1007/978-3-319-12871-9_15

exceptions. They offered evidence that region-specific characteristics have power to explain firm growth. In particular, these studies have concluded that industrial diversity, agglomeration economies, and employees' qualifications in a region explain firm growth.

For this reason, this paper aims at adding on the discussion about the factors that explain the high-growth firms' phenomenon. Particularly, our chief goal is to empirically evaluate if specific-region characteristics where the firm is located shape the probability of a firm being high-growth. To that, we use a sample of all active Portuguese firms registered in the database *Quadros de Pessoal* between 2002 and 2006. This database encompasses information about firms, their employees, and industries. It is also possible to know the firm's geographical location. The results indicate that employees' qualifications, industrial diversity, and services agglomeration in a region explain in a significant way the probability of firms being high-growth.

The remainder of the paper is organized as follows. Section 15.2 discusses the theoretical framework and previous empirical evidence on the relationship between firms' growth and geographical location. Section 15.3 describes the database used in the empirical analysis, presents a discussion on alternative definitions of high-growth firms, and presents some descriptive statistics on high-growth firms in Portugal and its distribution across Portuguese regions. Additionally, the econometric methodology and empirical explanatory variables are presented in Sect. 15.3. Section 15.4 presents and discusses the empirical results, while the main conclusions are summarized at Sect. 15.5.

15.2 The Role of Region-Specific Characteristics on Firm Growth

Internal and external factors have been identified as important factors that explain the differences on firms' growth rate (Dobbs and Hamilton 2007; Hermelo and Vassolo 2007). The impact of high-growth firms on a given economy and the specificity of this type of firms have been fostering some empirical studies.

Some studies focus attention on explanatory factors specific to the firm, as size and age. These variables have been extensively scrutinized to explain the process of firm growth. Through the survey of studies in different countries, industries, and time periods, it is possible to list the following results.

- High-growth firms tend to be young and small, contradicting Gibrat's law. Although the findings on the age's effect are consensual, the results on firms' size are more ambiguous (Henrekson and Johansson 2010; Hözl 2011).
- High-growth firms tend to belong to a business group. The connections between firms offer a set of facilities and allow their growth (Falkenhall and Junkka 2009; O'Regan et al. 2006).

- The firm level of human capital has a positive impact on high-growth (BERR 2008; Falkenhall and Junkka 2009).

The geographical location also seems to influence firm's performance. Location is intensely analyzed as an important factor in firms' formation rate. Nevertheless little is known about the impact of geographical location on firm growth (Acs and Armington 2004; Audretsch and Dohse 2007; Barbosa and Eiriz 2011). Audretsch and Dohse (2007) refer that there is a lack of theories and empirical evidence about the role that locational aspects have in firm growth. At empirical level, lack of detailed data prevents researchers from carrying out this analysis. Nevertheless, Audretsch and Dohse (2007) state that there are some reasons for geographical location have an impact on firm growth. Issues related to agglomeration, knowledge externalities in a location or region, as well as human capital are identified as important locational factors.

Agglomeration economies are a set of positive externalities resulting from spatial concentration of economic activity and consequently knowledge spillovers (Glaeser et al. 1992; Guimarães et al. 2000). According to Glaeser et al. (1992), the literature about the growth of cities differs along two models. The first argues that the transmission of knowledge occurs when there is some interaction between industries in a region. The Marshall-Arrow-Romer model posits that the concentration of firms with the same activity promotes the transmission of knowledge between them (Glaeser et al. 1992). Accordingly, the knowledge spillover is the most important to firm growth. There is no room for knowledge spillover across industries.

In fact, there are some reasons that encourage the location of firms in a cluster (Krugman 1991; Guimarães et al. 2000). The concentration of firms belonging to the same industry in a region allows the contact with a specialized labor market, with specific skills and it will be more likely for the existence of intermediary suppliers in the region as well as natural resources (Krugman 1991; Guimarães et al. 2000). Finally, the diffusion of information allows the firm to get a better production function than individual firms.

Limiting the impact of knowledge diffusion only at inside of the same industry could ignore an important source of knowledge across industries (Glaeser et al. 1992; Feldman and Audretsch 1999). According to Glaeser et al. (1992), the diversity of industries in a region leads to economic growth. Feldman and Audretsch (1999) conclude that the diversity of industries promotes the knowledge spillovers, the innovation in the firm and hence, economic growth. Nevertheless, some interaction across industries should occur in order to facilitate the exchange and creation of new ideas. Guimarães et al. (2000) consider that there are two important externalities related to agglomeration. The first is the size of the industry in the region and the second is the level of services agglomeration. These two externalities would impact significantly on firms' productivity, and would attract more firms to the region.

Empirical studies confirm the importance of diversification in a region (e.g., Glaeser et al. 1992; Figueiredo et al. 2009; Barbosa and Eiriz 2011). Glaeser

et al. (1992) find that the diversity, instead of specialization, in the region is the chief driver of growth employment in the industries. Knowledge diffusion inside the same industry is less important to growth than the diffusion among industries. Figueiredo et al. (2009) and Barbosa and Eiriz (2011) found that firms located in regions with more industrial diversity tend to exhibit a higher growth rate. Investment in innovation inside industries tends to be less in regions more concentrated in an industry (Feldman and Audretsch 1999). In a similar vein, Guimarães et al. (2000) conclude that agglomeration is the main driving force for location choice of foreign firms, while Acs et al. (2007) conclude that the local services agglomeration are relevant for firm survival. Nonetheless, Acs et al. (2007) pointed out that that effect only occurs when looking at the number of firms, regardless of their sizes. The number of firms in a region appears to be the driving force of that effect and not the number of employees with experience in these industries.

On the other hand, the local level of human capital has been recognized as an important explanatory factor among theories of economic growth (Acs and Armington 2004). The characteristics and the number of employees, their costs, skills, and their capabilities are important issues scrutinized in the literature (North and Smallbone 1995; Acs and Armington 2004). Acs and Armington (2004) refer that the level of human capital and innovation activity in a region mainly explains differences in firm formation rates, after controlling for demand and business characteristics. These factors at regional level stimulate the creation of new firms in the region and explain high rates of new firm formation.

In particular, higher educational level in a region fosters the formation of specific skills, which are important for start-up activities (Armington and Acs 2002; Acs et al. 2007). Nonetheless, many service firms started with unskilled and lower educational level labor force, which appear to be important for their survival. Jointly these findings suggest that in a region, a diversified educational and skills level of labor force is required for firms' growth and survival.

Empirical studies show that the regional workforce qualifications are positively linked with firm formation rates (e.g., Armington and Acs 2002; Acs and Armington 2004) and firm growth (Audretsch and Dohse 2007). Armington and Acs (2002) find that that relationship occurs mainly in technologically advanced industries. In a study on Japanese manufacturing start-ups in the United States, Woodward (1992) concludes that they are mainly located in regions with more educated and productive employees. Nevertheless, the results show that availability of employees with specific knowledge is not crucial. According to Acs et al. (2007), firms' survival is positively linked with the availability of well-educated employees in the region, but this relationship does not occur during recession periods. Barbosa and Eiriz (2011) analyzed the impact of specialization versus skills diversity in a region on firms' growth. Firms located in regions with a higher diversity of qualifications tend to have a higher growth compared with firms located in regions where there is a great concentration of one type of skills.

15.3 Data, Empirical Variables, and Econometric Model

15.3.1 The Data

The data used in this study comes from the database *Quadros de Pessoal*, provided by the Portuguese Ministry of Employment. This database provides information about employees and firms' characteristics and firm's geographical location. Thus, we can obtain information on the number of employees in a firm, their level of qualifications and educational fields, firm's size, and age, and the geographical location of firm, at municipalities, districts, or NUTS regions. *Quadros de Pessoal* is a compulsory and annual survey of all Portuguese firms, allowing us to collect information about almost all active firms in Portugal.

This paper covers the period from 2002 to 2006, using the firm as unit of analysis. All industries and firms are considered, regardless the legal form or ownership (public or private). Some studies have, nonetheless, excluded some industries, like construction, hotels and restaurants, agriculture and retail trade, on the grounds of high seasonality (Hözl 2011; Garcia and Puente 2012). The geographical unit of analysis chosen was the NUTS III, which is more disaggregated than district but they are bigger than municipalities. These geographical units do not have any administrative organization, but they are important for statistical analysis and allocation of structural funds. They are functional because of aggregate interaction between municipalities, labor mobility and they usually have similar problems and challenges.

15.3.2 On the Identification of High-Growth Firms

There is no unique method to define high-growth firms. Previous studies have applied different methods and measures to define and identify this type of firms. One can find growth measures based on employment growth (Delmar et al. 2003; Oliveira and Fortunato 2006; Bos and Stam 2011; Garcia and Puente 2012), turnover growth (Teruel and Wit 2011), market share, sales or profits (Delmar et al. 2003; Moreno and Casillas 2007; Henrekson and Johansson 2010), and total assets (Serrasqueiro et al. 2010; Barbosa and Eiriz 2011).

The database *Quadros de Pessoal* allows us to identify and analyze high-growth firms in terms of employment or sales. Using sales to compute firm growth requires a measurement at constant prices, as sales are sensible to inflation and currency exchange rates, while employment does not require such correction. On the other hand, according to Henrekson and Johansson (2010), the number of employees has been intensely used as a measure of growth to identify high-growth firms. In particular, the number of employees appears to be a good indicator when the study aims at concluding about the impact of high-growth firms on job creation. According to Coad and Hölzl (2010) employment is useful and more efficient when we consider multi-industries and different countries in our analysis.

Nevertheless, Delmar et al. (2003) have pointed out that the number of employees is affected by labor productivity and by the degree of capital–labor substitution. A firm can grow considerably in assets and production, while the number of employees remaining unchangeable. In a similar vein, Teruel and Wit (2011) argue that employment in comparison with economic and financial indicators does not reflect properly firm's growth. Country-specific labor legislation can affect the number of high-growth firms if one uses employment to identify them. Countries with strong labor protection legislation tend to reduce the number of high-growth firms identified using employment as an indicator of growth.

Apart from the heterogeneity on the choice of growth indicators, the definition of high-growth firms is also not consensual. The OECD definition considers a firm as a high-growth firm if it attains an average growth of 20 % for 3 successive years and employs at least ten workers (OECD 2010). Conversely, Delmar et al. (2003) and Bjuggren et al. (2010) pointed out that the choice between a relative or an absolute measure of growth could be relevant if firms have different sizes. High-growth firms defined using a relative measure tend to be in a smaller number than those based in an absolute measure. To reduce the impact of firm size on identification of a high-growth firm, Birch (1979) suggests an indicator that combines both the relative and absolute growth. This indicator, known as the Birch index, is defined by the difference between the employment in the period t and the employment over a 3 years period:

$$\left(E_{i,t} - E_{i,t-3}\right)\left(\frac{E_{i,t}}{E_{i,t-3}}\right), \tag{15.1}$$

where $E_{i,t}$ is the employment of the firm i, at the time t. According to Garcia and Puente (2012) an indicator should reflect characteristics of the firm as innovation strategies, successful, the management, among others, and not favor any size class. Hözl (2011) emphasizes that it is more important to take into account the relative or absolute growth than to be concerned with the use of specific measures of growth.

Some studies define the 10 % of firms with the highest Birch index as high-growth firms (Schreyer 2000; Falkenhall and Junkka 2009; Garcia and Puente 2012). Nevertheless, Hözl (2011) refer that this imposition in relative terms is not useful when one aims at studying the prevalence of high-growth firms over time. For that reason, Hözl (2011) suggests the modified Birch index, in which high-growth firms should report an annual growth rate of 20 % over 3 years and a size, at the beginning of the 3-years period of 20 employees. Until 20 employees, the index will require a higher relative growth than the OECD criteria and above 20 employees, a lower relative growth is required. Hözl (2011) denotes this type of firms as high impact firms. The modified Birch index can be defined as:

$$\left(E_{i,t} - E_{i,t-3}\right)\left(\frac{E_{i,t}}{E_{i,t-3}}\right) \geq 25.15968, \quad \text{se } E_{i,t-3} \geq 8. \tag{15.2}$$

Based on that index, Hözl (2011) have concluded that overall job creation by high impact firms is higher than overall job creation by high-growth firms based

Table 15.1 Annual distribution of high-growth firms: 2002–2006

Year	High-growth firms	%	Total of firms
2002	2,651	0.92	288,678
2003	2,404	0.82	294,949
2004	2,296	0.76	300,850
2005	2,224	0.68	328,230
2006	2,469	0.75	330,967
Total	12,044	0.78	1,543,674

Source: Quadros de Pessoal. Authors' calculation

on the OECD criteria. Moreover, the persistence of being a high-growth firm is much higher when applying the modified Birch index in comparison with the OECD criteria. These results suggest that high-growth firms identified through the modified Birch index seem to have a more impact on the economy. For that reason we will use this indicator in this study. Table 15.1 presents the percentage of high-growth firms in Portugal (excluding Madeira and Azores islands) from 2002 to 2006.

The results show that the proportion of high-growth firms is quite small when compared with the total number of observed firms. In 2002, the percentage of high-growth firms has the highest value. Since 2003, the number of high-growth firms decreases. This trend continues until 2005, despite the increase in the number of observed firms.

On the other hand, Table 15.2 shows the distribution of high-growth firms across NUTS III regions. The results show that high-growth firms are located in all regions, even though one can observe an asymmetric distribution. The regional distribution shows a large percentage of high-growth firms in the *Grande Lisboa* area. During the sampled period, 33.4 % of the high-growth firms were located there. There is, also, a great concentration of high-growth firms located in *Grande Porto* area, but with a smaller proportion. The regional distribution across other regions is almost irrelevant.

Moreover, the results show that high-growth firms are mainly located in metropolitan areas, which seems to offer several advantages for doing business. This may well explain why the *Península do Setúbal* region, due their proximity with *Grande Lisboa*, has a higher percentage of high-growth firms, in comparison with other regions. In the same way, regions of *Tâmega* and *Ave*, due his proximity with *Grande Porto*, have a higher percentage of high-growth firms. Over time, we can observe a quite homogeneous evolution of the high-growth firms' distribution by NUTS III, suggesting that region-specific characteristics have not substantially changed to engender a significant change on high-growth firms' distribution across regions.

15.3.3 Econometric Model and Empirical Variables

The main objective of this study is to assess the role of regions' characteristics in shaping the probability of a firm being high-growth. Thus, the dependent variable, y_i, with $i = 1, \ldots, n$ takes the value 1 if the firm is a high-growth firm, using the

Table 15.2 Regional distribution of high-growth firms

NUT III	2002	2003	2004	2005	2006	Total	%
Minho Lima	37	38	40	38	52	205	1.70
Cávado	86	83	79	79	96	423	3.51
Ave	126	115	121	101	134	597	4.96
Grande Porto	328	277	314	275	297	1,491	12.38
Tâmega	113	110	127	111	138	599	4.97
Entre Douro e Vouga	53	62	57	53	56	281	2.33
Douro	18	22	23	23	20	106	0.88
Alto Trás-os-Montes	23	22	15	20	11	91	0.76
Algarve	129	112	102	102	100	545	4.53
Baixo Vouga	106	75	67	78	88	414	3.44
Baixo Mondego	74	70	58	58	55	315	2.62
Pinhal Litoral	103	86	73	66	66	394	3.27
Pinhal Interior Norte	23	19	20	20	24	106	0.88
Dão Lafões	66	45	47	48	49	255	2.12
Pinhal Interior Sul	4	4	5	4	5	22	0.18
Serra da Estrela	8	5	8	3	5	29	0.24
Beira Interior Norte	20	21	18	14	11	84	0.70
Beira Interior Sul	12	12	7	6	11	48	0.40
Cova da Beira	9	9	15	12	14	59	0.49
Oeste	81	77	63	62	84	367	3.05
Médio Tejo	42	48	39	50	35	214	1.78
Grande Lisboa	885	813	726	758	846	4,028	33.44
Península de Setúbal	159	134	115	120	125	653	5.42
Alentejo Litoral	15	23	25	23	24	110	0.91
Alto Alentejo	12	18	22	17	24	93	0.77
Alentejo Central	35	22	30	21	18	126	1.05
Baixo Alentejo	19	18	16	17	21	91	0.76
Lezíria do Tejo	65	64	64	45	60	298	2.47
Total	2,651	2,404	2,296	2,224	2,469	12,044	100

Source: Quadros de Pessoal. Authors' calculation

definition based on Eq. (15.2), and 0 otherwise. We can see the dependent variable as being the result of latent variable, firm's growth index, $\boldsymbol{y}^*$, that is a function of explanatory variables, $\boldsymbol{x}_{i,t-3}$ and unobservable factors, $\boldsymbol{e}_{i,t}$. In this vein, the probability of high-growth would be given by

$$\boldsymbol{P}\left(\boldsymbol{y}=\boldsymbol{1}\,|\,\boldsymbol{x}\right)=\boldsymbol{p}\left(\boldsymbol{y}_{it}*>25.15968\,|\,x\right)=\boldsymbol{\Phi}\left(\boldsymbol{x}_{i,t-3};\boldsymbol{e}_{i,t}\right). \tag{15.3}$$

and it can be modeled through a probit model. In addition, the panel nature of the data suggests the use of fixed or random effects estimation methods. The choice between them should account for the imposed constraints on the relationship

Table 15.3 Explanatory variables: definition and expected effects

Variable	Operationalization	Expected effect
Service agglomeration	Share of total employment in the tertiary sector, by NUTS III	+
Qualification in the region	Sum of the squares of region qualification share, defined by the number of employees with each qualification with respect to total employment in the region	–
Industrial specialization	Sum of the squares of industry share in the region, defined as the number of employees in an industry and region by the employment in an industry	+
Location quotient	Ratio between the number of firms in an industry and region and the number of firms in the industry, divided by the ratio between the number of employees in the region and the total employment in the country	–

between the explanatory variables and the unobserved effects and the observed variability on the data. Random effects estimation implies that the unobserved effect is not correlated with the explanatory variables in all periods of the time, while fixed effects estimation relax this constraint on the relationship between the explanatory variables and the unobserved effects. However, fixed effects estimation—also called the *within* estimator—captures the effects engendered by the variability on the data within the observed units, while random effects estimation takes into account the overall variability. Comparing those estimators, Wooldridge (2003) refer, nonetheless, that panel estimation by fixed effects is usually a more efficient approach than estimation by random effects. Given that the explanatory variables in this study show greater variation between firms than within firms and over the time, a random effects estimation procedure is applied.

Based on data availability and theoretical and empirical arguments discussed previously, we consider the following explanatory variables, which aim at measuring region-specific characteristics: (1) qualification in the region; (2) service agglomeration; (3) industrial specialization; and (4) location quotient. In order to control for firm-specific characteristics, we added firm size and age as control variables. Table 15.3 describes the way each explanatory and control variable has been operationalized and indicates their expected effect, while Table 15.4 presents some descriptive statistics for each variable. All explanatory and control variables were measured at a 3-year lag.

Overall, all variables show some variability, indicating that Portuguese regions differ with regard to the operationalized specific characteristics. Employees' qualifications have low variability between regions, which suggests that, on average, the distribution of qualifications across regions is quite homogeneous. Nevertheless, the regions differ greatly with respect to the economic activities distribution. Concerning service agglomeration, we found that, the share of employees in the tertiary sector is high. On average, more than a half of employees in a region perform functions in the services sector.

Table 15.4 Descriptive statistics of dependent and explanatory variables

Variable	Observation	Mean	Std. dev.	Minimum	Maximum
High-growth	713,903	0.013	0.113	0	1
Qualification in the region	713,903	0.228	0.026	0.192	0.309
Industrial specialization	713,903	0.004	0.030	0.000	1
Location quotient	713,903	1.995	3.347	0.011	193.374
Service agglomeration	713,903	0.523	0.183	0.192	0.784
Age	713,903	2.124	1.023	0	7.602
Size	713,903	1.493	1.096	0	9.781

Source: Quadros de Pessoal. Authors' calculation

15.4 How Important Are Regional-Specific Characteristics?

In order to assess the effect of regional-specific characteristics on the probability of a firm being a high-growth firm, alternative probit models have been estimated. In all models, industry- (using two digits CAE) and year-dummies, age, and firm size have been included to control for firm- and industry-specific effects and for time-fixed effects. Given the nonlinear nature of the probit models, the coefficient estimates do not measure the substantial impact of a unit-change in an explanatory variable on the probability of the firm being high-growth. For that, marginal effects have to be estimated. Thus, coefficient estimates are present as long as the marginal effect of each explanatory variable.

Table 15.5 present estimates based on cross-sectional analysis, where explanatory variables are taken the value at the beginning of the growth period, while Table 15.6 shows the estimates for panel data with random firm-specific effects. Given the high correlation between services agglomeration and qualification in the region, these variables are alternatively included in the models. In the case of cross-sectional analysis, observations for a given firm are not identical and independently distributed over time, due to unobserved firm-specific characteristics. Therefore, the estimates of standard errors and variance–covariance matrix were corrected in order to account for the correlation of the intra-firm errors.

The results of cross-sectional and panel data show notable similarity in terms of statistical significance and coefficients' signals. Nevertheless, when estimates do not account for that a firm may be repeatedly observed over time—cross-sectional data—the marginal effects suggest a greater impact of the regional-specific characteristics on the probability of a firm being high-growth. This appears to suggest that no account for unobserved firm-specific effects overestimate the impact of the regional-specific characteristics on the probability of a firm being high-growth. For that reason, the discussion of the results is based on panel data estimates.

Overall, holding everything else constant, region-specific characteristics appear to have a substantive impact on the probability of a firm being high-growth. All but one explanatory variable are statistically significant and the signal

Table 15.5 Estimates and marginal effects on the probability of a firm being high-growth in Portugal: cross-sectional data

	Model 1		Model 2	
	Coefficient	Marginal effect	Coefficient	Marginal effect
Industrial specialization	−0.859*** (0.191)	−0.020*** (0.004)	−0.908*** (0.193)	−0.021*** (0.004)
Location quotient	0.002 (0.002)	0.000 (0.000)	0.003 (0.002)	0.000 (0.000)
Qualifications in the region	−1.082*** (0.006)	−0.025*** (0.006)	–	–
Services agglomeration	–	–	0.267*** (0.006)	0.006 (0.009)
Size	0.651*** (0.006)	0.015*** (0.000)	0.649*** (0.006)	0.020*** (0.000)
Age	−0.220*** (0.007)	−0.005*** (0.000)	−0.220*** (0.007)	−0.005*** (0.000)
Temporal dummies	Yes	Yes	Yes	Yes
Sectorial dummies	Yes	Yes	Yes	Yes
Constant	−2.870*** (0.077)		−3.252*** (0.049)	–
Pseudo-$R2$	0.33		0.33	
Number of observations	713,893		713,893	

Notes: Figures in parentheses are clustered standard errors
*, **, *** mean that coefficients are statistically significant at 10 %, 5 %, and 1 % level

of estimates agreed with the expected effect of the specific-region variables. Thus, geographical location seems to play an important role in firms' performance and how the firms grow.

Moreover, the results provide empirical evidence that firms located in regions with a less industry specialization, have a greater probability of being high-growth, holding everything else constant. These results are consistent with previous studies (e.g., Barbosa and Eiriz 2011), and show that firm growth process is significantly related with a greater diversity of industries in the region a firm is located.

Nonetheless, the results seem to cast some doubt on the importance of a firm belonging to an industrial cluster, where they have a set of favorable conditions to grow, like the existence of intermediate suppliers, natural resources, and specialized employees, as suggested by Krugman (1991) and Guimarães et al. (2000). The externalities of knowledge and the relationships that are established between firms from different industries seem to have a positive impact on the probability of being a high-growth firm. According to Feldman and Audretsch (1999), the proximity of complementary economic activities can promote innovation and thus firm growth.

The results also suggest that increasing the share of employment in the tertiary sector increases the probability of being a high-growth firm. There are different measures to analyze agglomeration; nevertheless we only assess the impact of the

Table 15.6 Estimates and marginal effects on the probability of a firm being high-growth in Portugal: panel data

	Model 1		Model 2	
	Coefficient	Marginal effect	Coefficient	Marginal effect
Industrial specialization	−0.648*** (−0.157)	−0.005*** (0.001)	−0.717*** (0.157)	−0.005*** (0.001)
Location quotient	0.003 (0.002)	0.000 (0.000)	0.005** (0.002)	0.000** (0.000)
Qualifications in the region	−1.674*** (0.339)	−0.012*** (0.002)	–	–
Services agglomeration	–	–	0.416*** (0.049)	0.003*** (0.000)
Size	0.840*** (0.008)	0.006*** (0.000)	0.838*** (0.008)	0.006*** (0.000)
Age	−0.287*** (0.008)	−0.002*** (0.000)	−0.288*** (0.008)	−0.002*** (0.000)
Temporal dummies	Yes	Yes	Yes	Yes
Sectorial dummies	Yes	Yes	Yes	Yes
Constant	−3.814*** (0.099)		−4.408*** (0.069)	
Pseudo-$R2$	0.38		0.38	
Number of observations	713,903		713,903	
Number of firms	270,616		270,616	

Notes: *, **, *** mean that coefficients are statistically significant at 10 %, 5 %, and 1 % level

concentration of business services. The relative importance of services agglomeration seems to indicate that the concentration of economic activities has impact on firm growth. At the same time, the results show the importance of complementary economic activities. The proximity of financial services, communication, and other business-related services seem to be important for a high-growth firm.

Looking at workforce qualifications in a region, the estimates suggest that the concentration of one type of skills affect negatively the probability of being a high-growth firm. In a different framework, Barbosa and Eiriz (2011) have attained a similar finding, establishing that a firm located in a region with diversity of qualifications seems to be important to grow. The results allow us to point out the importance not only of the availability at the region of top-educated employees, like some studies have been concluded (e.g., Audretsch and Dohse 2007) but also the mix of them with less-educated employees for firm growth. Thus, the concentration of skills and capabilities linked with high qualifications in a region appear not enough to foster high-growth firms. More interestingly, the diversity of employees' skills and capabilities appears to be the regional-specific characteristics with the greatest impact on the probability of being a high-growth firm, reinforcing the importance of human capital in a region.

15.5 Conclusion

In this chapter, the impact of region-specific characteristics on the probability of a firm being high-growth has been assessed. Using the modified Birch index, proposed by Hözl (2011), to identify Portuguese high-growth firms, the results suggest that firms located in regions that exhibit industrial diversity and services agglomeration have a greater probability of being high-growth. Moreover, the diversity of employees' skills and capabilities in a region explain in a significant way the probability of firms being high-growth. Several empirical studies refer the importance of high qualifications. However, the results show that regions with different types of employees enhance the probability of a firm here located to be of high-growth.

The major contribution of this chapter is to highlight the relevance of region-specific characteristics to engender high-growth firms, adding to the strand of the literature that mainly focuses on firm-specific characteristics and their impact on firm growth. In further research it would be interesting to analyze if the results are robust to the use of different growth measures and definitions to identify high-growth firms. Another interesting and potentially fruitful extension of our research would be to evaluate whether the relevance of region-specific characteristics on the probability of being a high-growth firm changes over time and business cycle. It would contribute to a better understanding of the conditions under which regions may have an important role in the formation of high-growth firms.

References

Acs ZJ, Armington C (2004) The impact of geographic differences in human capital on service firm formation rates. J Urban Econ 56(2):244–278

Acs ZJ, Armington C, Zang T (2007) The determinants of new-firm survival across regional economies: the role of human capital stock and knowledge spillover. Pap Reg Sci 86(3):367–391

Armington C, Acs ZJ (2002) The determinants of regional variation in new firm formation. Reg Stud 36(1):33–45

Audretsch DB, Dohse D (2007) Location: a neglected determinant of firm growth. Rev World Econ 143(1):33–45

Barbosa N, Eiriz V (2011) Regional variation of firm size and growth: the Portuguese case. Growth Change 42(2):125–158

Barringer BR, Jones FF, Neubaum DD (2005) A quantitative content analysis of the characteristics of rapid-growth firms and their founders. J Bus Ventur 20(5):663–687

BERR (2008) High growth firms in the UK: lessons from an analysis of comparative UK performance, BERR economics paper no. 3. Department for Business Enterprise and Regulatory Reform, London

Birch D (1979) The job generation process. MIT program on neighbourhood and regional change, vol 302. MIT, Cambridge

Bjuggren CM, Daunfeldt S, Johansson D (2010) Ownership and high-growth firms. Ratio working paper, no. 147. The Ratio Institute, Stockholm

Bos JWB, Stam E (2011) Gazelles, industry growth and structural change. Working papers, no. 11-02. Utrecht School of Economics, Utrecht

Coad A, Hölzl W (2010) Firm growth: empirical analysis. Papers on economics and evolution, no. 1002. Max Planck Institute of Economics, Germany
Delmar F, Davidsson P, Gartner WB (2003) Arriving at the high-growth firm. J Bus Ventur 18(2):189–216
Dobbs M, Hamilton RT (2007) Small business growth: recent evidence and new directions. Int J Entrepreneurial Behav Res 13(5):296–322
Falkenhall B, Junkka F (2009) High-growth firms in Sweden 1997–2007 characteristics and development patterns. The Swedish Agency for Growth Policy Analysis, Stockholm
Feldman MP, Audretsch DB (1999) Innovation in cities: science-based diversity, specialization and localized competition. Eur Econ Rev 43(2):409–429
Figueiredo O, Guimarães P, Woodward D (2009) Localization economies and establishment size: was Marshall right after all? J Econ Geogr 9(6):853–868
Garcia PL, Puente S (2012) What makes a high-growth firm? A dynamic probit analysis using Spanish firm-level data. Small Bus Econ 39(4):1029–1041
Glaeser E, Kallal M, Shleifer A, Scheinkman J (1992) Growth in cities. J Polit Econ 100(6):1126–1152
Guimarães P, Figueiredo O, Woodward D (2000) Agglomeration and the location of foreign direct investment in Portugal. J Urban Econ 47(1):115–135
Henrekson M, Johansson D (2010) Gazelles as job creators: a survey and interpretation of the evidence. Small Bus Econ 35(2):227–244
Hermelo FD, Vassolo R (2007) The determinants of firm's growth: an empirical examination. Abante 10(1):3–20
Hözl W (2011) Persistence, survival and growth. A closer look at 20 years of high-growth firms in Austria, WIFO working paper, no. 403
Krugman P (1991) Increasing returns and economic geography. J Polit Econ 99(3):483–499
Moreno AM, Casillas JC (2007) High-growth SMEs versus non-high-growth SMEs: a discriminant analysis. Entrep Reg Dev 19(1):69–88
North D, Smallbone D (1995) The employment generation potential of mature SMEs in different geographical environments. Urban Stud 32(9):1517–1534
OECD (2010) Structural and demographic business statistics. Publicação OECD
Oliveira B, Fortunato A (2006) Firm growth and liquidity constraints: a dynamic analysis. Small Bus Econ 27(2–3):139–156
O'Regan N, Ghobadian A, Gallear D (2006) In search of the drivers of high growth in manufacturing SMEs. Technovation 26(1):30–41
Schreyer P (2000) High-growth firms and employment. OECD science, technology and industry working papers, no. 2000/3
Serrasqueiro Z, Nunes PM, Leitão J, Armada M (2010) Are there non-linearities between SME growth and their determinants? A quantile approach. Ind Corp Change 19(4):1071–1108
Teruel M, Wit G (2011) Determinants of high growth firms: why have some countries more high-growth firms than others? EIM working paper, no. H201107
Wooldridge JM (2003) Introductory econometrics: a modern approach. Thomson, Mason
Woodward DP (1992) Locational determinants of Japanese manufacturing start-ups in the United States. South Econ J 58(3):690–708