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The Impact of New Firm Formation on Regional Development in the Netherlands

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Contents

Abstract

This paper examines the relationship between new firm formation and regional employment change in the Netherlands. Using a new regional data base for the period 1988-2002, we examine the time lags involved in the relationship. We also investigate whether the relationship differs by time period, by sector and by degree of urbanization. We find that the maximum effect of new businesses on regional development is reached after about six years. Our results also suggest that the overall employment impact of new-firm startups is positive but that the immediate employment effects may be small in the Netherlands. Furthermore, we find that the relation between new businesses and regional development has been stable during the period under investigation, that the employment impact of new firms is strongest in manufacturing industries and that the employment impact of new firms is stronger in areas with a higher degree of urbanization.

JEL-codes
J23, L10, M13, R11

Keywords
Startups, entrepreneurship, regional development, the Netherlands

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1 Introduction

It is frequently argued that in the last 30 years the innovative advantage has moved from large, established enterprises to small and new firms, because new technologies have reduced the importance of scale economies in many sectors (e.g., Meijaard, 2001). Also, an increasing degree of uncertainty in the world economy from the 1970s onwards has created more room for innovative entry (Audretsch and Thurik, 2001). A consequence of these developments is that the importance of new and small firms for economic development has increased. However the relationship between new firm formation and economic development is complex. When new businesses enter a market, they may have both direct and indirect effects on the economic performance of the market they enter. The direct or immediate effect relates to the new jobs that are created in the new units at the start of business operations. The indirect effects occur some time after the new firms have started and relate to the crowding-out of competitors (negative effect) and, still later, to improved competitiveness of the industry induced by the increased competition of the new firms (Fritsch and Mueller, 2004).

The present paper investigates the time lags related to the direct and indirect effects of new businesses on the economic performance of the market they enter. In particular, using a data base for 40 regions in the Netherlands over the period 1988-2002, we examine the lag structure of the impact of new firms on employment change. When investigating the relation between new firm formation and economic development we realise that, besides the lag structure, several other aspects are of importance. *First*, the relation may change over time. We know that since the 1970s the economic importance of new and small firms has increased. Hence it may well be possible that the relation is not stable for the period that we consider in our study. *Second*, the relation may differ by sector of economic activity. It is generally well-known that startups in manufacturing are quite different from startups in services, for instance in terms of startup capital. Hence the impact on employment may differ as well. *Third*, the degree of urbanization may influence the relation as well. In areas where business density is higher, agglomeration advantages and knowledge spillovers may also be higher, and hence the economic impact of new firms may be higher. In this paper we also examine whether the relation between new businesses and regional development differs by time period, by sector and by degree of urbanization.

We find that the maximum effect of new businesses on regional development is reached after about six years. Our results also suggest that the overall employment impact of new-firm startups is positive but that the immediate employment effects may be small in the Netherlands. Furthermore, we find that the relation between new businesses and regional development has been stable during the period under investigation, that the employment impact of new firms is strongest in manufacturing and that the employment impact of new firms is stronger in areas with a higher degree of urbanization.

The organization of this paper is as follows. In Section 2 we discuss the theory and earlier empirical evidence for the Netherlands. Section 3 describes our data base on startups and employment for the Dutch regions while Section 4 deals with the model and methods that we use in our paper. In the last sections the results are presented and interpreted.

2 Theory and earlier work

2.1 Theory

As mentioned, when new businesses enter an industry, they may have both direct and indirect effects on industry-wide economic performance. The *direct effect* relates to the new jobs that are created in the new units at the start of business operations. The *indirect effects* relate to the effects the new businesses have on the incumbent firms in the market. There are several types of indirect effects which may be negative or positive. For instance, one may think of job destruction in the least competitive incumbent firms through increased competition of the new firms (negative effect). On the other hand, there are also positive effects. Incumbents imitate innovations made by new firms. The incumbent firms are also stimulated to innovate themselves. Furthermore, to resist the threat of startups, incumbents lower their prices, which, in turn, increases demand for products and services (Verhoeven, 2004). For a more elaborate discussion of the direct and indirect effects of new firm formation we refer to Fritsch (2006).

In this study we will also investigate whether the relationship between business creation and employment growth differs by time period, by sector and by degree of urbanization. Regarding time periods, several studies argue that the importance of small and new firms in the economy has increased over the last 30 years or so (e.g., Meijaard, 2001; Audretsch and Thurik, 2001). Developments like globalization, the ICT-revolution and the increased role of knowledge in the production process have led to increased dynamics and uncertainty in the world economy from the 1970s onwards (Thurik et al., 2002). In turn, these developments have created room for (groups of) small firms to act as agents of change. The larger role in technological development for small and new firms is referred to by Audretsch and Thurik (2001) as a regime switch from the 'managed' to the 'entrepreneurial' economy. A consequence of this regime switch is that the impact of new firm formation on economic performance may not be stable but instead increases over time. Indeed, recent empirical evidence for German regions (Audretsch and Fritsch, 2002) and British regions (Van Stel and Storey, 2004) shows that the impact of new firms on regional employment growth was bigger in the 1990s compared to the 1980s. We investigate whether, for Dutch regions, the relation changes over time as well, which would possibly indicate that the Netherlands experience a regime switch from the 'managed' to the 'entrepreneurial' economy.

Regarding sector of economic activity one might argue that a higher startup rate has more impact in sectors with a higher innovation-intensity compared to non-innovative sectors. More intense competition in innovative sectors may lead to a higher speed of technological progress, which in the longer run may lead to higher growth in these sectors.

We also investigate whether the degree of urbanization influences the relation between new firms and employment growth. When many firms are located close to each other in heavily populated areas, positive agglomeration effects may emerge, e.g. access to a broader labour market, the sharing of research organizations and the easier diffusion of (tacit) knowledge (Werker and Athreye, 2004, p. 508). As knowledge spillovers tend to be localized, the new knowledge generated or induced by a given number of new firms spills over to potentially more applications in concentrated regions. Hence it may be expected that the economic impact of new firms increases with the degree of urbanization. Some support for the existence of agglomeration advantages is provided by Varga and Schalk (2004). Using a simulation approach for a macro-econometric model of regions in Hungary, they demonstrate that by changing the spatial distribution of additional R&D expenditures from equal to concentrated allocation, a significant increase in the national growth rate could be attained.

The results of Varga and Schalk (2004) are also in line with a study by Brakman et al. (2005). They estimate econometric models derived from the New Economic Geography (Fujita et al., 1999, Fujita and Thisse, 2002), using a data base for European regions. The New Economic Geography is a relatively new branch of economics that incorporates agglomeration advantages and location choice in a formal general equilibrium framework. Firms choose to locate in core regions or in peripheral regions. At the aggregate level, based on a trade-off between agglomeration advantages (e.g. lower trade costs because of a larger local market) and agglomeration disadvantages (e.g. congestion; high land prices) a 'dispersion equilibrium' (supporting an even distribution of economic activity across regions), or an 'agglomeration equilibrium' (supporting a disproportionate amount of economic activity in core regions) may emerge. For their European data base Brakman et al. (2005) find empirical support for an 'agglomeration equilibrium' to exist. This implies that regional disparities are persistent. We will perform some exercises to investigate whether agglomeration effects exist within the Netherlands as well.

2.2 Empirical evidence for the Netherlands

Several empirical studies of the relation between startup activity and economic performance have adopted different approaches yielding different results. For a discussion of these (international) results we refer to Van Stel and Storey (2004) and Fritsch (2006). In this paper we will limit ourselves to the empirical studies performed for the Netherlands.

Empirical investigations to the relation between the number of (new) businesses and economic performance at the regional level for the Netherlands are scarce. This is related to the limited use and availability of regional startup data. As far as we know, original research using systematic information on the number of startups and the number of businesses in the Netherlands covering all economic activity is only performed at EIM.[1] Hence the only Dutch studies on the topic are also EIM-based. Nevertheless the empirical evidence is mixed.

In EIM (1994, pp. 41-47), a principal component type of analysis is conducted, using data for Dutch COROP regions in the period 1987-1990.[2] No relation is found between employment growth and the principal component 'firm dynamics' (determined by the numbers of entries and exits). Bosma and Nieuwenhuijsen (2002) investigate the impact of turbulence (sum of entries and exits) on growth of total factor productivity for Dutch COROP regions in the period 1988-1996. They find a positive effect for services and no effect for manufacturing. Van Stel and Nieuwenhuijsen (2004), using the same regional data base, find an opposite result: a positive effect of the number of businesses on regional growth for manufacturing, and no effect for services. A number of differences

[1] The original data are collected at the Dutch Chambers of Commerce.

[2] The COROP classification is the regional classification for the Netherlands at the NUTS3 spatial aggregation level.

between the studies may be responsible for these different findings. *First*, EIM (1994) and Bosma and Nieuwenhuijsen (2002) use a measure of firm dynamics (entry and exit) while Van Stel and Nieuwenhuijsen (2004) use the total number of businesses as a measure of competition. *Second*, while the former two studies scale their measures on the number of existing businesses (ecological approach), the latter uses employment as scaling variable (labour market approach). Audretsch and Fritsch (1994) show that using the ecological approach or the labour market approach may have big implications when performing regression analyses. A third reason for the different findings may be the different control variables. In particular, Van Stel and Nieuwenhuijsen (2004) control for spatial autocorrelation while the former two studies do not.

Although the exact reasons for the differences found between the three studies mentioned above may be disputed, the need for further research seems clear. In particular, while the most recent data used in the studies mentioned above are for 1996, the present study will use data up to and including 2002.

3 Data

In this paper we use a regional data base for the period 1988-2002. The regional aggregation level employed is the Dutch COROP level (spatial NUTS3 level), which consists of 40 regions. The data are also subdivided by sector. The sectoral classification contains five main sectors of the Dutch economy, viz. manufacturing (Standard Industrial Classification code D), construction (SIC code F), trade (SIC codes GH), transport & communication (SIC code I), and services (SIC codes JKNOP). The definitions and sources of the main variables uses in this study are given below. With the exception of population density the variables are available at the regional and sectoral level as described above.

– *Employment growth*. Data on employment are taken from Statistics Netherlands and the employment figures relate to employee jobs expressed in full-time equivalents or labour years. Part-time work is proportionally being counted as fulltime work. Self-employed workers and unpaid family workers are excluded from the data. The employment levels have been measured at the first of January each year. The employment growth rates are measured over periods of three years, and are expressed in percent points.

– *Startup rate*. Following the labour market approach we define the startup rate as the number of new-firm startups divided by employment in full-time equivalents (as described above). The data on the number of startups are taken from the Dutch Chambers of Commerce. The number of startups is defined to include all new establishment registrations. It includes both establishments with employees and establishments without employees. Mergers, subsidiary companies and relocations to other regions are not counted as a startup.

– *Wage growth* measures three-yearly changes in regional wage rates and is expressed in percent points. The wage rate is computed as total wages in a sector/region divided by the employment of employees in full-time equivalents. Data on wages are also taken from Statistics Netherlands (CBS). Because sectoral classifications used by CBS changed in 1993, corrections had to be made in order to arrive at wage rates according to a uniform sectoral classification.

– Data on *population density* were also taken from Statistics Netherlands.

Some descriptive statistics for the dependent variable in this study (three-year employment growth) and the main independent variable (the startup rate) are presented below. Because we will study whether the relation differs by time period, sector and degree of urbanization, we present these statistics from these respective angles. Table 1 shows that in the period 1996-99 employment growth was three times as high compared to the other periods, corresponding to the boom of the Dutch economy in this period. Average startup rates are very stable over time though. From Table 2 we see that in the period 1990-2002 employment grew fastest in the services industries. We also see that manufacturing has the lowest startup rate. This is caused by the higher entry barriers in this sector, for instance the level of startup capital required to start a firm in this sector is much higher compared to the average new firm in the service or trade sectors.[1] Table 3,

[1] Additionally, the shift of economic activity away from manufacturing and toward services which takes place in almost all Western economies, causes the number of startups in manufacturing to be relatively low.

finally, shows that there are also differences by regions at the NUTS1 level, particularly in employment growth levels. Differences in the number of startups are not so high. Note however that these statistics are averaged both over time and over sectors, hence differences that exist at the sector level are not visible in Table 3.

table 1 Mean and standard deviation of employment growth and startup rate, by time period

	1990-1993	*1993-1996*	*1996-1999*	*1999-2002*
Employment growth				
– Mean	3.08	3.25	9.27	3.63
– Standard deviation	7.52	10.11	10.32	8.11
Startup rate				
– Mean	12.41	12.84	12.84	11.71
– Standard deviation	8.78	7.94	7.58	6.96
N	200	200	200	200

Note: Employment growth is measured over three-year periods, and expressed in %-points.
Startup rate is the number of starts per 1000 labour years.

table 2 Mean and standard deviation of employment growth and startup rate, by sector, 1990-2002

	Manufacturing	*Construction*	*Trade*	*Transport & Communication*	*Services*
Employment growth					
– Mean	-3.62	2.58	6.33	3.75	11.50
– Standard deviation	6.75	10.22	5.55	11.06	7.13
Startup rate					
– Mean	3.30	17.19	19.29	8.56	16.01
– Standard deviation	1.68	6.49	6.93	4.79	4.85
N	160	160	160	160	160

Note: Employment growth is measured over three-year periods, and expressed in %-points.
Startup rate is the number of starts per 1000 labour years.

table 3 Mean and standard deviation of employment growth and startup rate, by region, 1990-2002

	North	*East*	*West*	*South*
Employment growth				
– Mean	4.66	5.46	2.80	4.85
– Standard deviation	11.21	9.22	9.10	9.43
Startup rate				
– Mean	13.75	12.79	12.97	11.60
– Standard deviation	8.31	8.80	7.57	7.44
N	180	160	320	140

Note: Employment growth is measured over three-year periods, and expressed in %-points.
Startup rate is the number of starts per 1000 labour years.

4 Model and research design

As mentioned earlier, in investigating the impact of new firms on regional employment, we focus on the lag structure of the impact, and on differences between time periods, sectors and degree of urbanization, respectively. These different angles of looking at the relationship call for different model specifications and research designs to be used. In particular, in terms of panel data analysis, the model focusing on the lag structure calls for a within-type of analysis (investigating the impact of changes in the startup rate *over time*) while the other types of analyses call for a between-type of analysis (investigating differences in the startup rate *between regions*). The research design that we will use in each case will be described below.

4.1 Research design for analysis of the lag structure of the economic impact of new firms

Sector adjustment in data

In this analysis we focus on the startup rate for the whole regional economy. Therefore for each region the sectoral data have to be aggregated to the regional economy level. In doing so we use the *sector adjusted* startup rate. The startup rates are sectorally adjusted to correct for different sector structures across regions. Differences in sector structures lead to different startup rates at the aggregate level, because startup rates are far from identical across sectors (see Table 2). The regional sector startup rates are weighted by employment by sector for the Netherlands as a whole (see Ashcroft et al. 1991). Hence we impose an identical sector structure on each region. In this way we eliminate the impact of sector structure from our analysis. Similarly, we also apply a sector adjustment (using the same weighting scheme) for the variables employment growth and wage growth.

Almon lags

As we are interested in the short-, medium- and long-run impact of new firms on regional employment growth, we would, in principle, want to estimate a regression where employment change is explained by the sector adjusted startup rate and several lags of the startup rate. However, in reality regional startup rates are heavily correlated over time (see Table 4) causing severe problems of multicollinearity. To avoid these problems we use the Almon lag method. Basically this method imposes restrictions on the parameters of the startup rates in such a way that the estimated coefficients of the startup rates are a function of the lag length. By substituting these restrictions back in the original equation one arrives at a more compact model which can be estimated without problems of multicollinearity. We refer to Stewart (1991, pp. 180-182) for a general description of the Almon method and to Van Stel and Storey (2004, pp. 905-907, Appendix 3) for a similar application of this method using startup rates and employment growth rates of British regions.

table 4 Correlations over time of sector adjusted startup rates (S), N=280

	S_t	S_{t-1}	S_{t-2}	S_{t-3}	S_{t-4}	S_{t-5}	S_{t-6}	S_{t-7}	S_{t-8}
S_t	1								
S_{t-1}	0.89	1							
S_{t-2}	0.81	0.90	1						
S_{t-3}	0.77	0.82	0.90	1					
S_{t-4}	0.70	0.73	0.79	0.90	1				
S_{t-5}	0.65	0.65	0.69	0.78	0.90	1			
S_{t-6}	0.59	0.59	0.59	0.67	0.78	0.89	1		
S_{t-7}	0.54	0.57	0.56	0.58	0.68	0.78	0.89	1	
S_{t-8}	0.49	0.54	0.55	0.52	0.58	0.69	0.77	0.88	1

Control variables

When estimating our Almon lag model where the impact of the startup rate on the three-year employment growth rate is estimated as a function of the lag of the startup rate, we include some control variables which are also expected to influence regional employment change. *First*, we correct for spatial autocorrelation, i.e. the phenomenon that regions are economically interdependent, causing the growth rates and disturbance terms of neighbouring regions to be correlated. To correct for this, following Fritsch and Mueller (2004), we compute for each region the average of the residuals in the neighbouring regions and include this variable as an explanatory variable in the model.[1] *Second*, following Van Stel and Storey (2004) we also include wage growth as an explanatory variable. In labour economics local wage growth is a common determinant of employment growth. Rees and Shah (1986) assume the welfare maximising individual chooses between utility in self-employment compared with paid employment, for which wages are taken as the proxy. Hence rises in wage rates would be expected to lead to movements into wage-employment and out of self-employment, consistent with a positive effect on employment change (which in the present study is defined to include employees only). Furthermore, wage rises may also stimulate labour supply which could also lead to increased employment at the regional level. However, there is also a possible negative effect as a higher price of labour may lead to a lower demand for labour (substitution between capital and labour). These opposite effects make the sign of wage rates indeterminate from theory.

Estimation method

As the focus of this analysis is on the effects of new firms over time, we will make use of fixed effects estimation. For each region only the deviations from the average over time of the model variables are considered. Basically the structural differences between regions are eliminated in this way. Furthermore, to safeguard a straightforward interpretation of the regression results, we remove outlier observations.[2]

[1] Note that this implies that the estimation is actually performed in two rounds.

[2] Those observations which have an absolute normalized residual greater than 2.5 are removed (on average some 3% of the original sample observations).

4.2 Research design for analyses of time periods, sectors and degree of urbanization

For these types of analysis we do not need to make use of sector adjusted startup rates. We directly use the data at the regional and sectoral level. Furthermore, because the focus here is on the differences between regions we will not include startup rates from every period. Instead we use the average startup rate for the three years immediately preceding the period over which the dependent variable employment growth is calculated.

Control variables

Besides the controls for spatial autocorrelation and wage growth described in Section 4.1, we include two further control variables here. The *first* control factor is population density. This variable may capture several effects. According to Audretsch and Fritsch (2002, p. 120), who also use population density as a control in their regressions for Germany, 'Population density here represents all kinds of regional influences such as availability of qualified labour, house prices, local demand and the level of knowledge spillovers'. The *second* additional control factor is lagged employment growth. Those regions with high economic growth may be attractive areas for new firms to locate as local demand is high. This *reversed causality* effect potentially causes the impact of startup rates on employment growth to be overestimated. This is due to positive path dependency in the economic performance of regions (i.e. the business cycle effect). We correct for this by including a lagged dependent variable.[1] Note that both these control variables relate to the differences *between regions* hence we do not include them in the fixed effects analysis described in Section 4.1. Furthermore, we correct for sectoral differences by including sector dummies. As we are primarily interested in cross-regional differences here, we do not make use of fixed effects estimations. Instead we simply use OLS. Again outlier observations are removed.

Degree of urbanization

As mentioned we also investigate whether the relation between new firms and regional growth is dependent on the degree of urbanization. For this purpose we create interaction terms of the startup rate multiplied by a variable measuring a region's degree of urbanization or degree of rurality. These latter variables are taken from Statistics Netherlands (CBS). In particular, for each COROP region CBS provides figures on the percentages of land that can be classified as 'very urbanized', 'urbanized', 'moderately urbanized', 'little urbanized' and 'not urbanized'. The classes 'very urbanized' and 'urbanized' together form an indicator for the degree of urbanization. It measures the percentage of land in a region with 1500 or more addresses per kilometre square. Likewise, the classes 'little urbanized' and 'not urbanized' together form an indicator for the degree of rurality, in which all areas are included with 1000 or less addresses per kilometre square. These variables are measured in the year 2000.

[1] The concept of using lagged dependent variables to correct for reversed causality is known in the econometric literature as Granger-causality. The Granger (1969) approach to the question of whether x causes y is to see how much of the current y can be explained by past values of y and then to see whether adding lagged values of x can improve the explanation. y is said to be Granger-caused by x if x helps in the prediction of y, or equivalently if the coefficients on the lagged x's are statistically significant.

5 Results

5.1 Time structure of the impact of new firms on regional employment growth

We compute the short-, medium- and long-run impact of new firm formation on employment growth using the Almon method as described in Section 4.1. We choose to include the startup rate from the current year as well as lagged startup rates, up until eight years. Furthermore, other studies (Baptista et al., 2006; Fritsch and Mueller, 2004) have consistently found an Almon lag polynomial of third degree to be statistically optimal. We follow these examples and choose the polynomial to be of third degree. Considering that our data base contains data for the period 1988-2002 and our choice to include eight lags, implies that we can use six years in our estimation sample, hence the sample before removal of outliers consists of 240 observations (as there are 40 regions). Estimation results are in Table 5.

From the left part of the table (unrestricted regression) we see that only the first and the last lag of the startup rate are significant, illustrating the multicollinearity problems described earlier. In the second part of the table the results of the Almon lag estimation are presented. We see that in the estimated Almon lag polynomial the linear, quadratic and third degree terms are all significant. Furthermore both the control variables wage growth and spatial autocorrelation are significant (the positive sign pointing at positive interdependency of neighbouring regions) and the R^2 value is quite high, indicating a good model fit.

table 5 The impact of lagged startup rates on regional employment growth (t - t-3)

	Unrestricted regression	*Estimated 3rd order Almon polynomial* $\beta_i = \gamma_0 + \gamma_1 i + \gamma_2 i^2 + \gamma_3 i^3$ *(i = lag length in years)*		*Restricted start-up coefficients; 3rd order Almon (lags in left column)*
Startup rate current year t	0.33 (1.5)	γ_0	0.124 (0.8)	0.124
Startup rate year t-1	-0.54* (2.4)	γ_1	-0.291 # (1.7)	-0.068
Startup rate year t-2	0.18 (0.8)	γ_2	0.110 * (2.2)	-0.101
Startup rate year t-3	0.047 (0.2)	γ_3	-0.010 * (2.5)	-0.037
Startup rate year t-4	-0.062 (0.3)			0.065
Startup rate year t-5	0.17 (0.9)			0.143
Startup rate year t-6	0.11 (0.7)			0.137
Startup rate year t-7	0.024 (0.1)			-0.015
Startup rate year t-8	-0.36* (2.3)			-0.371
Wage growth t-3	0.24** (6.1)	Wage growth t-3	0.24 ** (6.5)	
Spatial autocorrelation (residuals in adjacent regions)	0.45** (2.7)	Spatial autocorrelation	0.56 ** (3.8)	
R^2	0.702	R^2	0.691	
N	233	N	233	

Note: Estimated with fixed effects. Absolute heteroskedastic-consistent t-values in parentheses.
Employment growth, startup rate and wage growth are all sector adjusted.
Employment growth and (lagged) wage growth are measured over periods of three years.
 # Significant at the 10% level.
** Significant at the 5% level.*
*** Significant at the 1% level.*

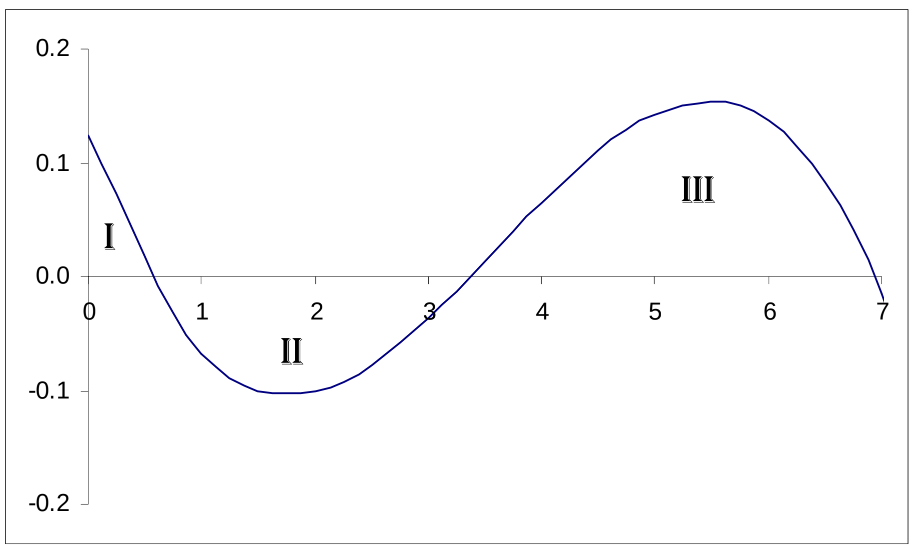
The restricted startup coefficients resulting from the Almon estimation are in the most right column of Table 5. This lag structure is presented graphically in Figure 1. The graph confirms the pattern described by Fritsch and Mueller (2004). First, there is a period of immediate job creation by the new firms (area I). Next, there is a period of crowding-out of competitors (area II).[1] Finally, there are positive indirect supply-side effects. After some years the intensified competition induced by the new entrants results in a restructuring of the market which is accompanied by positive effects at the aggregate level. Examples of these types of effects are: more efficient production by incum-

[1] Area II also captures employment losses in the non-surviving new firms.

bents because of the (threat of) increased competition; acceleration of structural change/innovation and an increased variety of products in the market.

In analyzing graphics like Figure 1 two aspects are of major (policy) importance. *First*, how long does it take before the maximum economic impact of new firm formation is reached? *Second*, how big is the net employment-effect (in terms of Figure 1, how big are the areas I, II and III?). The answers to both these questions are assumed to be dependent on the efficiency of the market process. If the quality of the newcomers is high the net-effect is likely to be positive as the incumbent firms are really stimulated to perform better (the threat of the new firms is more real). They may for instance increase efficiency freeing up resources for growth in other (new) parts of the market (niches). If the new firms are not so competitive the indirect supply-side effects are likely to be smaller and the net-effect may well be negative. From Figure 1 we see that for our sample of Dutch regions the estimated impact is maximal after 5.5 years. Furthermore, comparing the size of areas I and III on the one hand, and the size of area II on the other, we conclude that for the Netherlands in the period 1988-2002 the net-effect is positive. Comparing these results with similar studies for Portugal (see Baptista et al., 2006) and Great Britain (and in particular Scotland and Wales, see Mueller et al., 2006), it seems that the Netherlands performs better, both in terms of the time required to reach the maximum economic impact, and in terms of the size of the net-effect. This suggests that the market process in the Netherlands may be relatively efficient.

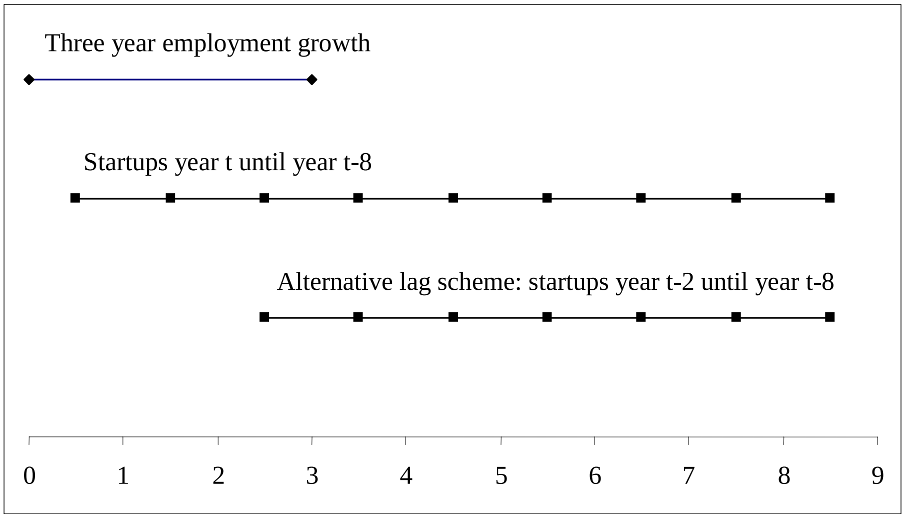
figure 1 The estimated lag structure (3rd order Almon polynomial)



Interpreting the 'direct effect'

In Figure 1 the area corresponding to the direct effect (area I) is positive, suggesting that - on average - new firms immediately render positive job creation effects. However, considering the Dutch economy this result is not as straightforward as it may seem at first sight. In particular, relatively many new firms do not hire employees at the start. According to Bangma et al. (2005), on average over the period 1987-2003 each new-firm startup in the Netherlands created 1.5 job, *including* that of the entrepreneur/business owner. Considering that in our study the employment measure excludes the self-employed, one might expect a negative effect. When a new firm is started by someone who was previously wage-employed[1], employment of employees goes down by one, while only half a (wage) job is created (excluding the job of the entrepreneur). So, given our employment measure one would expect the direct effect to be negative.

figure 2 Different lag schemes startup rates relative to period of employment growth



One possible explanation for the positive direct effect in Figure 1 (area I) may be the reversed causality issue discussed earlier. New firms may want to locate in regions with strong economic performance as local demand is likely to be high in such regions. Also, it may be more attractive to start a new firm in a period of high growth rates compared to a recession period.[2] Hence the reversed effect is expected to be positive. As the start-up rates of the current year and of the first two lags on the one hand, and the dependent variable employment growth on the other hand, are measured in the same period (see the the top and middle line in Figure 2), the possibility that the estimated direct effect is overestimated, cannot be ruled out.

This can be seen as follows. As explained earlier, both the (theoretical) direct employment effect and the reversed effect are expected to be positive. However, because the period in which the direct employment effect is expected to emerge, overlaps with the period in which a reversed causality effect might take place (this is the period during which the dependent and independent variables overlap, compare the top and middle line in Figure 2), the direction of causality is hard to disentangle from the regression output. In other words, it is possible that the direct effect computed on the basis of the regression coefficients, is actually overestimated. If in reality a positive reversed effect exists, then, to some extent, this effect will be picked up by the OLS coefficients, and hence the estimated impact of the startup rates of the most recent years will be higher than the real (unknown) direct employment effect.

[1] In the Netherlands, on average two out of every three startups are started by persons who were previously wage-employed (Van Uxem and Bais, 1996).

[2] Considering the 'within' estimation context of the current application (see Section 4), this latter explanation is actually more valid here.

To test this, we estimated an Almon lag polynomial where the first two lags were excluded, so that only the most recent startup rate used overlaps with the period of employment growth (compare the top and bottom line in Figure 2). In this way the chance that a reversed effect is picked up by the regression coefficients is reduced considerably.[1] Results are displayed in Table 6 and Figure 3. Remarkably, we no longer find an immediate positive effect of new firms on regional employment. Parameter estimate γ_0 is negative. Even though this estimation is artificial (the impact in the current year and one year lagged startup rate is equal to zero by construction), it does illustrate that in Figure 1 the direct effect might be overestimated due to reversed causality. When the first two years are removed the positive area is replaced by a negative area. Also note that in both Figures 1 and 3 the later positive effect ends after about seven years. It is likely that the early negative effect in Figure 3 corresponds to area II in Figure 1 and the later positive area to area III in Figure 1. From this exercise we conclude that the direct immediate job-creating impact of new firms is overestimated in Figure 1.

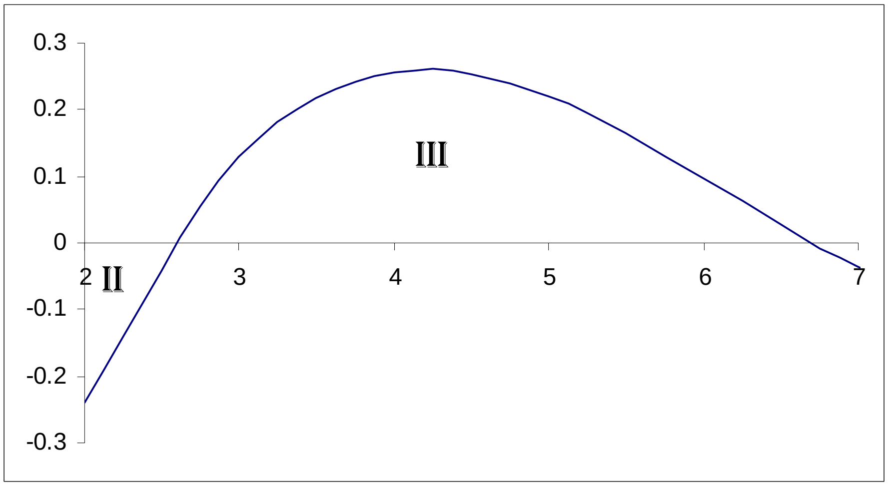
table 6 Estimating an alternative Almon polynomial function

Estimated 3rd order Almon polynomial $\beta_i = \gamma_0 + \gamma_1 (i-2) + \gamma_2 (i-2)^2 + \gamma_3 (i-2)^3$ *(i = lag length in years)*	
γ_0	-0.239 (0.9)
γ_1	0.517# (1.8)
γ_2	-0.160# (1.9)
γ_3	0.013* (2.0)
Wage growth	0.253** (5.4)
Spatial autocorrelation	0.831** (3.9)
R^2	0.773
N	155

Note: Estimated with fixed effects. Absolute heteroskedastic-consistent t-values in parentheses.
Employment growth, startup rate and wage growth are all sector adjusted.
Employment growth and (lagged) wage growth are measured over periods of three years.
 # Significant at the 10% level.
** Significant at the 5% level.*
*** Significant at the 1% level.*

[1] This possibility can never be ruled out completely because of path dependency in the employment growth variable.

figure 3 The estimated lag structure (3rd order Almon polynomial), excluding the first two periods



5.2 Does the impact of new firms on regional development differ by time period?

In this section we investigate whether the relation between regional startup rates and employment growth has changed over time. As explained in Section 2, many economies move from a 'managed' to an 'entrepreneurial' economy (Audretsch and Thurik, 2001). Considering this development it is not unthinkable that the impact of new firms might increase over time. To test this we divided the sample in two periods. Considering the lags involved in our model we split the sample in two periods, 1991-1996 and 1996-2002. Also, considering the focus on cross-regional differences, and to avoid a downward bias in the standard error, we use non-overlapping three-year periods in each sample. This results in two time observations per period. As there are 40 regions and five sectors, this results in 400 observations for each subsample, before removal of outliers.

Estimation results are in Table 7. We see that the estimated coefficient of the startup rate is exactly the same in both periods. Hence we conclude that the impact of new firms has been stable over the period 1991-2002.

table 7 Determinants of regional employment growth by time period

	1991-2002	*1991-1996*	*1996-2002*
Constant	-6.66**	-5.48**	-6.13**
	(9.94)	(5.31)	(6.80)
Startup rate	0.36**	0.33**	0.33**
	(6.87)	(4.91)	(4.04)
Population density	-0.002**	-0.003**	-0.0006
	(4.42)	(5.32)	(1.28)
Wage growth	0.15**	0.029	0.19**
	(5.32)	(0.58)	(5.85)
Lagged growth	-0.051	-0.069	0.004
	(1.44)	(1.36)	(0.07)
Spatial autocorrelation	0.69**	0.59**	0.41**
	(11.46)	(6.21)	(4.02)
Adjusted R^2	0.511	0.620	0.348
JB test [p-value]	[0.053]	[0.073]	[0.476]
N	777	394	383

Note: Absolute heteroskedastic-consistent t-values in parentheses. Sector dummies not reported.

** Significant at the 5% level.*

*** Significant at the 1% level.*

5.3 Does the impact of new firms on regional development differ by sector?

In this section we investigate whether the relation between regional startup rates and employment growth differs across sectors of economic activity. Again we use non-overlapping three-year periods (as employment change is measured over three years), resulting in four time observations (1994, '96, '99 and 2002). As there are 40 regions this results for each sector in a sample of 160 observations, before removal of outliers.[1]

Results are in Table 8. The result that stands out is that the impact of new firm formation is by far the largest for manufacturing. Even though both average employment growth and the average startup rate are the lowest of all sectors (see Table 2), those regions which have relatively high startup rates in manufacturing benefit in terms of employment. This may be related to the greater importance of innovation in manufacturing compared to, for instance, services. Innovation in service firms has a different character than in manufacturing. In particular, innovations in service industries are often non-technological and they mostly involve small and incremental changes in processes and procedures (De Jong et al., 2003, p. 16). To the contrary, innovations in manufacturing require more R&D and are more radical in nature. In modern entrepreneurial economies radical innovation is more conducive to economic growth than incremental innovation. This is because industry life-cycles are shorter and hence, at a given point in time, more (niche) markets are in an early stage of the life cycle where R&D is highly productive and the costs of radical innovation tend to be relatively low (Audretsch and Thurik, 2001). Hence, a lack of entrepreneurship in manufacturing industries may be

[1] Note from the non-significance of the Jarque Bera (JB) statistics that for the cleaned samples residuals are normally distributed.

particularly damaging to economic performance, as it may imply a lack of incentives to create (radical) innovations.[1]

table 8 **Determinants of regional employment growth by sector**

	Manufacturing	*Construction*	*Trade*	*Transport & Communication*	*Services*
Constant	-8.70**	-2.99	0.94	0.16	5.28**
	(7.06)	(1.54)	(0.54)	(0.06)	(2.82)
Startup rate	1.28**	0.39**	0.14*	0.39*	0.34**
	(5.32)	(3.24)	(2.35)	(2.18)	(4.14)
Population density	-0.003**	-0.003	-0.001**	0.002	-0.0009
	(4.47)	(1.88)	(3.19)	(1.05)	(1.71)
Wage growth	0.13**	0.12	0.21**	-0.071	0.18**
	(2.87)	(1.93)	(3.90)	(0.90)	(3.36)
Lagged growth	-0.071	-0.079	0.003	-0.031	-0.13*
	(1.25)	(0.90)	(0.05)	(0.38)	(2.12)
Spatial autocorrelation	0.89**	0.20	0.70**	0.40**	0.90**
	(8.84)	(0.94)	(4.40)	(2.80)	(11.02)
Adjusted R^2	0.512	0.117	0.320	0.055	0.548
JB test [p-value]	[0.409]	[0.794]	[0.365]	[0.957]	[0.972]
N	157	158	155	154	157

Note: Absolute heteroskedastic-consistent t-values in parentheses.

* *Significant at the 5% level.*

** *Significant at the 1% level.*

5.4 Does the impact of new firms on regional development differ by degree of urbanization?

In this section we investigate whether the relation between regional startup rates and employment growth differs across different parts of the country, and in particular, whether the degree of urbanization plays a role. To gain some first insight into regional differences we started by estimating the relation separately for NUTS1 regions (North, East, West and South). See Table 9.[2] The impact of new firms is bigger in the West compared to the North. This may be due to the agglomeration advantages discussed in Section 2. Indeed, using the indicator for the degree of urbanization discussed in Section 4.2, the average degree of urbanization for the Northern provinces is 12%, compared to 51% for the Western provinces in the Netherlands. This cannot however explain the different results for the East (positive impact of startups) and the South (no significant impact), as the degree of urbanization is similar in these regions (about 25%).

[1] An additional explanation for the large effect in manufacturing is related to the bigger average firm size. It is likely that on average startup size in manufacturing is also bigger compared to other sectors, implying that the direct employment effect may be relatively large.

[2] Note that we do not correct for spatial autocorrelation here as the adjacent regions are almost identical for each region within a NUTS1 region.

table 9 Determinants of regional employment growth by NUTS1 region

	North	*East*	*West*	*South*
Constant	1.35	-4.40 *	-9.4 **	-3.5 *
	(0.4)	(2.5)	(7.7)	(2.1)
Startup rate	0.17	0.56 **	0.46 **	0.19
	(1.2)	(5.8)	(5.5)	(1.2)
Population density	-0.023	-0.007 *	-0.001	-0.004
	(1.7)	(2.5)	(1.7)	(1.7)
Wage growth	-0.021	0.16 **	0.20 **	0.13 *
	(0.3)	(2.7)	(4.8)	(2.0)
Lagged growth	-0.26 **	-0.26 **	0.017	-0.091
	(3.5)	(3.2)	(0.3)	(1.0)
Adjusted R^2	0.289	0.553	0.478	0.450
JB test [p-value]	[0.877]	[0.718]	[0.363]	[0.036]
N	175	155	315	136

Note: Absolute heteroskedastic-consistent t-values in parentheses. Sector dummies not reported.

* *Significant at the 5% level.*

** *Significant at the 1% level.*

Nevertheless it may be interesting to investigate whether the impact of startups differs with the degree of urbanization of a COROP region. For this purpose we created interaction terms of the startup rate multiplied by the degree of urbanization or the degree of rurality as defined in Section 4.2. Again we pool data for four time periods, five sectors and 40 regions resulting in 800 observations before cleaning of outliers. Results are in Table 10. We look at the agglomeration effects from two slightly different angles. *First*, we examine whether the impact of new firms increases with the degree of urbanization (Model I). Table 10 suggests that this is the case as the interaction term is significantly positive. *Second*, we examine whether the impact decreases with the degree of rurality (Model II). Table 10 suggests that this is also the case. The interaction effect in Model II is stronger though. This suggests that it is even more important for a region to have little rural areas than it is to have many urbanized areas. The same number of new firms create less jobs in a rural area compared to a non-rural area.

The result from Table 10 might be explained by agglomeration effects such as a higher degree of knowledge spillovers in more dense regions. This explanation might interact with the observation that new firms in rural areas are often of a different nature compared to new firms in urbanized regions. Using the same CBS data base on the degree of urbanization Hessels et al. (2005) found that for the Netherlands the Total Entrepreneurial Activity rate (TEA) as measured by the Global Entrepreneurship Monitor, is highest for regions scoring high in the extreme classes 'very urbanized' and 'not urbanized' (i.e. rural), compared to the middle three levels of urbanization. In highly urbanized regions high startup rates occur due to a high population density. The attitude towards entrepreneurship is positive and business startups are services related. In rural regions the high startup rates are related to a smaller average firm size and the fact that there is a minimal level of shops and stores needed to sustain small village communities. Hence entrepreneurship in rural areas may be more of a subsistence nature.

Although more research is needed in this area we may conclude from Table 10 that the location of a new firm is important. This is in line with findings of Hoogstra & Van Dijk (2004). They address the question to what extent the location of a firm can be regarded as having an influence on employment growth of a firm. Using an econometric model based on a data set of circa 35,000 establishments in the northern provinces of the Netherlands, they find that 'location matters'. In particular the authors find that both belonging to a spatial cluster of similar firms and a great diversity of economic activities in the area a firm is located enhances employment growth of that firm. Our results are also in line with the study of Brakman et al. (2005), described in Section 2.1, who find empirical support for an 'agglomeration equilibrium' to exist.

table 10 **Determinants of regional employment growth by degree of urbanization/ rurality**

	Model I	*Model II*
Constant	-6.13 **	-5.93 **
	(8.5)	(8.2)
Startup rate	0.30 **	0.50 **
	(5.0)	(7.0)
Startup rate,	0.21 *	
interaction term degree of Urbanization	(2.1)	
Startup rate,		-0.29 **
interaction term degree of Rurality		(3.1)
Population density	-0.002 **	-0.003 **
	(4.5)	(5.3)
Wage growth	0.15 **	0.15 **
	(5.2)	(5.2)
Lagged growth	-0.052	-0.057
	(1.5)	(1.6)
Spatial autocorrelation	0.68 **	0.68 **
	(11.4)	(11.4)
Adjusted R^2	0.513	0.516
JB test [p-value]	[0.049]	[0.070]
N	777	777

Note: Absolute heteroskedastic-consistent t-values in parentheses. Sector dummies not reported.

* *Significant at the 5% level.*

** *Significant at the 1% level.*

6 Discussion

In this paper the relationship between new firm formation and regional employment change has been examined. Using a new regional data base for the period 1988-2002, we examine the time lags involved in the relationship. We also investigate whether the relationship differs by time period, by sector and by degree of urbanization. We find that the maximum effect of new businesses on regional development is reached after about six years. Our results also suggest that the overall employment impact of new-firm startups is positive but that the immediate employment effects may be small in the Netherlands. Furthermore, we find that the relation between new businesses and regional development has been stable during the period under investigation, that the employment impact of new firms is strongest for manufacturing and that the employment impact of new firms is stronger in areas with a higher degree of urbanization.

Our research has several policy implications related to the short and long-run effects of new firm formation. *First*, concerning short-term effects, policy makers are often inclined to stimulate business creation on the ground that new firms immediately create jobs. Our exercises suggest however that the immediate employment effect may actually be small in the Netherlands. *Second*, concerning long-run effects, policy makers are often inclined to neglect these, or at least to put less emphasis on these effects. However, as the longer term effects may well be substantial, it is of vital importance to take these into account when considering regional growth policies (Martí, 2004; Hoogstra and Van Dijk, 2004). The Almon lag model used in the present study is able to take the short as well as the long-run effects into account. We find that the maximum impact is reached after about six years and that the net-employment effect of startups is positive. Comparing these results with those obtained for other countries (in particular Portugal, Scotland and Wales, for which similar studies have been conducted), we see that the maximum economic impact is reached faster, and that the net employment-effect is larger. This tentatively suggests that the market process in the Netherlands may be relatively efficient.

However, this should not be taken as an encouragement to implement policies designed to maximize the number of new-firm startups, particularly in peripheral regions. The net-employment effect is dependent on the quality of the new firms. Once business creation in peripheral areas is subsidized this may attract entrepreneurs with lower levels of human capital who contribute negatively to regional development. Research for Great Britain by Mueller et al. (2006) provides some intuition for this hypothesis. Using a similar Almon lag approach they show that the net employment-effect of new firms is smaller for regions in Scotland and Wales compared to English regions. In a British context Scotland and Wales may be considered peripheral lagging regions with relatively many (often subsidized) startups in easy to enter, non-innovative sectors. From a policy perspective the British results suggest that subsidising entry may not be productive if the subsidised entrants are in easy to enter, non-innovative sectors such as vehicle-repairing and window cleaning (Van Stel and Storey, 2004).

The conclusion that stimulating business creation in peripheral areas may be inefficient is also in line with the study by Brakman et al. (2005), described in Section 2.1. By estimating econometric models derived from the New Economic Geography, they find empirical support for an 'agglomeration equilibrium' to exist, suggesting that for their European data set the agglomeration advantages (such as higher levels of knowledge spillovers) outweigh the disadvantages (such as traffic congestion). This would imply that regional disparities are persistent and hence difficult to counter with regional policy. The authors therefore conclude that attracting economic activity to the periphery through subsidies does not make sense, as this economic activity will in the long run be pulled to the core because of agglomeration advantages. The periphery lacks the critical economic mass to hold on to mobile firms. While the results of Brakman et al. (2005) are valid in a general European context, results in the present study suggest that agglomeration effects may also specifically exist within the Netherlands. We find the employment effect of startups in rural areas to be smaller compared to the effect in urban areas. It is conceivable that many of the more mobile startups in the periphery who find that they are less effective because of their location will relocate in the core. Therefore it is far from obvious that potential regional policies designed to maximize the number of startups in peripheral areas will have the desired effects on the regional economy.

Although the prior comments are caveats against generic quantity-based business stimulation policies, this is not to say that any stimulation policy would be futile. Instead, when considering business stimulation policies, both the quantity *and* the quality of the new-firm startups should be taken into account.

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