

# SPATIAL VARIATIONS IN FIRM EMPLOYMENT GROWTH

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## Abstract

This paper addresses the question to what extent a firm's location can be regarded as having an influence on the performance of a firm as measured by employment growth. Point of departure is the striking discrepancy between theoretical arguments and existing empirical research in the literature on business economics and entrepreneurship. While in theory it is widely acknowledged that 'location' should be considered as a relevant growth determinant, empirical research has so far mainly focused on firm-internal factors. Therefore, we will empirically verify the question raised by means of an econometric model based on a data set of circa 35,000 establishments located in the northern part of the Netherlands during the period 1994-1999. Based on the fact that we find several significant coefficients we conclude that 'space matters' but that the effect differs by type of economic activity. Besides scientific reasons it is claimed that the issue warrants further investigation not at least because from a policy point of view, precisely adjustments to the location characteristics of firms are often pointed out as the obvious measures to enhance (regional) employment growth.

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## 1. Introduction

Ever since Birch (1979) unravelled the economy of the United States by focusing on the individual economic units from which it is built, there has been a lot of interest in firms and their contribution to economic growth. Following his provocative finding that most new jobs are created in small establishments, studies concentrating on firms and employment growth have been carried out in quick succession, capitalising on the increasing amount of available data on the micro-level of firms. In the emerging literature on business economics and entrepreneurship, those studies specifically dealing with the *determinants* of firm employment growth have received considerable attention, not least because of the practical implications for entrepreneurs as well as (regional) policy makers. Understanding the determinants of growth, a firm will more or less know what it takes to be successful. Obviously, this insight is rather beneficial to the managers of existing firms as well as to potential entrepreneurs who might enhance the (long-term) chances of success of a business start-up. Schutjens and Wever (2000) for example recently singled out having a business partner, a thorough preparation, and previous work experiences of the entrepreneur as quite decisive factors for the employment growth of new firms. Consequently, they suggested that shortcomings in those fields should be removed if a new firm wants to become successful.

In studies exploring firm employment growth a distinction is often made between three groups of growth determinants, namely those that are related to the *firm*, to the *entrepreneur* (also defined as founder-specific and owner/manager-specific), and those that can be classified as '*external*' and which are generally seen in relation to the location or environment of a firm (see e.g. Almus and Nerlinger 1999; Schutjens and Wever 2000).<sup>1</sup> So far, most studies have particularly focused on firm-associated and entrepreneur-associated factors that may influence firm growth. A comparison of the list of variables that have been investigated under the different headings in the various studies would suggest that the so-called external factors are

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<sup>1</sup> Alternatively, Barkham et al. (1996) amongst others explicitly distinguished factors related to the business strategy of a firm. However, as Brüderl et al. (1996) demonstrated, such factors can also easily be captured under the heading of firm-specific factors.

either less fancied as having an influence on growth or simply have been somewhat neglected. Illustrative in this respect is the fact that both Storey (1994) and Barkham et al. (1996) [unarguably two of the most comprehensive studies that have dealt with growth determinants of (small) firms] included only one location characteristic in their analysis.<sup>2</sup> Furthermore, the general notion of “location” or “environment” has often been poorly specified. Most studies that at least considered location as a potential growth determinant simply introduced a dummy variable for different regions as a proxy for locational influences. Although some of these studies have found some evidence that firms in certain regions are relatively more successful in terms of employment growth, they provide no insight in the question *why* firms located in these regions display more employment growth. That is to say, they can only speculate what the underlying causes of firm employment growth related to the location are (compare Poot et al. 1997). Furthermore, given the rather poor operationalisation, the statistical validity on which arguments with respect to locational influences are based, may be rather weak and can lead to misleading conclusions. The number of firms investigated in empirical studies is often relatively small and does not allow a detailed regional subdivision, thus leading to using a small set of regional dummies that may hide substantial variation within regions.

The purpose of the present study is to explore the question to what extent a firm’s location can be seen as having an influence on a firm’s employment growth. Here, we make use of a large data set (containing 35,000 establishments) with detailed information on a firm’s location (by means of postcodes) and also on the type of economic activity. This allows us to answer the question “*does location matter for explaining firm employment growth?*” more rigorously than has been done before. Moreover, we make a distinction in several location characteristics which can be assumed to be instrumental for firm growth (population growth, accessibility, spatial clustering of firms etc.) and en passant focus on the geographical range at which these factors may be at work.

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<sup>2</sup> This location variable is simply measured as a regional dummy. As Barkham et al. (1996, p. 125) put it forward: “*the study was not designed to investigate the regional differences in small firm growth*”.

Given the lack of attention paid to external influences in the current literature of business economics and entrepreneurship, this paper might provide some useful complementary insight in the range of potential growth determinants. But also from the perspective of regional science, the question raised here warrants further investigation. Practically since Birch (1979), the notion of “regional growth” as an aggregate outcome resulting from the behaviour of individual economic units has become widely accepted.<sup>3</sup> Classifying such behaviour into firm-demographic components, it is argued by Van Dijk & Pellenbarg (2000a) among others that the issue of employment changes in (existing) firms has so far been underexposed.

Furthermore, the identification of determinants regarding location characteristics can be regarded as rather valuable from a practical point (similar to suggestions that are based on the identification of firm-specific and entrepreneur-specific determinants). The practical use of this study is however not limited to those who are responsible for the course of individual firms, but stretches out to policy makers involved in issues related to (regional) economic development. The opportunities available to them to realise the obvious policy target of employment growth can predominantly be found in adaptation of the location characteristics that proved to be instrumental for firm growth (and thus for regional employment growth). Given that a distinction is made between several types of location characteristics that can be influenced (to a certain extent), the present study directly touches upon distinct potential policy measures that can be implemented in order to enhance employment growth. Besides, a detection of ‘strong’ and ‘weak’ locations and locations with ‘growth potential’ can be regarded as highly significant with respect to spatial policy measures (compare Poot et al. 1997).

The paper starts with a literature review in which the impact of the firm’s location on its employment growth is discussed. Several arguments will be brought forward a priori in favour and against the idea that the performance of a firm is influenced by location characteristics. Section 3 proceeds with an empirical model to

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<sup>3</sup> Armstrong and Taylor (1993) for instance argue that existing evidence on the factors that determine regional employment growth remains unsatisfactorily and incomplete as long as the underlying behaviour of firms (start-ups, closedowns, migrations, expansions, and contractions) is not monitored (p. 157).

test the impact of specific location characteristics on firm employment growth. In section 4 the results of the empirical model will be presented. Finally, this paper concludes with section 5 in which the main findings of the present study will be summarised. Additionally, some remarks regarding future research and policy implications will be made.

## **2. The impact of location on firm employment growth: some reflections**

As outlined in the introduction, most studies that have dealt with growth determinants of firms have up to now hardly paid any attention to the possible impact of a firm's location. This is rather surprising since it is widely acknowledged that firms are for their functioning to say the least, somewhat dependent on external influences. In this context, one may refer to the much-cited notion of '*environment*', which can simply be defined as "everything outside the focal organisation that is relevant for its functioning" (McDermott and Taylor 1982, p. 17). Within this environment, different layers can be distinguished depicting the directness with which the external forces act upon a firm. These environmental layers range from highly generalised social, political, cultural, and technological developments to interchanges with other actors, such as customers, suppliers, competitors, and regulators like government and unions (compare McDermott and Taylor 1982). If the question is raised what influence the location of a firm has on the functioning of firm (as measured by employment growth), an explicit spatial dimension is attached to the environmental forces. From the notion that the nature of many environmental forces differs across space and this may affect firm performance, the concept of the '*spatial margins to profitability*' introduced by Smith (1966, p. 106) is also relevant. Theoretically a firm would choose a location that maximises profit. Due to the dynamics in the spatial economic environment and/or the firm, the optimal location may change over time rather often. This does not imply that firms also move rather often, because relocation itself is often rather costly especially when rather large investments in buildings and

equipment or required. Therefore, firms will stay in sub-optimal locations till they approach the spatial margins of profitability (Pellenbarg and Van Dijk 2000b).<sup>4</sup>

The importance of location conditions for firm behaviour is mainly seen in the context of location decision-making of firms, which explicitly bear reference to the firm-demographic processes of firm start-ups and migration. Consequently, studies trying to explain regional variation in firm formation and firm migration rates have mainly focused on geographic specific characteristics and seem to have found considerable evidence that these characteristics matter.<sup>5</sup> Moreover, the ultimate evidence for such arguments can be found in the striking observation that economic activities are unevenly distributed over space. Obviously, firms display a strong tendency to locate in specific places due to geographical variations in opportunities and constraints. Likewise, one might reasonably expect these opportunities and constraints related to various locations to systematically affect the ability of firms to grow (compare Poot et al. 1997). In addition, simply on the basis of the empirical observation that there are *spatial* differences in employment growth (which can be found by comparing regions), one is intuitively inclined to conclude that there must also be some impact of location on the growth of individual firms.

There are also some arguments that can be put forward against the idea that the performance of a firm in terms of employment growth is influenced by the firm's location. Wever and Van der Velden (2000), among others, have pointed out that in western developed countries many factors, which might be assumed to be relevant for the functioning of firms, display no longer significant spatial differences. They argue that in an *urban field* such as the Netherlands, opportunities and constraints that condition the performance of firms are nowadays basically the same everywhere implying that the 'spatial margins to profitability' are widened. Moreover, they point towards a diminishing dependency of firms on their respective locations. First of all, this can be explained by changes in the sort of business activities, in which 'modern

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<sup>4</sup> Notice that such line of reasoning corresponds very much to regional science, a scientific field that has made the impact of location on firms as one of the prime objects of study (Vaessen 1993). But also amongst economists, since the work of Krugman (1991) and Porter (1990), there is nowadays a widespread belief that "space matters" (Krugman 1991, p. 8).

<sup>5</sup> With respect to new firm formation, see e.g. Reynolds et al. (1994). With respect to firm migration, see e.g. Pellenbarg et al. (2002).

activities' like business services are assumed to be more independent from specific location factors and thus foot-loose.<sup>6</sup> Secondly, there are developments (predominantly technological by nature) that enable a firm to operate on a larger spatial scale and thus overcoming specific local or regional pitfalls. Similar to the suggestions made by Wever and Van der Velden (2000), there are also arguments that throw doubt on the idea that empirical evidence can be found for the impact of location on the firm's growth on the basis of macro-economic business cycles. Davidsson (1989) amongst others has argued that firms are particularly influenced by their location during periods of economic recession. That is to say, during periods of economic growth the locational influences are said to be less discriminative among firms. Obviously, during periods of economic recession the rivalry between firms is more intense, implying that profit margins are decreasing. This implies that the 'spatial margins of profitability' are also narrowed and the 'better' located firms come to the fore and survive.

There are also arguments that question the supposed impact of location on firm performance on the basis of more fundamental reasons. These arguments bear on a rejection of the decisive influence on the functioning of a firm that has been attributed to the firm's location and suggest that growth determinants should predominantly be sought in factors that are more intrinsic to the firm. Naturally, one can dispute the influence of a firm's location in case there is considerable variation in the performance of firms that are located in the same area and therefore subject to the same conditions. Moreover, there is the observation of firms performing well *against all the odds* in so-called "disadvantaged" regions (Vaessen 1993). Obviously, this is where the firm and the entrepreneur come in. As Vaessen (1993) argues, a firm is able to respond actively to external conditions of the local business region and handle locational disadvantages effectively by ways of manipulating, immunising against, adapting to, or utilising the environment. The judgement of the appropriate response to the locational disadvantages can be very much found in the *ability* of firms and their entrepreneurs (compare Davidsson 1989). In studies dealing with firm

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<sup>6</sup> Bruinsma et al. (1998) provide empirical evidence that nomadic firms that are both foot-loose and have negligible transition and sunk cost exist only rarely. There will nearly always be some physical linkage to existing infrastructure.

employment growth the notion of 'ability' is often conceptualised with the inclusion of factors such as the educational level and working experience of the entrepreneur (e.g. Brüderl et al. 1996; Schutjens and Wever 2000). Also, the use of factors specifying the business strategy of a firm can more or less be seen as a reflection of the significance attached to the firm's ability (see e.g. Barkham et al. 1996; Brixy and Kohaut 1999). Following Davidsson (1989) it can be argued that besides the external forces influencing firms (*opportunities* related to the location), and the *ability* of entrepreneurs to recognise these forces and act sufficiently upon them, there is also the *willingness* of entrepreneurs to do so that influences the performance of firms. With respect to the importance attached to these various aspects, it is claimed by Boswell (1972, see Davidsson 1989) that "...*managerial ambition and ability seems to be a necessary condition for growth; more, they can be a sufficient one*"(p. 9). From such viewpoint it can be claimed that there are no such things as 'strong' or 'weak' locations, but only 'strong' and 'weak' firms (compare Nijmeijer 1997).

The foregoing implies that the question 'Does space matter?' can not be answered unambiguously given the empirical research that is presently available. The characteristics and size of our data permits in our view a more rigorous test of this question.

### **3. The impact of location on firm employment growth: empirical model**

#### *3.1 Data set and research area*

In order to find empirical evidence for the supposed influence of location on firm employment growth and to shed some light on the validity of several arguments presented in the previous section, an econometric model is developed in which firm employment growth as a dependent variable will be related to several location characteristics that serve as independent variables. Testing ground is provided by the Establishment Registers of the three northern provinces of the Netherlands, which

contain practically all single physical locations at which or from where some kind of economic activity is practised [i.e. including government, education, health care, and non-profit services]. By means of an employment survey among nearly all firms the registers provide information on changes in personnel.

From the registers, a data set is constructed which consists of establishments that have been registered both in 1994 and 1999. While the former year represents an economic turning point after which the Netherlands experienced a period of unprecedented economic growth, the employment statistics of both years are largely based on integral employment surveys and thus regarded as most reliable.<sup>7</sup> The selection of *all* establishments [irrespective of economic activity] registered during the specific period gives rise to the supposition that there is no bias in the results in relation to particular types of establishments. Among others, Audretsch et al. (1999) and Borland and Home (1996) have demonstrated the importance of sample selection for studies on the determinants of firm employment growth. All the included establishments are, however, by definition *survivors*, as the sample only contains the establishments that have been registered in both the starting year and the closing year of the period. As a result, a group of firms that has been established after 1994 or disappeared before 1999 and a group of firms that existed only *temporarily* between 1994 and 1999 are excluded from the analysis. Since the non-surviving firms are more likely to have experienced negative growth, we have to take into recognition that generally growth will be somewhat biased upwards (especially with respect to the smallest firms; compare Johnson et al. 1999). This may be partly offset by the fact that firms that disappeared are probably on average larger than the average starter. So, to what extent our results differ from an analysis on a population of all firms is a priori unclear. However, because our major interest is to get insight in the employment performance of existing firms this point is not very relevant.

An establishment may be one of a number owned by a firm or enterprise but is classified separately if it has a discrete building and work force at a specific location. Concerning employment growth, one has to bear in mind that important

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<sup>7</sup> With respect to the years in between 1994 and 1999, the employment surveys have been conducted integrally for all large firms (with 5 or more employees), whereas small firms only received a questionnaire every two/three years.

decisions are often made on the firm level and forced upon the various establishments. Given the lack of information in our data set on the relationships between establishments and their respective position within an organisation, we have to assume that employment growth in establishments can be sufficiently explained by focusing on establishments on their own. Besides, it can be argued that the greater part of the stock of establishment consists of –what is called- *simples*<sup>8</sup> by Reynolds & Maki (1990, see Davidson et al. 1994). Furthermore, one has to take into consideration that employment growth is often not regarded as the major business target by the establishment in itself. When we follow basic neo-classical micro-economic theory where an economic unit focuses on profit maximisation, the matter of the number of employees seems of minor importance. Although in the long run an economic unit needs to be profitable, the growth of an economic unit follows a life-cycle pattern often characterised by a strategy of increasing turnover and an increasing number of employees. This fits in a strategy of benefiting from economies of scale with as major goal survival of the firm. In addition, as outlined in the previous section, growth of individual firms is closely related to the objectives and ambitions of the entrepreneur. Although the influence of location characteristics on firm employment growth may therefore be masked, we claim that from the notion of “establishments characterised by employment growth represent at least business that prosper”, sufficient insight in the impact of location on firm employment growth can be derived.<sup>9</sup>

The data we use contains information about 35.000 firms and this are nearly all firms located in the three northern provinces Groningen, Fryslân and Drenthe of The Netherland. The northern part of The Netherlands can be seen as the ideal testing area for studying the impact of a firm’s location on firm employment. Firstly, for a relatively small region, a large differentiation in economic conditions (which

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<sup>8</sup> Besides the notion of two multi-establishments business types, namely *tops* and *branches*, Reynolds and Maki distinguish so-called *simples*, which are defined as single-establishment firms with autonomous ownership, i.e. which don’t form a part of a corporate structure.

<sup>9</sup> Compare Havnes and Senneseth (2001) who noted that the opposite argument can’t be made: “... *the absence of growth can’t be constructed as an indicator of inferior performance*”(p. 294).

basically represents all conditions that can be found in the Netherlands) can be assumed. Referring to the notion of the Netherlands as an *urban field* in which business opportunities and constraints are assumed to be similar everywhere (see previous section), we point out that the research area comprises some of the most peripheral areas of the highly urbanised Netherlands. Being located well outside the sphere of influence of the economic core area of the Netherlands, especially the most isolated regions along the shore and borderline might not be suited to meet most of the basic location conditions required by firms. Secondly, the region is characterised by a dominance of small and medium-sized establishments, which are no part of a corporate structure, and which themselves make the decision to hire or dismiss personnel (see above). And finally, since by far the largest bulk of the establishments are ‘inwards’ orientated (export is of less importance than in the rest of the country), the possible impact of location characteristics are to be found in the region itself.

### 3.2 Explanatory variables

With respect to the wide range of potential explanatory variables<sup>10</sup> that can be regarded as “*umfeldbezogene Erfolgsfaktoren*” [environmental success factors] (Brüderl et al. 1996), an eclectic approach is followed in the choice of location variables for the empirical analysis. Regional *population levels* and *population growth* stand for essential location characteristics representing labour as a necessary production factor as well as a proxy for ‘demand’ indicating the size of consumer markets. In regional growth theory, the relation between population and employment levels and changes has already received considerable attention (see for instance Borts and Stein 1964). Additionally, empirical studies that specifically focused on this issue (e.g. Steinnes and Fisher (1974), Carlino and Mills (1987), Boarnet (1994)) have found substantial evidence to suggest that population levels and population changes are among the (if not *the*) most important determinants of employment growth when measured at the regional level.

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<sup>10</sup> For an overview of potential location factors see e.g. Bruno and Tyebjee (1982) or Hayter (1997).

In addition to variables describing population characteristics, regional *employment growth* is also incorporated in the model.<sup>11</sup> As an alternative to population growth, the variable is put forward as a global indicator for the overall economic climate. More directly, the variable gives an indication of whether there is some empirical justification to suggest that a firm's performance is closely related to the performance of neighbouring firms.

Furthermore, the model includes several variables that describe locational advantages or disadvantages resulting from the spatial proximity of other firms. First, it is argued that the presence of a large number of firms may yield certain advantages (external economies), that are manifested in the firm's performance.<sup>12</sup> In this respect, a distinction can be made between externalities that may occur as a result of clustering of similar economic activities (also referred to as 'localisation economies') and externalities that are related to the clustering of a large range of different activities ('urbanisation economies') (Gordon and McCann 2000). Secondly, a variable describing the employment share of new firms is included. By focusing on the possible impact of competition we might assume that the opportunities for growth of existing firms would be severely hampered in case many new firms have entered the market. Alternatively, following Johnson et al (1999) we might argue that the variable as measured here may also reflect a vibrant market with considerable dynamism in economic activities and thus more opportunities for growth.

Besides the variables describing population and employment characteristics, the model includes variables in which *accessibility* (distance to motorway) and *enterprise zones* (industrial sites, office parks etc.) are defined. While the argument to include the former can be found in the importance attached to this location factor by entrepreneurs as becomes clear from numerous business surveys where accessibility is a location factor with a very high rank (see e.g. Ministerie van Economische Zaken, 1997), the latter mainly reflects the role of government regulation. In order to

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<sup>11</sup> Theoretically the size of the labour force or the level of employment are better indicators of the availability of labour than the population level. However, because participation rates in the area under study hardly show regional variation, the level of employment is highly correlated with population levels. Therefore, it was not included in the final regression model.

<sup>12</sup> Note that in the field of regional science, research on regional growth resulting from sectoral composition has attracted considerable attention (for an overview see e.g. Gordon and McCann 2000).

preserve landscape and environment-related qualities, the Netherlands is characterised by a highly regulated market for business accommodation, in which the possibilities for expansion (and location) of firms outside these 'enterprise zones' have been limited.<sup>13</sup> Furthermore, it is reasonable to expect that firms, which are located at sites specifically designed for particular kind of economic activities, will experience several benefits (which may result from inter-firm spill-over effects, the presence of infrastructural facilities etc.) that are ultimately reflected in the number of employees.

In order to distinguish the possible influences of the location characteristics from factors that are more intrinsic to the firm, the model controls for size, age, economic sector, and relocation. The first three variables represent some of the most documented growth determinants that can be found in practically any research on firm employment growth<sup>14</sup>. Relocation indicates that the firm probably came within the spatial margins of profitability and therefore moved to a better location. This variable also covers that for some firms the location variables measured at the beginning of the period are not valid for the whole period.<sup>15</sup>

### *3.3. Spatial impact range of variables*

With respect to the variables that describe the location characteristics of firms, it is hard to say in advance at which spatial range these factors may be at work. There are no unambiguous theoretical or empirical arguments for defining the spatial impact range of the variables. Generally, there is some consensus that especially the impact

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<sup>13</sup> In this respect, the relationship between enterprise zones and firm employment growth may also reflect a self-selection process in which firms that foresee an increase in personnel are particularly attracted to these zones. However, also firms located at an enterprise zone may after some time face constraints in growth possibilities or may not even have the intention to grow but relocated for other reasons.

<sup>14</sup> Since the focus of the present paper is on firm employment growth resulting from a firm's location, the nature of the relationships with the control-factors that are more intrinsic to the firm is not discussed here (for an extensive discussion see, for instance, Storey 1994).

<sup>15</sup> Assuming that firms move because of location opportunities and constraints, the relocation may indicate that a firm has moved to a location that facilitates employment growth. In this respect, the variable relocation may also partly act as an indicator for self-selection. However, moving to another location does not necessary imply that a firm will also increase in the number of employees and the reasons to move may also be of another nature.

of externalities resulting from firm clustering is very localised. Since highly aggregated regional data may mask such influences, the analysis requires information with detailed spatial observations. For this reason, we make use of postcode areas (4-digit), which represent the smallest territorial units for which the necessary information can be obtained (see also Raper et al. 1992). With respect to the research area of the present study, 943 of such units have been distinguished. Furthermore, from this detailed level of spatial analysis the data can easily be aggregated, so that the impact of factors, which can be assumed to work on a larger spatial range (for instance population levels and growth) can also come to the fore. Consequently, by making use of different aggregations, we have chosen to ‘let the data speak for itself’ with respect to the most appropriate geographic unit of analysis. Here, employment growth of an establishment is related to population characteristics (levels and growth) and employment characteristics (diversity, specialisation, competition, and growth) of all the postcode areas that are within one, two-and-a-half, five, and 10 kilometres distance of the postcode area in which the establishment is located.<sup>16</sup> Following Bartels (1979) who suggests that simple (binary) weight matrices are as adequate as more complex gravity matrices in which a distance decay has been incorporated, we have chosen to give similar weights to all the postcode areas that lie within the respective spatial ranges.<sup>17</sup>

Information on the location of firms at specific types of enterprise zones is obtained by address matching combining the spatial information of firms and various enterprise zones (as distinguished in the *Integraal Bedrijventerreinen Informatie Systeem* (IBIS) database). Finally, information on accessibility comes from the *WoonMilieuDatabase* (WMD) and is measured as the absolute distance between 4-digit postcode centroids and entrance and exit points of highways. An overview and formal description of the research variables can be found in appendix 1.

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<sup>16</sup> By means of a Geographical Information System (GIS) and *SpaceStat* (Anselin 1995; see also [www.spacestat.com](http://www.spacestat.com)) binary spatial weight matrices have been constructed based on absolute distances between postcode centroids.

<sup>17</sup> Given that the research focuses predominantly on the impact of location characteristics and not so much on the precise spatial range of this impact, the question of the most appropriate spatial weight matrix is of minor importance.

#### 4. Results

In order to find empirical evidence on the relationship between employment growth and the potential growth determinants described in the previous section, we estimate a linear regression model by means of ordinary least squares. We first estimate the model for all firms taking into account industrial heterogeneity by means of a set of 28 dummy variables. Since the determinants may not only vary in levels across economic sectors, but also in terms of slopes (as recently shown by e.g. Audretsch et al. 1999 with respect to firm-associated factors), we also run regressions for subgroups of the data set as classified by economic activity. The results of the regression estimates are shown in table 1.

From the table, it appears that we have found significant statistical evidence at conventional levels on the relationship between employment growth and various spatial variables besides the well-known firm related variables. Although the  $R^2$  of our model seems to be limited (as we have only been able to explain 8.2% of the variations in firm employment growth at a maximum), all the models are highly significant (according to the F values). With respect to the explanatory power of our estimations, we have to take into account that our samples of establishments are rather large (and therefore) heterogeneous by nature. Furthermore, the rather low  $R^2$  is not unusual for the type of study in which micro data is used. And finally, maximising the explanatory power is of less importance as we are predominantly interested in finding significant relations between location factors and firm employment growth. Although we do not entirely control for all relevant firm- and entrepreneur-specific variables<sup>18</sup>, we assume that we sufficiently control for these effects to avoid large biases due to omitting variables from the model that are theoretically highly important.

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<sup>18</sup> Such as legal form of the firm, skills of the entrepreneur, or technological status of which the influence on firm employment growth has been shown by previous studies (see e.g. Almus and Nerlinger 1999; Brixy and Kohaut 1999).

**Table 1: Firm employment growth (OLS-estimates)**

	ALL FIRMS			MANUFACT. SECTOR			RETAIL SECTOR			BUSINESS SERVICE SECTOR		
	Coefficient	t-value	Sig.	Coefficient	t-value	Sig.	Coefficient	t-value	Sig.	Coefficient	t-value	Sig.
Constant	-0.008	-0.217		0.014	0.105		0.243	2.971	***	0.046	0.380	
<i>firm specific variables #</i>												
SIZE	-0.083	-32.606	***	-0.072	-9.941	***	-0.128	-20.773	***	-0.055	-6.095	***
AGE94	0.086	7.954	***	0.149	3.873	***	0.037	1.667	*	0.077	2.566	***
AGE9392	0.061	7.056	***	0.122	3.718	***	0.075	4.541	***	0.053	2.124	**
AGE9189	0.026	3.345	***	0.106	3.534	***	0.047	2.890	***	0.011	0.467	
AGE8885	0.014	1.814	*	0.023	0.856		-0.000	-0.028		0.045	1.751	*
RELOC	0.083	11.317	***	0.125	4.835	***	0.048	3.132	***	0.103	5.290	***
<i>location variables</i>												
POPL ^	0.009	3.872	***	0.002	0.215		0.004	0.894		0.010	1.310	
POPG ^	0.021	0.445		-0.310	-1.944	*	-0.022	-0.208		0.051	0.351	
EMPG ^	0.105	5.314	***	0.177	2.585	***	0.141	3.215	***	-0.020	0.777	
DI §	0.003	1.763	*	0.010	1.734	*	-0.001	-0.400		0.005	0.911	
ZI §	0.313	2.966	***	0.915	2.153	**	-0.779	-2.288	**	-0.706	-1.353	
EMPS §	-0.275	-5.599	***	-0.294	-1.647	*	-0.307	-3.231	***	-0.175	-1.085	
ACCESS	0.001	0.288		-0.003	-0.369		-0.004	-1.015		-0.009	-0.121	
INDSITE	0.067	9.017	***	0.069	3.071	***	0.066	3.777	***	0.082	3.376	***
OFFSITE	-0.009	-0.514		-0.167	-2.281	**	-0.070	-2.214	**	0.058	1.356	
<i>statistics</i>												
F	49.021		***	11.221		***	37.700		***	7.291		***
Adj. R <sup>2</sup>	5,2%			8,2%			6,6%			2,5%		
N	34,918			3,091			7,839			3,726		
* Significant at the 10% level, ** at 5% level, *** at 1% level												
# estimation results for 28 industry dummies not shown here; but available from the authors upon request												
^ estimations results based on 5 km range; § based on 10 km range												

From table 1, it can be concluded that firm employment growth is significantly related to all the included firm-specific variables, suggesting that especially small, young and relocated firms experience relatively large increases in employment.<sup>19</sup> With respect to the specific impact of location characteristics on the employment performance of *all* firms, table 1 reveals that except population growth, accessibility and office sites, all the included variables contribute significantly in explaining

<sup>19</sup> Since these variables predominantly serve as control variables, a detailed discussion falls outside the scope of the present study and is not carried out here.

variation in firm employment growth. As it turns out, firms seem to benefit (as reflected in employment numbers) from being located in an area with high population levels, employment growth, and a great diversity of economic activities. Furthermore, there is an indication that firms profit from the spatial clustering of firms with similar activities. That is, firms that belong to an industrial sector that comprises a large share of the total regional employment are characterised by relatively large increases in employment.<sup>20</sup> Alike, firms located at industrial sites seem to experience more employment growth than those that can be found outside any specific kind of facilitated enterprise zone (reference group). Interestingly, the coefficient between employment share of new firms and firm employment growth displays a negative relationship, suggesting that the opportunities for growth are severely hampered in case of competition resulting from firms that enter the local market.

Although the values of the coefficients and t-values show considerable variations by varying distances of the location variables, the estimates of the regression analysis largely stay statistically significant for different spatial aggregations of the location variables. A notable exception is the specialisation index, which only displays a statistically significant relation with the dependent variable at the spatial level of postcode areas within the 10 kilometres range [which suggests that the impact of industrial clustering can only be regarded as ‘localised’ to a certain extent]. In general, the regression coefficients as found for the location variables become statistically more significant as the spatial range becomes smaller.<sup>21</sup>

The most striking unexpected result is that accessibility is insignificant in all models we tried. Although this results has also be found in another Dutch study (Van Meurs, 1993) we do not have a clear explanation. The outcome suggests, however, that the high rank of this factor in all kinds of surveys investigating location factors is possibly questionable and needs further study. The fact that population growth does

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<sup>20</sup> As a reminder, note that in the way in which diversity and specialisation have been measured, they are no opposites (see appendix 1). In fact, specialisation as measured here, is sector specific and refers to the employment share of the sector a firm belongs to. In contrast, the diversity index as measured here is similar to all firms in the respective region (see also Duranton and Puga 2000).

<sup>21</sup> With respect to the estimation results presented in table 1, the location characteristics have been consequently measured either at the 5 km or 10 km level. These levels generally represent the

not turn out to be significant may reflect that (small) changes in the number of consumers hardly has any influence. The absolute number of consumers in area reflected by the population level plays a dominant role. That changes in employment are significant in contrast to population growth may reflect that this is an indicator of a prosperous economic development in the area or it acts as an indicator of a dynamic labour market. In contrast to enterprise zones for manufacturing, location at specific office site shows no significant relation with employment growth. It may indicate that office-related activities are rather footloose.

As demonstrated by Audretsch et al. (1999) in relation to firm-internal factors, it turns out that the influence of specific location characteristics also differs considerably across industries. In table 1, those industry groups are included which reveal the most striking deviations from the general model that is based on all firms.<sup>22</sup> Regarding manufacturing and retail, there is ample empirical evidence to suggest that the employment performance of a firm is related to a firm's location. Firms belonging to any of those two industry groups are characterised by a negative influence on employment growth from being located at an office enterprise zone, which is not surprising given that these sites are not particularly facilitated for these kind of activities. Likewise, it can be claimed that the areas characterised by large increases in population numbers do not represent the most suitable business environment for manufacturing firms. The negative coefficient on population growth reflects the fact that households and firms may also compete for space.<sup>23</sup> Furthermore, there is an indication that the employment performance of retailing firms is severely impeded in highly specialised locations. That is, in case retailing is the most dominant economic activity in an area, competition seems to have the upper hand over the positive externalities that result from clustering (which view is supported by the negative coefficient on new firm's employment share, which more directly measures the

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statistically most significant estimations, while issues of multicollinearity (especially between population level and the specialisation and diversity indices measured at similar levels) are avoided.

<sup>22</sup> More results for the different economic sectors are available from the authors upon request.

<sup>23</sup> Since manufacturing firms do not directly dependent on consumer purchases, and households generally prefer to live in neighbourhoods free of any inconvenience resulting from these activities, it is hardly surprising that the impact of population dynamics comes to the fore in the model for the manufacturing sector.

element of competition). Finally, it turns out that the location characteristics hardly contribute in explaining variations of employment growth of firms belonging to the business service sector. Consequently, the overall explanatory power (as shown by  $R^2$ ) is also substantially lower than for the other sectors. Given the results of the regression analysis, we are inclined (see section 2) to support the argument of Wever and Van der Velden (2000) that so-called 'modern economic activities' like business services (as opposed to traditional activities such as manufacturing and retailing) make less demands on location factors and are more or less footloose.

## **5. Summary and conclusions**

In the emerging literature on business economics and entrepreneurship, those studies specifically dealing with the determinants of firm employment growth have received considerable attention. Most studies focus on characteristics of the firm and/or on characteristics of the entrepreneur as explanatory variables. Less attention is paid to the role of external factors that are related to a firms' location like nearness to consumers and suppliers, labour markets characteristics, accessibility to infrastructural facilities, and agglomeration and clusters effects or competition effects. Some authors argue that opportunities and constraints that condition the performance of firms are nowadays basically the same everywhere or at least within a country like The Netherlands that can be seen as one urban field. The latter vision implies that the spatial margins of profitability hardly play a significant role in the firms' decisions processes and that firms are to a large extent footloose. Others argue that the location of firm is of considerable importance for the performance of the firm in terms of profitability and employment growth. Although several studies provide also empirical evidence that regional differences are indeed important for firm performance the operationalisation of regional differences is in most studies rather simple. Many studies only use a set of regional dummies.

The main aim of this paper is to study the relation between employment growth in individual firms with a rather detailed set of spatial characteristics. Our data set is rather large and consists of nearly all firms in the northern part of The

Netherlands. Furthermore, of each firm we know the exact spatial location (postcode) and have detailed information about the type of economic activity. This permits that the spatial variables can be tailored to reflect really the spatial setting of a particular firm also in relation with the economic sector. Using GIS techniques we are able to construct spatial variables with varying spatial ranges from the location of the firm. For instance, we have constructed a variable that reflects the number of consumers in a range of 5 kilometres, but we can also construct a variable with the number of consumers in a range of 10 or 20 kilometres around the area where the firm is located. The same method with varying spatial ranges is also applied for several other variables.

The empirical model is estimated with OLS using data on about 35.000 individual firms located in The North of The Netherlands. Employment growth is measured during the period 1994 till 1999 and this implies that only firms that exist at both moments in time are used in the empirical analysis. The usual variables in this type of model, like initial size, age and a set of dummies controlling heterogeneity between due to differences by type of economic activity perform as expected. To this model various variables reflecting spatial issues are added and the final model is also estimated for individual economic sectors in order to shed light on the question if the spatial influence differs by economic activity. Our results show that a higher number of people in a range of 5 kilometre has a positive effect on employment growth in individual firms. Population growth in the same spatial area has no significant effect on growth, but employment growth in the area goes together with employment growth in individual firms. Interestingly, the number of new jobs in new firms has a negative effect on the growth of existing firms. This implies that if new firms enter the market this hampers employment growth in existing firms. This finding implies that a policy of stimulating new firm formation can only be successful if also the negative effect on existing firms is taken into account.

The findings for recently relocated firms indicate that these firms show larger increases in employment. The same holds true for firms located at a site especially designed for manufacturing activities, but the effect for location at an office site is

insignificant even when the sample is restricted to only business services. The positive coefficients can be interpreted as that for certain firms especially in the manufacturing and retail sector specific facilities at these sites are necessary to permit employment growth. The positive effect of relocation indicates that these firms want to grow and already adapted by means of a location strategy that allows growth. It seems that office-related activities are more footloose. These firms can probably also adjust easier to changes because the investments in building and equipment are relatively lower than in the manufacturing sector. This hypothesis is confirmed by the overall performance of the model estimated only on firms providing business services: the overall explanatory variables is substantially lower than for other sectors and nearly all the spatial characteristics are insignificant.

Access to highways is not a discriminating variable in any of the models we tried. Although this result has been found in other studies, we do not have a clear explanation. Our results show that both spatial clustering of similar firms and a great diversity of economic activities enhances employment growth. At first sight this may seem to be rather strange, but it is not. Because we used a rather detailed subdivision in economic sectors, a high spatial concentration of similar firms does not at all imply that the employment structure in an area is dominated by only one or a few sectors and can be characterised by a mono-culture. Our result indicate that on the one hand that there are certain agglomeration or scale effect in for instance the availability of specialised labour or certain facilities that are linked to a specific industry, but on the other hand that also a broad variety of for instance business services, infrastructure, education and knowledge centres may have a positive effect on employment growth.

In this paper we have shown that empirical models explaining firm employment can be enhanced by the inclusion of external factors that are related to the firms' location. It requires data that permit that location variables can be operationalised in a very rigorous way and can be directly related to the location of a firm. Furthermore, by running regressions for subgroups of firms with similar economic activities remarkable differences are found with regard to the influence of location factors indicating differences in the spatial margins of profitability. More insight in these relations requires a more detailed analysis by economic sector and

need a more in depth analysis of the spatial impact range of the variables. Also the puzzling result we find for the relation between accessibility and employment growth is a challenge for further research. Just like the finding that employment creation in new firms may cause lower employment growth in existing firms, these insights can be of value for regional policy makers, but also for individual entrepreneurs. The overall conclusion of our analysis is that location does matter for explaining firm employment growth.

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## Appendix 1: operationalisation and measurement variables

variables	description	measurement	databases
FEMPGR	firm employment growth	$\ln(\text{fulltime employees } 99) - \ln(\text{fulltime employees } 1994)$	PWR
SIZE	size	$\ln(\text{fulltime employees } 1994)$	PWR
AGE94	age cohort 94 (dummy)	1 if year of start-up = 1994, [0 otherwise]	PWR
AGE9392	age cohort 93/92 (dummy)	1 if year of start-up = 1993 or 1992	PWR
AGE9189	age cohort 91/89 (dummy)	1 if year of start-up = 1991, 1990 or 1989	PWR
AGE8885	age cohort 88/85 (dummy)	1 if year of start-up = 1988, 1987, 1986 or 1985	PWR
AGE84	age cohort 84 (dummy, ®)	1 if year of start-up = 1984 or earlier	PWR
INDUST	industry (28 dummies, <i>not shown here</i> )	... on basis of SIC-93 codes	PWR
RELOC	relocation (dummy)	1 if postcode 1994 # postcode 1999 (6-digit)	PWR
POPL*	population level	$\ln(\text{inhabitants } 1995)$	PCR/Statline
POPG*	population growth	$\ln(\text{inhabitants } 2000) - \ln(\text{inhabitants } 1995)$	PCR/Statline
EMPG*	employment growth	$\ln(\text{fulltime emp. } 1999) - \ln(\text{fulltime emp. } 1994)$	PWR
EMPS*	firm dynamics: employment firm start-ups	$\ln(\text{employment establ. registered in } 1999 \text{ but not in } 1994) / \text{divided by employment establ. stock in } 1994$	PWR
ZI*	industry specialisation index (industry specific)	employment share specific sector in total employment of a region in 1994 **	PWR
DI*	regional diversity index of industries	(inverse Hirshman-Herfindahl index) inverse of sum over sectoral shares (squared) in employment of a region **	PWR
ACCESS	distance to motorway	$\ln(\text{distance (abs.in km) centroid postcode (4-digit) and nearest motorway exit/entrance point (1994)})$	WMD
INDSITE	industrial sites (dummy)	1 if centroid postcode 1994 (6-digit) coincides with polygons of industrial enterprise zone	PWR/IBIS
OFFSITE	office sites (dummy)	1 if centroid postcode (6-digit) coincides with polygons of office enterprise zone	PWR/IBIS
NONSITE	non industrial or office site (dummy, ®)	1 if centroid postcode 1994 (6-digit) is located outside 'enterprise zone' polygons	PWR/IBIS
® = reference category			
* = measured at various spatial ranges, varying between 1 and 10 kilometres (making use of 4-digit postcodes)			
** = see also Duranton and Puga (2000)			