Institute for Employment Research

The Research Institute of the Federal Employment Agency

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IAB-Discussion Paper 4/2009

Articles on scientific dialoge

What makes start-ups out of unemployment different?

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Abstract

'What makes start-ups out of unemployment different?' To answer this question we formulate a theoretical sketch for start-up activity out of unemployment. Furthermore, we estimate spatial autoregressive models for the regional start-up rates out of unemployment as well as out of employment with German data from 1999 to 2004 at the NUTS3-level. Characteristics describing the populations of potential entrepreneurs as well as agglomeration externalities have a similar impact on both start-up rates. They are, however, affected in different ways by the regional wage level and the probability of entrepreneurial success. Moreover, the local impact of these determinants is amplified by spatial spillover and spatial feedback effects in particular for the start-up rate out of unemployment.

Zusammenfassung

"Was macht Gründungen aus Arbeitslosigkeit anders?" Um diese Frage zu beantworten, entwickeln wir einen theoretischen Ansatz für die Gründungsaktivität aus Arbeitslosigkeit. Weiterhin schätzen wir räumlich-autoregressive Modelle für die regionalen Gründungsraten aus Arbeitslosigkeit und Beschäftigung mit deutschen Daten von 1999 bis 2004 auf Ebene der deutschen Kreise. Agglomerationsexternalitäten haben ebenso wie die meisten Variablen, die personenbezogene Merkmale der Populationen von möglichen Gründern beschreiben, einen ähnlichen Effekt auf beide Gründungsraten. Auf unterschiedliche Art und Weise werden sie dagegen vom regionalen Lohnniveau und der Wahrscheinlichkeit des unternehmerischen Erfolgs beeinflusst. Insbesondere bei der Gründungsrate aus Arbeitslosigkeit wird der regionale Einfluss dieser Determinanten durch räumliche Spillovers und räumliche Feedback-Effekte verstärkt.

JEL classification: C 31 (Spatial Econometrics), J 23 (Self Employment), M 13 (Entrepreneurship), R 12 (Regional Economic Activity)

Keywords: Bridging Allowance, regional start-up activity, self-employment, spatial panel, unemployment

Acknowledgements: We thank Georg Hirte, Florian Lehmer, Annekatrin Niebuhr, Marcel Thum and participants at the Spatial Econometrics World Conference 2007, Cambridge, for their helpful comments. As well, we are grateful to Cerstin Erler for preparing the data. The usual disclaimer applies.

1 Introduction

Establishing new firms is important for economic development. Most studies on the transition into self-employment assume that persons have been in dependent employment before starting a business (e.g. Rees/Shah, 1986, de Wit, 1993, Blanchflower/Oswald, 1998 and Clark/Drinkwater, 2000) because they compare potential profits of the new firm with current salaries. The entrepreneurial behaviour of persons in other employment states, especially in unemployment, has not been analysed to the same extent, although these start-ups are quite important.[1] To our knowledge, there are no studies on the aggregate start-up activity within a population of unemployed persons. Some evidence on unemployed starting up at the individual level is provided by Evans/Leighton (1990), Wagner (2003), Niefert/Tchouvakhina (2006) and Caliendo/Kritikos (2007) who focus on the personality of the new entrepreneurs. In these studies particularly the business idea and the entrepreneurial skills turn out to be relevant, as well as qualification, job status and tenure, income and accessability of capital and the personal background. Other variables with regard to the industry-specific, local or national environment are mostly neglected not only in these papers but also in studies analysing start-ups of employed persons at the individual level. Additionally, there might be various specific factors influencing the entrepreneurial activity of the unemployed that are closely related to their status of being unemployed. For example, the incentive to overcome unemployment by self-employment is directly bound to this status. Moreover, unemployment even causes a worse financial standing resulting from discrimination of the unemployed. On the other hand, special programmes and subsidies may be available only for the unemployed. These factors not only affect the individual probability to start a new firm, they should also be reflected in the macro perspective, i.e. in the start-up activity of a certain population.

This paper analyses the differences between new firm formation of the employed and the unemployed at the regional level of the German NUTS-3 regions for the period from 1999 to 2004. Applying spatial autoregressive models we find that most of our included variables describing the population, environmental characteristics and the situation on the local labour market feature the same sign and nearly a similar magnitude regarding the impact on the two start-up rates. The largest differences between new firm formation out of employment and unemployment arise out of spatial dependence, the regional wage level, the failure probability and qualification.

To answer the question 'What makes start-ups out of unemployment different?' or, to be more precise, 'What exactly distinguishes the regional start-up activity of an unemployed from the one of an employed?' we proceed as follows: We start with presenting the existing literature on the determinants of the regional start-up activity. In Section 3 we develop a micro-founded model of the regional start-up activity out of unemployment. Section 4 describes the data we employ in our analysis. Thereafter, statistical descriptions with a special focus on spatial patterns are provided. In Section 5 we sketch the econometric design of our analysis that results in an econometric model controlling for different sources

[1] In Germany, roughly one third of all start-ups the entrepreneur has formerly been unemployed, cf. Sternberg/Brixy/Hundt (2007) or Wagner (2003).

of spatial interdependence. The results of the estimations with a special focus on these spatial aspects are discussed in Section 6. Important findings and implications for scientific practice are recapitulated in the conclusion.

2 Determinants of new firm formation – a literature review

Regional start-up activity out of unemployment should be influenced by the same determinants as start-ups where the previous employment status is unknown. In addition, there may be specific factors arising from the circumstance of being unemployed which so far have not been discussed in the literature. However, even well established determinants are likely to generate differences between employment and unemployment start-ups because of differences in their relevance for the two groups. Additionally, even when the factors have the same impact on the start-up activity of the unemployed, the endowment with these factors probably differs between the populations of the employed and the unemployed. Nonetheless, in determining which variables should be included in the estimation and which impact we should expect we first discuss the body of literature that generally does not distinguish between the start-up activity out of employment and out of unemployment. In a next step we adapt these hypotheses for unemployment start-ups and discuss the differences.

Significant explanatory variables for regional start-up activity in general are various measures of agglomeration, product demand, firm size and labour-market tightness. Common determinants like person-related characteristics that are used in studies focusing on the individual level are not taken into account in analyses on the more aggregated regional level, but instead are incorporated in environmental characteristics.

From the literature on the micro level, we know that several individual characteristics have a clear influence on the entrepreneurial decision. Men are more likely to establish a new firm than women (e.g. Bergmann/Sternberg, 2007 and Hyytinen/Ilmakunnas, 2007). Besides many other reasons, women show a higher risk aversion than men (Wagner, 2007). When starting their business, entrepreneurs are often between 25 and 45 years old. Younger and older persons have lower ambitions to start a business (e.g. Lafuente/Vaillant/Rialp, 2007 and Zissimopoulos/Karoly, 2007): the younger generation lacks knowledge, experience and often capital, the older generation is often more risk averse and have a shorter remaining work life.[2] In addition, the entrepreneurial aptitude is mostly found to increase with the educational level (e.g. Wagner/Sternberg, 2004 and Kim/Aldrich/Keister, 2006), even though other authors state a non-significant or actually a negative relation (Greene, 2000 and Henrard, 2003).[3] Information on nationality is seldom included although on the one hand foreigners are more likely to start a new firm due to poorer chances on the labour market (Boissevain et al., 1990 and Georgarakos/Tatsiramos, 2008), and on the other hand for them business formation is often more complex (Kontos, 2003).

[2] Some other studies find a higher start-up activity the older a person is (e.g. Lazear, 2005 and Falter, 2007). However, they only allow for a linear relation and hence the models might be misspecified.

[3] For a detailed country-specific overview on the relation between start-ups and person-related characteristics see Cowling (2000).

The economic environment is frequently approximated by three variables: unemployment rate, population density, and the share of small firms. Among these, only the impact of the share of small firms has a clear direction. The typically positive relationship is explained by the 'incubator thesis' (Keeble/Walker, 1994). In small firms the employees learn more about the company's planning and management processes. Thus, they are in a better position to start a new firm themselves than employees of larger firms. Transferring this finding to the regional level, regions with a small-firm structure should feature a larger number of start-up activities (e.g. Reynolds/Storey/Westhead, 1994 and Fritsch/Falck, 2007).

Population density often acts as a proxy variable for agglomeration effects and demand in regional analysis. Most often, the estimated relationship is positive (e.g. in studies from Fotopoulos/Spence, 1999, Bade/Nerlinger, 2000, Gaygisiz/Köksal, 2003, Brixy/Grotz, 2007). A negative sign is often interpreted as the effect of higher competition or cost disadvantages when starting a business in agglomerated regions. In this whole context, only Reynolds (1994) considers the dependency of the observed relationship on the sectoral structure; his results suggest a sub-optimal approximation for agglomeration and demand effects by population density. Instead of or additionally to this overall proxy one could include variables that are more specific in measuring the pure agglomeration effects, demand and competition, such as plant density, market potential, wage level, and sectoral shares.

Plant density has an ambiguous influence on regional entrepreneurial activity. On the one hand, it serves as an indicator for competition: The more firms exist in a region, the higher the probability of a competitor within the same market and the lower the chances of a profitable market niche or for oligopoly rents. On the other hand, regions with a high plant density provide advantages in terms of better access to distributers, customers or networks. Armington/Acs (2002) state a positive relationship between regional start-up activity and plant density. To measure a similar relation most authors apply indices for industry specialisation or diversification. While Garofoli (1994) for Italy and Reynolds (1994) for the US find a positive relation between their specialisation indices and regional new firm formation, Segarra/Callejòn (2001) state a negative effect of diversification measured by the inverse Hirshman-Herfindahl index.

In order to reflect effects of regional demand on the start-up activity, studies include either the local wage level (e.g. Berlund/Brännäs, 2001 or Gerlach/Wagner, 1994) or the per-capita income (e.g. Carree, 2002 or Ritsilä/Tervo, 2002). However, these variables bear two major disadvantages. Firstly, the wage level in particular reflects the factor costs in production (which reduce the firm's profit) as well as the opportunity costs in the entrepreneurial decision (cf. Section 3). Secondly, as districts are small, largely open economies, demand effects from other regions should also be considered (Head/Mayer, 2004): The local market potential – a distance-weighted average of incomes over several locations (Harris, 1954) – seems to capture the effective demand better than the local wage or income level.

The sectoral structure of new firm formation is accounted for by sectoral dummies or a separate analysis for several industries (e.g. Audretsch/Fritsch, 1999 and Wang, 2006). In addition to an above-average start-up activity in regions with a high share of services (in terms of lower entry barriers), Fritsch/Falck (2007) also find a positive effect for manufacturing.

The fear of failure (see e.g. Tamásy, 2006, Wagner/Sternberg, 2004) or risk aversion in general (Ekelund et al., 2005) can impede self-employment.[4] However, although the success of new businesses in a certain region is another (environmental) characteristic that can influence the start-up rates, previous evidence on the relation between aggregate new firm formation and local survival chances respectively failure probability is rather limited (see Sutaria/Hicks, 2004 for an exception).

Interestingly, older studies on new firm formation at the regional level (published before 2000) mostly ignore spatial correlation although the collocation of industries and firms (often discussed since Marshall, 1890, 1920, 1997) could imply collocation of firm entries. More recent articles apply specific spatial econometric models: for example, a cross-sectional spatial-lag ML estimation in Van Oort/Atzema, 2004, variants of a spatial lag and spatial error model in Brixy/Grotz, 2007 and Fritsch/Falck, 2007, and just recently extended by a spatial Durbin model in Breitenecker (2007). However, none of these studies provide detailed arguments why for example the spatial lag of the endogenous variable should have a certain impact on regional new firm formation, but rather explain the sources of spatial effects quite generally with agglomeration effects like knowledge spillovers or a collective use of resources. Deeper explanations as well as their concrete application in econometric analyses are not existent.

These empirical relations are in general valid for unemployment start-ups, although the initially mentioned differences arise. Presumably, the sign of person-related and environmental factors is identical for the two start-up alternatives. However, person-specific characteristics may lose their impact when aggregating them at the regional level. The magnitude of the impact might differ for environmental factors, especially for variables like the share of small firms, the success of start-ups in the region and in market-related factors like plant density and market potential. Furthermore, there are additional influencing factors on new firm formation out of unemployment that control for unemployment duration or specific subsidies.

The evidence on the relation between unemployment duration and new firm formation is contradictory. Alba-Ramirez (1994) finds a positive relationship for Spain and the US. Ritsilä/Tervo (2002) show a non-linear relationship, and Evans/Leighton (1990) present its non-significance. The positive sign can be explained by the declining reservation wage that reduces the value of dependent employment, i.e. the opportunity costs of self-employment (Alba-Ramirez, 1994). Ritsilä/Tervo (2002) explain their result of a decreasing probability of becoming self-employed by the lower survival chances in the labour market and the loss of entrepreneurial skills the longer unemployment lasts.

Intuitively, the regional level of subsidies as well as their composition have a positive influ-

[4] The discussion if and when one can speak of a successful start-up is ignored here, because the failure or survival of a start-up alone provides information.

ence on start-ups as this start-up activity is higher in regions with a generally high promotion of new firm formation out of unemployment. Previous studies that do not distinguish between different former employment states show no significant impact (e.g. Garofoli, 1994 and Kim/Aldrich/Keister, 2006). In our opinion, this hints towards a large dissimilarity between new firm formation out of employment and out of unemployment. In order to elaborate on these differences we formulate a theoretical sketch on starting a business out of the two employment states.

3 A model of new firm formation out of unemployment

The classical model of entrepreneurship relates the income in self-employment to the income in dependent employment. A person will choose self-employment if the expected profit π of the new firm exceeds the wage w which can be received in dependent employment (cf. Blanchflower/Oswald, 1998, Rees/Shah, 1986, de Wit, 1993). In order to introduce the entrepreneurial risk (Knight, 1921) into the model, it can be assumed that the success of a business is uncertain with probability p^s. In addition, we assume that in the case of failure the person will return to dependent employment.[5] Both the probability of success p^s and the profit π depend positively on an individual's entrepreneurial skill level θ, whereas the other variables in the model – such as the earnings in dependent employment – do not (Clark/Drinkwater, 2000). In the following, we suppress the subscript θ for notational simplicity. Starting a business is related with sunk costs C^s. The expected value of self-employment can then be formulated as $V^{s|d} = p^s\pi + (1-p^s)w - C^s$. The expected value of dependent work $V^{d|d}$ is w because w will be received with probability 1. An individual will opt for self-employment if the net expected value of self-employment relative to dependent employment, $\Delta^{s,d|d} = V^{s|d} - V^{d|d}$, is equal or higher than zero:

$$\begin{aligned} \Delta^{s,d|d} &= p^s\pi + (1-p^s)w - C^s - w \\ &= p^s(\pi - w) - C^s \geq 0. \end{aligned} \tag{1}$$

Basically, our analysis for the start-up decision of unemployed persons follows the same arguments. An individual will start a business if the expected income in self-employment is higher than the expected income when opting for dependent employment. However, the unemployed person will not only face uncertainty about success in self-employment, but

[5] Alternatively, failed entrepreneurs could be randomly assigned either to dependent employment or unemployment. Then we obtain $p^s(\pi - w) + (p^s - 1)(1 - p^d)(w - b) - C^s$ as decision rule instead of equation (1) and $p^s(\pi - w) + p^s(1 - p^d)(w - b) - C^s + B^s$ instead of equation (2). Instead of an additional value of starting any kind of work, here the difference between the start-up decisions out of unemployment and employment, $(1 - p^d)(w - b) + B^s$, can be interpreted as a risk premium for giving up a safe job which has to be yielded only by start-ups of formerly employed persons. However, the rather limited previous evidence on the subsequent occupational career of failed entrepreneurs supports our approach: Caliendo/Uhlendorf (2008) state a possibility nearly three times higher for being in dependent employment than being non-employed after self-employment (7.1% to 2.1%). For unemployment start-ups our data shows the opposite: One year after starting up, 14.87% of the persons are employed in dependent employment whereas 36.60% of the persons have returned to claiming unemployment benefits.

also uncertainty about finding dependent employment. To account for this uncertainty, we denote the probability of finding a job as p^d. The fall-back option in the case of failure is now given by the unemployment benefit b. Then, the expected value of searching for dependent work is $V^{d|u} = p^d w + (1 - p^d)b$.

Active Labour-Market Policy (ALMP) typically focuses on increasing the chances to find a job. Starting a business from unemployment may be promoted by some specific ALMP programmes, e.g. the Bridging-Allowance in Germany or the Enterprise Allowance Scheme in the UK. In the following we denote these start-up subsidies by B^s. The expected value of starting self-employment out of unemployment is $V^{s|u} = p^s \pi + (1 - p^s)b - C^s + B^s$.

For an unemployed's expected net value of self-employment relative to dependent employment we can write:

$$\Delta^{s,d|u} = [p^s \pi + (1 - p^s)b - C^s + B^s] - \left[p^d w + (1 - p^d)b\right] \tag{2}$$

Similarly to equation (1), an unemployed person will decide to start a business if $\Delta^{s,d|u} \geq 0$. Some rearrangements of equation (2) allow a more detailed analysis of the entrepreneurial decision of an unemployed person and particularly its distinction to establishment formation out of employment:

$$\begin{aligned} \Delta^{s,d|u} &= p^s \pi - C^s + B^s - p^d w - (p^s - p^d)b \qquad (3) \\ &= p^s(\pi - w) - C^s + B^s + (p^s - p^d)(w - b). \end{aligned}$$

As can be seen, the first term on the right hand, $p^s(\pi - w) - C^s$, is equal to the net expected value of a person who starts a business out of employment which is given by equation (1). The second term, $B^s + (p^s - p^d)(w - b)$, reflects the part of the decision that is specific for firm formation out of unemployment. In this expression, $(w - b)$ represents the net surplus of being employed at all. The specific incentive to start a business results from the difference in the probabilities to work – i.e. to receive this revenue – either in self- or dependent employment. We can conclude from equation (1) that an employed person will only start an enterprise if the value of π is sufficiently higher than w. In contrast to this, an unemployed individual may decide to establish a new firm even if $\pi < w$. Self-employment can be the better choice if the difference $(p^s - p^d)$ is large, i.e. if the chances in self-employment are significantly better than the probability of transition into dependent employment, or if the start-up subsidy B^s is high.

Transferring the individual model to the regional level, the distribution of entrepreneurial skills $\theta \in \{\underline{\theta}, \overline{\theta}\}$ in the relevant population becomes important. The aggregate rent of the regional start-up activity is given by the integral of the entrepreneurial net value $\Delta^{s,d}$ over the individual skills. $\theta^{*,d}$ denotes the critical skill level where $\Delta^{s,d}$ becomes positive, i.e.

the skill level which maximises this aggregate rent. For business starts out of employment it can be formulated as:

$$\mathcal{V}_F(\theta_r^{*,d};\pi_r,w_r,p_r^s,C_r^s)=\int_{\theta^{*,d}}^{\overline{\theta}}[p^s(\pi-w)-C^s]dF_r(\theta). \quad (4)$$

The corresponding start-up rate follows from the fraction of the cumulative density function of θ above the critical value:

$$F(\theta_r^{*,d};\pi_r,w_r,p_r^s,C_r^s)=1-F_r(\theta_r^{*,d}). \quad (5)$$

Similarly, the start-up activity out of unemployment

$$\Gamma(\theta_r^{*,u};\pi_r,w_r,p_r^s,C_r^s)=1-F_r(\theta_r^{*,u}) \quad (6)$$

on the regional level follows from the maximisation of the aggregate entrepreneurial rent of the unemployed according to

$$\mathcal{V}_\Gamma(\theta_r^{*,u};\pi_r,w_r,p_r^s,p_r^d,C_r^s)=\int_{\theta^{*,u}}^{\overline{\theta}}[p^s(\pi-w)-C^s+B^s+(p^s-p^d)(w-b)]dF_r(\theta). \quad (7)$$

The difference between start-ups out of employment and unemployment generated by the unemployment-specific component of an individual's decision is maintained in the regional aggregation. Due to this difference, the critical value of entrepreneurial skills, θ^*, differs between unemployment or employment origin as do values derived from θ^*, e.g. the marginal wage level $w^*(\theta^*)$ where dependent employment and self-employment break even. Further, as $\theta^{*,u}$ has an impact on both parts of equation 6 it can hardly be integrated out.

As our study refers to start-up rates at the NUTS-3 level, we consider the regions to be small open economies. Their start-up rates are thus determined not only by the economic situation within the region but also by the situation of those regions it is interacting with. The classical advantages of agglomeration – input sharing, labour market pooling and knowledge spillovers – affect especially the spatial pattern of profits π, wages w and the distribution of industries. Besides these commonly mentioned advantages of agglomeration there may be additional economies of scale in starting a business: The more new entrepreneurs collocate close to each other, the lower C^s could be, the costs of starting up. For example, advise and consulting are probably cheaper and more precise when shared by many potential entrepreneurs. In addition, young entrepreneurs work as a role model for other nascent entrepreneurs (e.g. Lafuente/Vaillant/Rialp, 2007, Bergmann, 2004, Wagner/Sternberg, 2004). They also benefit from spatial proximity, because face-to-face meetings between them become possible: how do start-ups take place, which specific regional factors should be kept in mind, what are causes of failure and how can mistakes be avoided?

There is one additional source generating spatial patterns: politics and administration on several regional levels – in Germany the Federal Government, the Länder Governments, the Federal Employment Agency and Local Authorities – decide on the allocation of active labour-market policy schemes, i.e. amongst others even on B^s. As a consequence, decisions on a superior regional level may work as “global” or multi-regional external conditions that may introduce spatial correlation of start-up rates.

4 Data and spatial patterns of new firm formation

Our empirical analysis covers the German NUTS-3 regions over the period from 1999 to 2004 and employs mainly record data collected by the labour-market administration. Information on start-ups, wages, employment, unemployment and ALMP participation is contained in the *Integrated Employment Biographies* (IEB), (Jacobebbinghaus/Seth, 2007 and Spengler, 2008). Distances between NUTS-3 centroids are provided by the *Bundesinstitut für Bau-, Stadt- und Raumforschung (BBSR)*. The population data is published by the German Federal Statistical Office, the consumer price index by the German Bundesbank.

4.1 The identification of start-ups and variable definitions

In identifying start-ups out of employment we follow the procedure of Fritsch/Brixy (2004) who employ the establishment file of the German Social Insurance Statistics, a plant-level aggregate of the IEB.[6] This database covers only plants having at least one employee subject to obligatory social insurance, i.e. plants without any staff are not included. An establishment is considered as newly formed if its identification number has not been reported within the previous three years. Additionally, among the newly founded establishments those which report more than twenty employees are excluded. Typically, these are not started by a person but by an enterprise and often result from reorganisation and outsourcing. Hence, they should not be classified as a start-up. By this procedure nearly 70% of original start-ups are accurately identified (Fritsch et al., 2002: 75).[7]

A relatively good approximation for start-ups out of unemployment is provided by an instrument of active labour-market policy (ALMP) in Germany. The ‘Bridging Allowance’ (BA, *Überbrückungsgeld* according to the German Social Code III, §57) is available for persons who end or avoid unemployment by transition into self-employment. Recipients have either been unemployed or have participated in another ALMP programme, i.e. in a training or job-creation scheme. Bridging Allowance is not granted to employees who benefit from wage subsidies (§ 217 – 233 Social Code III). The subsidy is also available to employees who would become unemployed otherwise. Financial transfers to new entrepreneurs are equivalent to their former unemployment benefits. Additionally, recipients are reimbursed by the labour administration for their social security contributions, i.e. the compulsory health insurance funds, the nursing care insurance, and the statutory pension fund. Both the direct transfer and the reimbursement are granted for half a year. To prevent malpractice of the

[6] The probability of an inclusion of unemployment start-ups in this data is relatively low. A representative survey on new firm formation in Germany, the *KfW-Gruendungsmonitor 2008* (Kohn/Spengler, 2008), states 0.6 full-time equivalents as the average number of employees for start-ups out of unemployment.

[7] There is no database in Germany from which start-ups can be identified in an absolute reliable way. Fritsch et al. (2002) provide an overview and an evaluation of the individual quality of different databases measuring start-up activity in Germany.

programme, especially windfall gains, external checks are obligatory. The economic sustainability of the entrepreneurial concept has to be certified by competent authorities, e.g. the chamber of commerce and industry or credit institutions.

Why is it possible to measure the start-up activity out of unemployment with BA? There are some arguments for using BA as a measure: Firstly, every unemployed is entitled to a bridging allowance when providing a sustainable entrepreneurial concept. Moreover, an unemployed who ends unemployment by transition into self-employment without claiming BA or another subsidy misses some chances for a 'simpler' start-up. Secondly, BA is the predominant programme for promoting the step from unemployment to self-employment in our period of observation.[8] And thirdly, data for other subsidies are available only as regionally disaggregated non-representative survey data. Henceforth, other authors (e.g. Pfeiffer/Reize, 2000a or Pfeiffer/Reize, 2000b) use BA to approximate the start-up activity out of unemployment. Surely, we are not covering all start-ups out of unemployment, but BA 'seems to be an appropriate estimate for the number of transitions from unemployment to self-employment in Germany, today' (Wagner, 2003).

The regional aggregate of the two start-up variables is calculated as the respective share of the employed or the unemployed in region i and year t, because these certain populations represent the number of potential entrepreneurs. As we use quantities of persons as denominators, these measures are related to the labour-market concept of start-up rates (Audretsch/Fritsch, 1994, Kangasharju, 2000).

Most of the explanatory variables are also defined without a dimension. Variables related to specific sub-groups of the employed and unemployed are expressed as shares, e.g. the share of younger and elder, the shares according to the skill level, the share of short and long-term unemployed, the share of employees in a certain sector, etc. Population density is defined as persons per square kilometer, plant density as the number of establishments per inhabitants and the share of small firms as the number of establishments with less than 20 employees divided by all establishments. The real wage is calculated as the average annual nominal wage in 1000 € divided by the consumer price indices. Market potential is defined similar to Harris (1954): $MP_i = \sum_{i \in R} \frac{\text{Wage sum}_i}{d_{(i,j)}}$, with $d_{(i,j)}$ as the physical distance between region i and region j; it is measured nominally in Mio. €.[9] Both real wages and market potential are included in logs. For the probability of failure which nascent entrepreneurs take into consideration we use the share of plants that closed down in the region within the previous year.

Short-term unemployment is defined as those persons who have been unemployed less than three months divided by all the unemployed, long term-unemployment is measured

[8] Another large programme aiming at firm creation has been introduced in 2003: the start-up subsidy (*Existenzgründungszuschuss, EXGZ*). However, in 2003 and 2004 there were less persons participating in this programme than in BA. Additionally, the EXGZ had no active prevention for malpractice until the end of 2004. For us, this leads to an non-consideration in measuring start-ups out of unemployment.

[9] Instead of the GDP as applied by Harris (1954) we use the sum of wages, because on the one hand the factor salaries have roughly constant shares on GDP, and on the other hand the local GDP is approximated by variables like wages, employees and profits. Hence, the market potential is a weighted sum of the income of all employees in Germany and henceforth should be comparable.

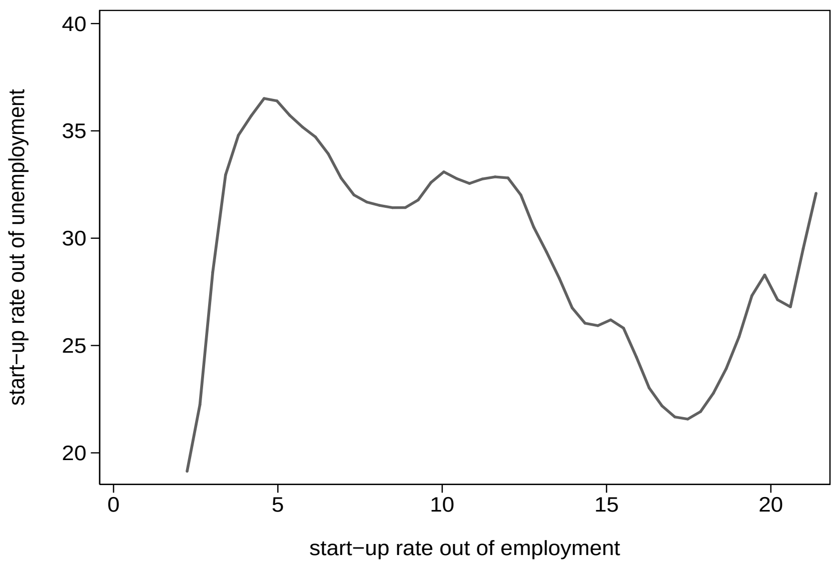
as the share of persons who have been without a job for more than one year. As variable for total Active Labour-Market Policy we use the natural logarithm of the number of all participants per year. Recipients of start-up subsidies are not included in this number, as well as participants in short-term programmes, i.e. those with a maximum participation duration of less than three months. In contrast to these, the share of second labour-market programmes – in order to control for the number of artificial jobs, and thus for the performance of the local labour market and the entire local economy[10] – is defined as the ratio of participants starting this programme relative to the inflow into unemployment.

4.2 Descriptive evidence – the data at a first glance

In the following, we provide some short descriptions of our central variables, the start-up rates out of employment and unemployment. Statistics for the covariates are shown in the Appendix in Table A.1.

The existing literature and our theoretical discussion suggest a rather positive correlation between the two start-up rates. In contrast, the Pearson correlation coefficient shows a significantly negative relation (-0.1074) between regional start-up rates out of employment and unemployment. Also, a non-linear relationship could be possible. To examine our assumption we look at the conditional expectation of the local start-up rates of the unemployed for a given start-up rate out of employment for the German NUTS-3 regions from 1999 to 2004. In fact, we find areas in the data range showing a positive correlation and areas showing a negative one, resulting in a N-shaped pattern as can be seen in Figure 1.

Figure 1: Conditional expectation of the start-up rate of the unemployed for given start-up rate out of employment (per thousands)



Expectations are computed non-parametrically as Nadaraya-Watson estimators $E\{y|x\} = m_h(x)$ with gaussian kernel and MSE-minimising bandwidth h.

[10] Entrepreneurship studies typically incorporate the unemployment rate which is not appropriate in our context due to the fact that it is defined as relation of the two start-up populations.

A comparison of the start-up rates in the six years from 1999 to 2004 shows an increasing start-up rate out of unemployment and a decreasing rate out of employment (see Table1). The development in opposite directions could be one explanation for the N-shaped curve and the negative correlation. Alternatively, the findings can be illuminated further by looking at the regional distribution of both start-up rates in Figure 2. The well-known and clearly visible East-West differences in the case of start-ups out of employment (e.g. Fritsch, 2004) can be discerned for the start-up rates out of unemployment as well. However, the distribution is reversed here, i.e. the BA-formation rates out of unemployment are lower in the Eastern part compared to the Western part. It could be argued that our observation is caused by the different denominators, but the results also hold when using a joint denominator (e.g. employment + unemployment). In the south of Bavaria and a few other regions both the start-up rates out of employment and unemployment are high. In the Ruhr-area and other urbanised regions both rates are low.

The obvious patterns in Figure 2 suggest spatial correlation which can be tested for by using Moran's Index (MI) on the variable x:

$$MI = \frac{\sum_{i=1}^{N}\sum_{j=1}^{N} w_{i,j}(x_i-\bar{x})(x_j-\bar{x})}{\sum_{i=1}^{N}\sum_{j=1}^{N} w_{i,j}\frac{1}{N}\sum_{i=1}^{N}(x_i-\bar{x})^2} \quad (8)$$

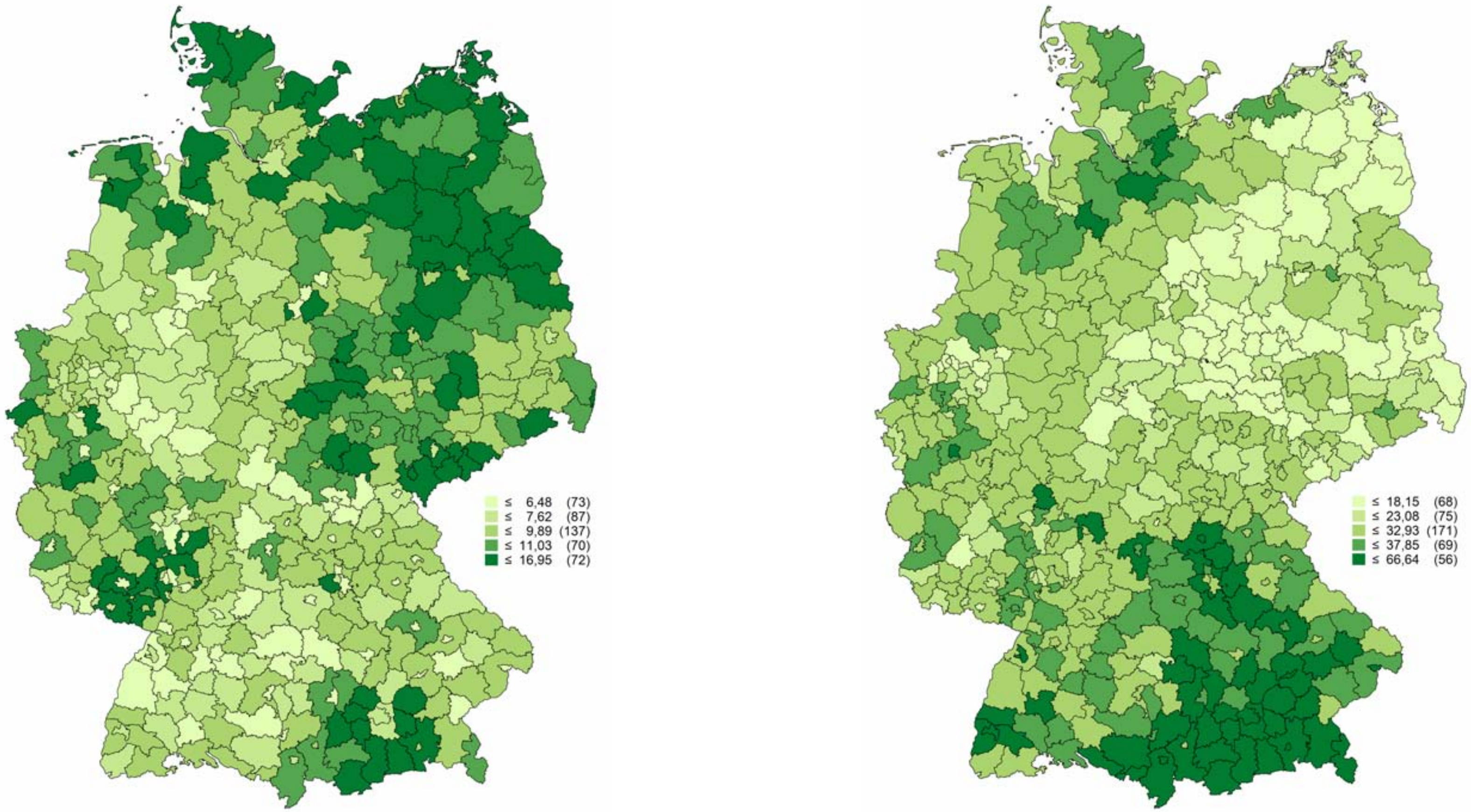
where $w_{i,j}$ denotes the i,j-element of a row-normalised contiguity matrix[11]. The MI for both start-up rates are highly significant. However, start-up activity out of unemployment has much higher values, i.e. the spatial correlation is lower for start-up rates out of employment. All in all, the descriptive analysis suggests considering spatial dependence in our econometric models. Neglecting these spatial dependencies in the data could lead to biased coefficients and hence a misinterpretation of results.

Table 1: Descriptive statistics of the local start-up rates by year

variable	year	mean	std.-dev.	min	max	Moran I
start-up rate out of employment	1999	10.939	3.261	2.760	21.376	0.412***
	2000	9.079	2.203	3.110	16.669	0.195***
	2001	8.028	2.052	2.579	15.980	0.195***
	2002	8.217	2.076	3.159	15.756	0.208***
	2003	7.755	1.986	2.538	14.483	0.199***
	2004	7.789	1.984	2.238	13.893	0.206***
start-up rate out of unemployment	1999	22.628	7.517	1.307	49.558	0.516***
	2000	25.982	9.672	3.957	89.052	0.451***
	2001	27.097	9.266	8.155	59.994	0.572***
	2002	32.682	12.180	2.102	79.905	0.621***
	2003	38.520	15.120	9.610	100.796	0.668***
	2004	47.260	19.909	9.882	126.570	0.689***

[11] $w_{i,j}$ takes the value 1 if region i and region j share a common border, otherwise it is 0.

Figure 2: Average start-up rates out of employment and unemployment (1999 – 2004)



Start-up rate out of employment (# per thousands)

Start-up rate out of unemployment (# per thousands)

5 Econometric design

The incorporation of spatial autocorrelated processes in the empirical model seems adequate in order to consider the spatial pattern of the data. Neither a spatially lagged dependent variable nor a spatially lagged error can be excluded a priori. Additionally some spatially lagged explanatory variables may be used, e.g. to consider agglomeration effects in more detail. Furthermore, with the panel data we are able to account for the unobserved time-constant heterogeneity of the regions. Hence, the empirical model can be formulated as Spatial Autoregression with Spatially Autocorrelated Residuals (SARAR) model

$$
\begin{aligned}
y_{i,t} &= \rho W_{N i,.} y_{.,t} + X_{i,t}\beta + u_{i,t} \qquad (9)\\
u_{i,t} &= \lambda M_N u_{.,t} + \varepsilon_{i,t}\\
\varepsilon_{i,t} &= \mu_i + \nu_{i,t}
\end{aligned}
$$

where W_N and M_N denote spatial connectivity matrices ($W_{N i,.}$ is row i of the matrix), $y_{i,t}$ is the dependent variable in region i at time t, $X_{i,t}$ is the row vector of exogenous variables[12] and $u_{i,t}$ is the spatially autocorrelated error term. The time-constant error component μ_i and the time-varying error component $\nu_{i,t}$ are assumed to be i.i.d. with zero mean, variance $\sigma^2_\mu, \sigma^2_\nu$ and finite forth moments, and to be orthogonal to each other. β, ρ, λ are the parameter vectors to be estimated.

To identify the model in equation (9), we apply estimations in the line of Kelejian/Prucha (1998) and Kapoor/Kelejian/Prucha (2007). The first paper develops a generalized method of moments procedure that allows to estimate a model containing both a spatially lagged dependent variable and a spatial error. The latter study extends the former cross-section moment conditions for an application to panel data.

In the first step, the equation is estimated by IV using those spatial lags of the exogenous variables $(I_T \otimes W_N)X$ as instruments for the endogenous $(I_T \otimes W_N)y$ which are not directly included in the estimation.

Hence, we get consistent first step estimates $\tilde{\rho}, \tilde{\beta}$ which allow to compute unbiased errors $\tilde{u}$. Applying the procedure of Kapoor/Kelejian/Prucha (2007) on $\tilde{u}$ and weighting the six moment conditions with matrix $\hat{\Xi}$ proposed in their paper, we estimate the coefficients in the spatial error process, λ, σ^2_ν and σ^2_1. Then, $\hat{\lambda}$ is used to run a Cochrane-Orcutt transformation on the variables, i.e. to compute $[y_{\hat{\lambda}}, X_{\hat{\lambda}}] = [I_T \otimes (I_N - \hat{\lambda} M_N)] \times [y, X]$. Then, we estimate the final model

$$y_{\hat{\lambda}} = \rho(I_T \otimes W_N) y_{\hat{\lambda}} + X_{\hat{\lambda}}\beta + U_{\hat{\lambda}} \qquad (10)$$

by IV using $Z_{\hat{\lambda}} = (I_T \otimes W_N) X_{\hat{\lambda}}$ as instruments. The IV estimator is calculated as a feasible generalized least squares estimator

[12] $X_{i,t}$ is allowed to contain spatial lags of other exogenous variables.

$$\hat{\beta}_{FGLS} = \left[(X'_{\hat{\lambda}}\hat{\Omega}_{\varepsilon}^{-1}Z_{\hat{\lambda}})(Z'_{\hat{\lambda}}\hat{\Omega}_{\varepsilon}^{-1}Z_{\hat{\lambda}})^{-1}(Z'_{\hat{\lambda}}\hat{\Omega}_{\varepsilon}^{-1}X_{\hat{\lambda}})\right]^{-1} \times \left[(X'_{\hat{\lambda}}\hat{\Omega}_{\varepsilon}^{-1}Z_{\hat{\lambda}})(Z'_{\hat{\lambda}}\hat{\Omega}_{\varepsilon}^{-1}Z_{\hat{\lambda}})^{-1}(Z'_{\hat{\lambda}}\hat{\Omega}_{\varepsilon}^{-1}y_{\hat{\lambda}})\right] \quad (11)$$

with $\hat{\Omega}_{\varepsilon} = E(\varepsilon\varepsilon') = \hat{\sigma}_{\mu}^2(J_T \otimes I_N) + \hat{\sigma}_{\nu}^2 I_{NT} = \hat{\sigma}_1^2 P + \hat{\sigma}_{\nu}^2 Q$, where $\sigma_1^2 = \sigma_{\nu}^2 + T\sigma_{\mu}^2$, $P = (I_T - \iota_T(\iota'_T\iota_T)^{-1}\iota'_T) \otimes I_N$, $Q = (\iota_T(\iota'_T\iota_T)^{-1}\iota'_T) \otimes I_N$ and ι_T denotes a unit vector of a length T.

Implicitly, like any other linear model, this estimator assumes that the dependent variable is defined on an unlimited domain, i.e. from $-\infty$ to $+\infty$. The start-up-rate as described in Section 4 does not fulfill the prerequisite as the rate is defined by $\breve{y} \in (0;1)$. Therefore we use a nonlinear monotonous transformation of the start-up rates for employment and unemployment, $y = -\ln(-\ln(\breve{y}))$, as dependent variable.[13]

As spatial connectivity matrices W_N as well M_N we employ a population-share-weighted, row-standardised distance-based matrix whose elements are given by

$$w_{i,j} = \frac{Pop_j e^{-0.1 d_{i,j}}}{\sum_{j=1}^{N} Pop_j e^{-0.1 d_{i,j}}} \quad (12)$$

with Pop_j as the population of region j in 1998 and $d_{i,j}$ as the physical distance between region i and region j in kilometers. This weighting scheme has been introduced by Mutl (2006) and because we use relative figures as dependent variables, it seems appropriate. German NUTS-3 regions show a high degree of variation in size which can be interpreted as dividing the whole country into heterogeneously sized parts, and because of the population weights this scheme is robust against area division and against the varying detonators in the start up rates. Geographical distances reflect economic and socio-cultural relations better than political or administrative borders which determine contiguity matrices.[14]

6 Results and discussion

As we employ a spatial econometric approach to answer our research question 'What makes start-ups out of unemployment different?' we start the discussion of the estimations with some aspects on spatial dependence. Thereafter, we turn to the empirical comparison of the entrepreneurial activity out of employment and unemployment. Hence, Table 2 reports not only the coefficient estimates of the start-up equations for the unemployed, Γ, and the employed, F, but also standard random-effects panel estimates (without spatial

[13] The logit transformation $y = \ln(\frac{\breve{y}}{1-\breve{y}})$ is more common. However, the loglog transformation has the advantage to go less fast to $-\infty$ for $\breve{y} \rightarrow 0$. For the relevant data range, it is closer to the real start-up rate than the logit, and the coefficient estimates should reflect the 'real' relationship between explanatory and dependent variable better.

[14] However, we also estimated the models with several alternative spatial connectivity schemes, and the results for other row-normalised matrices were quite similar.

autocorrelation).[15] At all, our SARAR models can explain a large part of the regional variance in the start-up activity out of employment and unemployment: the centered R^2 is 0.8 in $\digamma$ and 0.785 in Γ.

6.1 Considering spatial dependence: A matter of specification

Our formal model presented in Section 5 contains both a spatial lag of the endogenous variable as well as a spatial error. In this case, Kelejian/Robinson (1993) and Kelejian/Prucha (1998) suggest spatially lagged exogenous variables, i.e. a subset of WX, as instruments for Wy. As instrument, the spatial lag of the kth exogenous variable Wx_k has to be correlated with Wy but uncorrelated with the error term u. Hence, if we find a correlation between a candidate instrument and the error term, this hints at including this spatial lag as explanatory variable rather than as (excluded) instrument. Indeed, we find a direct impact of some spatially lagged explaining factors on the start-up rate. Whereas in Γ the spatial lag of the public sector and the probability of failure have a significant impact on the start-up rate, in $\digamma$ the share of business services, the probability of failure and ALMP are the influencing spatial exogenous variables. The share of highly skilled and the share of second labour-market schemes on total ALMP are included as instruments in both the estimations of $\digamma$ and Γ.

The estimated spatial autocorrelation coefficients $\hat{\lambda}$ and $\hat{\rho}$ differ between the two start-up rates. As the magnitude of the coefficients show, the impact of ρ is more relevant than λ in the case of the start-up activity out of unemployment. The start-up activity out of unemployment in one region is positively correlated with unemployment start-ups in close regions. The opposite can be stated for new firm formation out of employment: $\hat{\rho}$ is just weakly significant, whereas $\hat{\lambda}$ is moderately large. Interestingly, for $\digamma$ $\hat{\rho}$ decreases and looses its significance in the first-step estimation after the Cochrane-Orcutt transformation. Hence, we find the start-up activity out of unemployment to be interrelated with the start-up activity in close regions, whereas in $\digamma$ the spatial dependence arises only in the unexplained part.

Likewise, these results suggest more biased coefficients in a non-spatial estimation of Γ and more intense spatial feedback effects than in $\digamma$. Written formally, in the spatial lag model $y = [I - \rho W]^{-1}X\beta + [I - \rho W]^{-1}\varepsilon$ the coefficients β do not reflect the full impact from X on y because spatial interdependencies are at work; the overall or global ceteris-paribus effect of a change in x_k is given by $\frac{\partial y}{\partial x_k} = [I - \rho W]^{-1}\beta_k$ which is unequal β_k when $\rho \neq 0$. In contrast, in the spatial error model $y = X\beta + [I - \lambda W]^{-1}\varepsilon$ no spatial impact of $x_{k,i}$ on y_j exists and β_k is the unbiased ceteris-paribus effect. In our analyses the coefficient estimates in the spatial model for Γ differ from a standard random-effects estimation to a larger extent than in $\digamma$. As can be seen in Table 2, for seven variables a significant coefficient reverses into insignificance with opposite signs between the two estimations of Γ. For start-ups out of employment, significance and sign of just one variable change between the spatial and the random-effects model.

[15] Here we will show the estimation results of the transformed start-up rates $y = -\ln(-\ln(\breve{y}))$. The results for the 'normal' start-up rates are presented in the appendix in Table A.2.

Table 2: Estimation results

	SARAR		Random Effects	
	Γ	$\digamma$	Γ	$\digamma$
σ_ν^2	0.002	0.000	0.002	0.000
σ_1^2	0.011	0.001	0.004	0.000
λ	0.107	0.242		
spatial lag endogenous variable ρ	0.635***	0.254*		
	(5.85)	(1.94)		
share of males	0.006	-0.044	-0.175**	-0.003
	(0.09)	(-1.17)	(-2.54)	(-0.09)
share of $<$ 25 years	0.095	-0.118*	0.028	-0.185***
	(0.80)	(-1.68)	(0.23)	(-2.58)
share of $>$ 45 years	-0.154**	-0.147***	-0.275***	-0.152***
	(-2.54)	(-3.14)	(-4.41)	(-3.31)
share of lowly skilled	-0.119**	-0.053	-0.269***	-0.065*
	(-2.22)	(-1.47)	(-5.20)	(-1.71)
share of highly skilled	0.706***	-0.046	0.811***	-0.106**
	(6.28)	(-1.02)	(5.91)	(-2.15)
share of foreigners	-0.423***	0.407***	-0.399***	0.464***
	(-4.98)	(5.87)	(-4.27)	(6.20)
share of Europeans	-0.204	0.133**	-0.225	0.120*
	(-1.46)	(2.30)	(-1.36)	(1.83)
log (un)employment population	-0.037***	-0.011***	-0.021***	-0.011***
	(-4.52)	(-4.01)	(-2.66)	(-3.75)
log real wages	0.257***	-0.107***	0.372***	-0.125***
	(4.10)	(-4.65)	(5.61)	(-5.66)
population density	-0.010*	-0.002	0.008	0.000
	(-1.67)	(-0.92)	(1.14)	(0.15)
log market potential	0.059***	0.023***	-0.000	0.017***
	(3.46)	(3.26)	(-0.01)	(2.82)
plant density	0.001	-0.000	0.004***	0.001***
	(0.56)	(-0.36)	(4.97)	(4.40)
share of small firms	0.278***	0.626***	0.269***	0.574***
	(4.97)	(26.77)	(4.12)	(24.62)
sectoral share Manufacturing	0.127	0.157**	0.323	0.152**
	(0.69)	(2.28)	(1.58)	(2.28)
sectoral share Construction	-0.037	0.247***	0.472*	0.354***
	(-0.15)	(2.89)	(1.89)	(4.40)
sectoral share Trade / Logistics	0.294	0.225***	0.380*	0.209***
	(1.58)	(3.24)	(1.80)	(3.05)
sectoral share Business Services	0.147	0.311***	0.259	0.320***
	(0.79)	(4.18)	(1.20)	(4.46)
sectoral share Public Sector	-0.025	0.241***	0.054	0.295***
	(-0.14)	(3.12)	(0.26)	(4.24)
probability of failure	0.008	-0.011***	0.012	-0.014***
	(1.40)	(-3.86)	(1.38)	(-5.09)
log # ALMP-participants ($\ln$ ALMP)	0.027***	0.006***	0.030***	0.006***
	(5.71)	(3.80)	(6.72)	(3.97)
share of $2nd$ labour market	-0.003	-0.001	-0.007***	-0.001
	(-1.46)	(-0.73)	(-3.21)	(-0.72)
share of short-term unemployed	0.214**	-0.063*	0.123	-0.016
	(2.07)	(-1.76)	(1.11)	(-0.49)
share of long-term unemployed	-0.202***	-0.048***	-0.505***	-0.039**
	(-2.64)	(-2.72)	(-8.34)	(-2.51)
dummy for eastern Germany	0.021	0.004	-0.029	-0.002
	(1.20)	(0.53)	(-1.52)	(-0.30)
constant	-1.289***	-1.309***	-2.476***	-1.795***
	(-3.73)	(-4.77)	(-8.65)	(-18.70)
spatial lag Business Services	0.122	0.205***	0.212**	0.217***
	(1.37)	(6.37)	(2.10)	(6.22)
spatial lag Public Sector	-0.214***	0.026	-0.489***	0.096***
	(-2.67)	(0.71)	(-5.82)	(3.30)
spatial lag probability of failure	0.045***	-0.047***	0.039**	-0.062***
	(2.76)	(-3.98)	(2.43)	(-12.28)
spatial lag $\ln$ ALMP	0.003	0.006***	0.006	0.010***
	(0.72)	(2.88)	(1.28)	(5.88)
number of observations	2634	2634	2634	2634
R^2	0.993	0.999	0.990	0.999
Centered R^2	0.785	0.800		
Hansen J Statistics	0.030	0.370		

to be continued . . .

Table 2 continued:

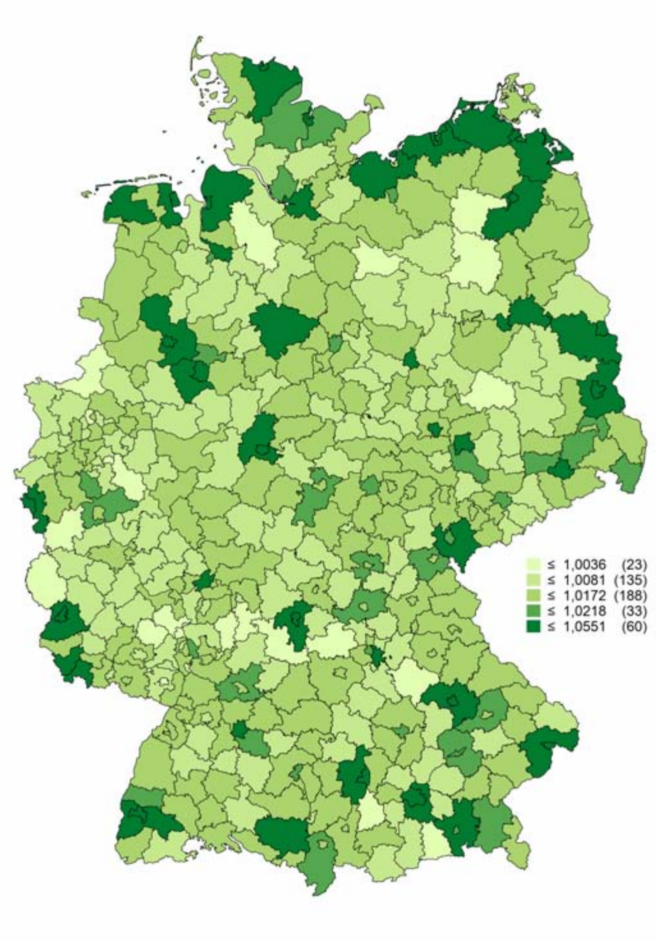
	SARAR		Random Effects	
	Γ	$\digamma$	Γ	$\digamma$
part. R^2 of excluded instruments at the first stage	0.052	0.046		

Z-values in parentheses; ***significant at the 1% level, **significant at the 5% level, *significant at the 10% level.

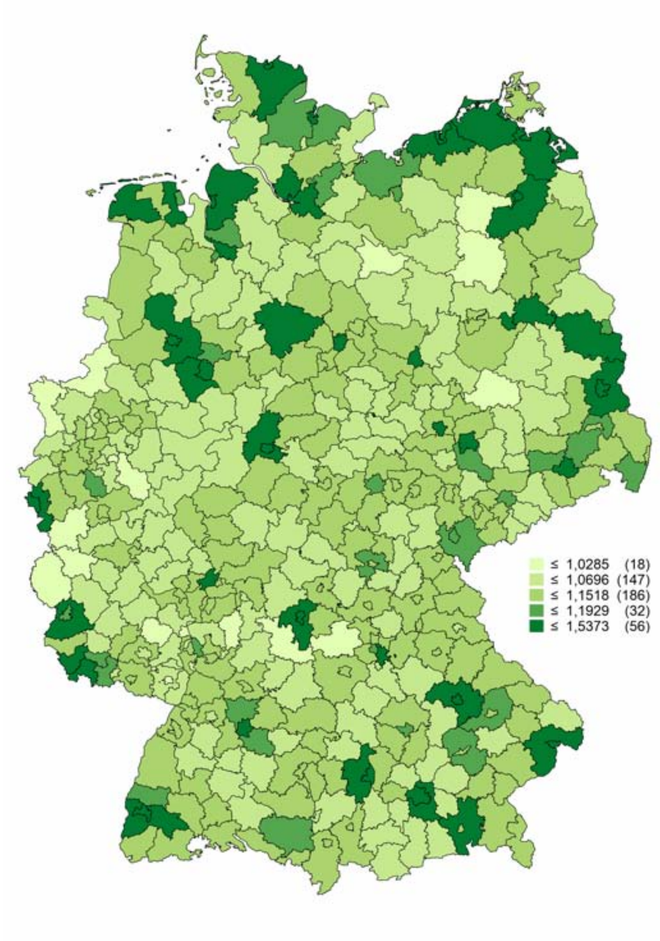
Negligence of spatial autocorrelation results in the estimation of an average partial effect which roughly equals the average global c.p. effect when considering spatial-lag dependence. The direct effect of a manipulation of variable $x_{k,i}$ in region i (on y_i) is smaller than this average effect, and the direct effect is amplified by spatial side-effects (e.g. from $x_{k,j}$ via y_j on y_i) and spatial feed-back effects (from $x_{k,i}$ via y_i to y_j and than back again to y_i). However, the amount of these spatial effects depends on the proximity between regions and on their respective population shares. Hence, the elements of the 'spatial multiplier' $(I - \rho W)^{-1}$ also vary between the regions. However, the manipulation of a variable in region i shows N (in our case 439) different effects $\frac{\partial y}{\partial x_{ki}}$, which can not be presented for all regions. Therefore, we only show the regional distribution of the spatial feed-back effects, i.e. the values of the main diagonal of the spatial multiplier, $\mathfrak{V}\left\{(I - \rho W)^{-1}\right\}$, in the following maps (Figure 3). From this, we further identify regions that are relatively autonomous, i.e. independent from other areas.

Leaving the scale aside, the spatial distribution of $\mathfrak{V}\left\{(I - \rho W)^{-1}\right\}$ looks similar between start-ups out of employment and unemployment. The magnitude, though, differs considerably: On average, spatial feedback effects are nearly ten times higher in Γ than in $\digamma$. The average spatial feedback effects in employment estimations amount to 1.3%, in unemployment estimations to 11.1%. In most German rural areas the spatial feedback effects are relatively low. They add 7.0% at maximum to the direct effect of a variable on the unemployment new firm formation. In some regions on the border to Poland, Luxembourg, Belgium or the Netherlands, in the most important metropolitan cores as well as on the coasts of the Northern and Baltic Sea the spatial feedback effects exceed 19.2%. At the borders where some of the neighbours are not included in the data we attribute this to 'edge effects'. In the coastal areas and the metropolises it could be due to a high degree of spatial autonomy because the regions are either isolated or dominant. However, a low or moderate spatial feedback effect goes along with remarkable spatial side-effects and hence it is not congruent with a low degree of spatial interdependence.

Figure 3: Elements of $\mathfrak{V}\left\{(I - \rho W)^{-1}\right\}$



Employment



Unemployment

Besides these econometric aspects, the spatial autocorrelation parameters also have economic implications. As we noted in Section 3, spatial patterns can be generated by general agglomeration effects, start-up-specific agglomeration externalities as well as by multi-regional external conditions. The higher ρ for regional start-up activity out of unemployment implies stronger effects of collocated (or closely located) new firms, relative to $\digamma$. Assuredly, the general agglomeration effects contribute little to the magnitude of the spatial endogenous effects, because we control for these (dis-)advantages by including environmental factors like population density, market potential or the share of small firms. In contrast, start-up specific agglomeration externalities – those that lower the sunk costs of starting a business, C^S – should be subsumed in the spatial-lag effect, since they are affected by the number of new firms nearby and we are not able to control for them explicitly. However, they could also be reflected by the spatial error term that is slightly larger for $\digamma$. We suppose that most of the high spatial lag coefficient is due to multi-regional policy effects and the way we measure start-ups out of unemployment: all the start-ups are recipients of a certain subsidy, Bridging Allowance, which is the major difference between $\digamma$ and Γ regarding the three mentioned sources of spatial correlation.

To sum up the preceding discussion, the effect of the spatial lag is more distinct in Γ. A non-spatial model overestimates the impact of the determinants on the start-up activity out of unemployment. In contrast, spatial correlation in the residuals is more relevant for new firm formation by former employees. Thus, in the following Section 6.2 one has to keep in mind that the discussion only refers to the direct impact of the variables, and in particular for Γ indirect spatial effects also exist.

6.2 Regional new firm formation in detail

The impact of variables describing the populations of potential founders coincides in the estimations for both the start-up rates out of unemployment and employment, with our expectations derived from the empirical evidence on the individual level. Some fundamental differences between the two employment states still exist. The largest differences between the two start-up rates $\digamma$ and Γ with regard to population-describing variables are found for the qualification levels and the shares of non-Germans. Interestingly, the start-up activity out of unemployment increases with the share of highly skilled among the unemployed. This effect may be caused by the subsidy level which is determined by the former wage level: the higher the subsidy B^s, the higher is the start-up activity out of unemployment. Due to Lazear (2005) the highly skilled could be divided into two groups, the 'specialists' and the 'generalists'. Although generalists make better entrepreneurs due to more balanced skills, they are more often confronted with unemployment than specialists who are highly productive employees regarding some special tasks. The different coefficients in Γ and $\digamma$ could then result from a kind of selection due to the different unemployment probabilities. As well, a high share of non-German employees goes along with a high start-up activity out of employment, in contrast to the negative impact of the foreign unemployed on Γ. This could emerge from the individual level: Higher fixed entry costs ($C^s - B$ in the theoretical model) due to language barriers, bureaucracy etc. may be more restrictive for the unemployed than for the employed foreigners, as the former are on average less qualified than the latter (OECD, 2008: 122-123).

On the one hand, high real wages lead to more start-ups out of unemployment, but on the other hand to a lower new firm formation rate out of employment. This result is in accordance with our theoretical model in Section3. There the wage has a clearly negative impact on the entrepreneurial part of the start-up decision ($p^s(\pi - w) - C^s$) and presumably a positive effect on the unemployment-specific part ($B^s + (p^s - p^d)(w - b)$). Hence, we find evidence the latter term, i.e. the incentive to overcome unemployment, is more relevant for start-ups out of unemployment. For employees the regional wage level corresponds to their current income. In contrast, the unemployed interpret an increase in the wage level in the sense that being employed at all becomes more valuable, no matter whether in dependent work or self-employment.

The probability of success or failure shows the expected sign (cf. Section 3) only for the start-up activity out of employment: the more establishments close in a year, the lower F. According to our theoretical model, the same effect should be found in the start-up activity out of unemployment because the probability of success in self-employment is included positively in both components of $\mathcal{V}_\Gamma$. However, we do not find a significant impact in the same region; for the probability of failure in nearby regions the coefficient shows a significantly positive sign, i.e. the opposite of what was suggested in Section 3. As more closures in previous periods result in a lower number of firms providing jobs, both p^s and p^d are determined by the regional business-failure rate. Hence, they are strongly positively correlated and the difference $p^s - p^d$ converges towards zero on the aggregate level, although it may be positive for the small group of unemployed entrepreneurs. Then, the business-failure rate is a relatively poor aggregation over these individuals.[16] In addition, the possibility of getting work p^d may decline faster than the probability of entrepreneurial success, leaving the aggregate value of the difference $p^s - p^d$ larger than zero.

The impact of environmental factors on the regional start-up activity is similar between Γ and F: Whereas the influence of population density and plant density is hardly existent, market potential (as a measure of centripetal agglomeration forces) and a high share of small firms (which is more typical for a rural economic structure indicating centrifugal forces) have a positive effect. The similar magnitude of the coefficients between F and Γ could hint at the impact of agglomeration externalities (due to knowledge spillovers, input sharing and labour-market pooling) on $p^s(\pi - w) - C^s$. The second part under the integral in $\mathcal{V}_\Gamma$, $B^s + (p^s - p^d)(w - b)$ – which we interpret as the value of being employed at all – should be affected only by labour-market pooling, other agglomeration externalities will play a minor role. Considered individually, sectoral shares only have a positive significant impact in F; when the sectoral shares in Γ are tested jointly, the χ^2-statistic of 22.74 (p-value 0.0004) indicates significance, too. Additionally, we find explanatory power of some spatially lagged sectoral shares. Amongst the industries, a high share of Business Services either in the own or close regions is most fostering with regard to the regional

[16] Theoretically, a better variable could be derived from aggregating Individual Treatment Effects $E_i(Y_1 - Y_0|x_i)$ to a regional Average Treatment Effect, where two different outcome variables (Self-employment, dependent employment) have to be considered. Survival in self-employment is however not reported in our data when the promotion phases out.

entrepreneurial activity in F. Realising an entrepreneurial idea strongly depends on the availability of supportive business services, e.g. advertisement, market research, cleaning companies, security or the supply of temporary workers. Unemployed founders may not be able to access business services due to possible budget constraints. A negative impact on new firm formation out of unemployment results from a large public sector nearby. This is typically related to a low private-sector activity caused by bad market conditions. Furthermore, several active labour-market programmes, e.g. job-creation schemes, are restricted to jobs in public or non-profit institutions. Otherwise, start-ups out of employment increase if the share of public sector industries is high. Presumably, the public sector works as a solid customer of the few private firms in these regions, and its guaranteed demand for products and services fosters (employment) start-ups as long as the new firms are not too small.

The log of the number of ALMP participants has a much higher impact on the start-up rate out of unemployment than on F. The coefficient indicates that a one percent increase of ALMP participants results in a disproportionately high increase of the start-up rate by 27 new firms per thousand unemployed, leaving nonlinearities aside. The 0.6 percent effect of both, a marginal increase in ALMP in the own region and its spatial lag on the start-up rate out of employment is surprising as we could not expect a certain effect of ALMP. Interestingly, the volume of artificial jobs in the second labour market has no effect on the start-up activity neither out of unemployment nor employment. Labour-market malfunctioning indeed seems to be subsumed by other variables.

When turning to unemployment duration, we find several effects. Firstly, Γ is more sensitive regarding the duration of unemployment. Secondly, the negative impact of a high share of long-term unemployed is intuitively plausible as long-term unemployment leads to a loss of entrepreneurial skills θ at individual level, hence the marginal entrepreneurial skill θ^* should be rare in regions with a high share of long-term unemployment. Thirdly, a high share of short-term unemployed is positive for start-ups out of unemployment but negative for the normal start-up activity. The negative sign for the share of short-term unemployment in F could indicate a well-performing labour market where only frictional and voluntary unemployment exists. This is conform to the push-pull-discussion: the lower the level of unemployment, the lower the perceived net benefits of self-employment and the lower the rate of new business formation (Hamilton, 1989). The significant positive impact on Γ possibly results from incentives: Nearly one third of the Bridging Allowance recipients suffered unemployment for less than three months, a shorter period than the average pre-programme duration. Hence, as unemployed entrepreneurs are supported by B^s, 'voluntary' unemployment aimed at windfall gains can not be excluded.

7 Concluding remarks

To answer the question 'What makes start-ups out of unemployment different?' we contribute threefold. Firstly, we formulate a micro-founded theoretical model for the start-up activity out of unemployment. We show that one part is fully equivalent to start-ups out of employment. The additional component is specific for unemployment, i.e. only included in the start-up activity out of unemployment. It reflects the different chances of transition into either self-employment or dependent employment. Secondly, we are the first who use a SARAR model – containing a spatially lagged endogenous variable, spatially lagged determinants and a spatially autocorrelated error – in analysing regional start-up activity. This is more precise and reliable than neglecting spatial influences or capturing spatial influences incompletely or in misspecified form. With our econometric spatial panel analysis, we thirdly shed some light on the empirical differences between start-up activities out of employment (F) and unemployment (Γ).

We indeed observe strong regional disparities between the start-up activity out of employment and unemployment. Both are spatially correlated over the German NUTS3-regions, though the spatial correlation for the start-up rate out of unemployment is higher. The typical explanatory variables in entrepreneurship studies show significant spatial correlation, too, as well as several of our additional determinants. The spatial lag of the endogenous variable is very important for start-ups out of unemployment, whereas for the employment start-up activity a spatially autocorrelated error is more relevant. Thus, the bias caused by spatial feedback effects is more distinct in Γ. In particular, for start-ups out of unemployment the impact of other variables is amplified by the presence of other new entrepreneurs, which should also be kept in mind when conducting analyses on the individual level.

We are able to ascertain the impact of determinants describing the populations of potential founders, agglomeration effects as well as the situation on the local labour market. For most of the variables the impact has the same sign and a similar magnitude between the start-up rates out of unemployment and employment. Surprisingly, start-ups out of unemployment are influenced by environmental factors to nearly the same extent as employment start-ups. Agglomeration effects in particular not only affect the spatial distribution of 'entrepreneurial' start-ups, but also the start-ups of the unemployed. The negative effect of the wage in F and its positive effect in Γ coincide with theory; they indicate that the motive of leaving unemployment plays a major role for the start-up activity of the unemployed. In contrast to our theoretical expectations and its significantly negative impact on F, we are not able to verify a negative impact of the local failure probability in Γ. Furthermore, we find a positive relation between the qualification level and the start-up activity for the unemployed , which can not be detected for F. All in all, our estimations fit well, and we are able to predict the patterns found in the data, particularly the spatial distribution of the start-up activity.

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A Appendix

Table A.1: Descriptive statistics for exogenous variables (Average from 1999 to 2004)

variable	mean	std.-dev.	min	max	Moran I
share of males (emp)	0.549	0.044	0.404	0.723	0.167***
share of $<$ 25 years (emp)	0.135	0.019	0.091	0.205	0.637***
share of $>$ 45 years (emp)	0.299	0.026	0.234	0.374	0.720***
share of lowly skilled (emp)	0.173	0.051	0.075	0.317	0.847***
share of highly skilled (emp)	0.070	0.034	0.023	0.229	0.332***
share of foreigners (emp)	0.032	0.025	0.002	0.100	0.857***
share of Europeans (emp)	0.020	0.019	0.001	0.096	0.740***
share of males (unemp)	0.536	0.043	0.431	0.653	0.651***
share of $<$ 25 years (unemp)	0.120	0.016	0.071	0.163	0.502***
share of $>$ 45 years (unemp)	0.387	0.034	0.299	0.508	0.550***
share of lowly skilled (unemp)	0.261	0.051	0.139	0.378	0.554***
share of highly skilled (unemp)	0.038	0.024	0.009	0.175	0.182***
share of foreigners (unemp)	0.081	0.062	0.004	0.283	0.651***
share of Europeans (unemp)	0.030	0.027	0.001	0.142	0.723***
employment population	62321.810	85986.490	12450.170	1101245.000	0.095***
unemployment population	9367.113	15233.400	1184.417	283265.500	0.100***
real wages	26.353	3.337	18.738	34.822	0.870***
population density	0.509	0.654	0.040	3.954	0.292***
market potential	5.494	2.811	2.260	29.362	0.344***
plant density	26.212	4.027	15.891	40.062	0.262***
share of small firms	0.317	0.073	0.092	0.500	0.087***
probability of failure	0.104	0.017	0.070	0.165	0.822***
number of ALMP	5142.901	8274.562	489.667	151429.700	0.182***
share of 2^{nd} labour market	0.073	0.087	0.002	0.342	0.892***
share of short-term unemployed	0.222	0.043	0.138	0.410	0.759***
share of long-term unemployed	0.337	0.063	0.150	0.504	0.686***
industrial share Manufacturing	0.290	0.110	0.055	0.674	0.477***
industrial share Construction	0.087	0.034	0.023	0.180	0.337***
industrial share Trade / Logistics	0.230	0.045	0.106	0.450	0.199***
industrial share Business Services	0.113	0.049	0.040	0.386	0.229***
industrial share public sector	0.263	0.069	0.087	0.490	0.287***

Table A.2: Estimation results for the non-transformed start-up rates

	SARAR		Random Effects	
	Γ	F	Γ	F
σ_ν^2	29.597	0.516	31.510	0.535
σ_1^2	129.181	2.431	56.180	1.017
λ	0.040	0.200		
spatial lag endogenous variable ρ	0.629***	0.413***		
	(4.72)	(2.69)		
share of males	-11.295	-1.145	-39.710***	1.086
	(-1.24)	(-0.69)	(-4.90)	(0.66)
share of $<$ 25 years	21.344	-7.763**	35.001**	-11.952***
	(1.33)	(-2.42)	(2.34)	(-3.55)
share of $>$ 45 years	-24.078***	-9.088***	-40.833***	-9.616***
	(-3.16)	(-4.10)	(-5.51)	(-4.43)
share of lowly skilled	-17.786***	-1.110	-37.449***	-1.497
	(-2.63)	(-0.71)	(-6.10)	(-0.85)
share of highly skilled	72.436***	1.703	85.355***	-0.804
	(5.62)	(0.88)	(5.39)	(-0.35)
share of foreigners	-57.454***	17.549***	-54.822***	21.528***
	(-6.12)	(5.81)	(-5.13)	(6.25)
share of Europeans	-8.934	5.265**	3.472	3.431
	(-0.56)	(2.25)	(0.19)	(1.14)
log (un)employment population	-4.401***	-0.409***	-1.878**	-0.479***
	(-4.05)	(-3.40)	(-2.03)	(-3.65)
log real wages	38.186***	-5.131***	55.297***	-6.405***
	(4.91)	(-4.72)	(7.23)	(-6.20)
population density	-0.333	-0.071	2.319***	0.073
	(-0.41)	(-0.75)	(2.87)	(0.70)
log market potential	4.805**	0.787***	-3.370*	0.495*
	(2.05)	(2.62)	(-1.79)	(1.78)
plant density	-0.070	-0.002	0.309***	0.067***
	(-0.62)	(-0.11)	(3.21)	(5.21)
share of small firms	28.950***	25.427***	29.025***	22.267***
	(4.53)	(23.57)	(3.88)	(20.56)
sectoral share Manufacturing	6.007	1.862	32.524	2.880
	(0.34)	(0.53)	(1.38)	(0.93)
sectoral share Construction	-16.455	6.877	46.913	14.324***
	(-0.66)	(1.58)	(1.63)	(3.81)
sectoral share Trade / Logistics	28.852	3.669	46.805*	4.423
	(1.63)	(1.04)	(1.93)	(1.39)
sectoral share Business Services	8.985	8.948**	21.592	11.376***
	(0.49)	(2.37)	(0.87)	(3.42)
sectoral share Public Sector	-10.629	3.926	3.255	8.594***
	(-0.64)	(0.97)	(0.14)	(2.65)
probability of failure	1.342*	-0.452**	1.931*	-0.739***
	(1.76)	(-2.46)	(1.86)	(-5.64)
log # ALMP-participants ($\ln$ ALMP)	3.375***	0.130*	3.461***	0.185***
	(5.90)	(1.82)	(6.39)	(2.72)
share of $2nd$ labour market	-0.383	-0.022	-0.828***	-0.020
	(-1.22)	(-0.72)	(-3.03)	(-0.58)
share of short-term unemployed	15.764	-3.270**	-16.802	-1.432
	(1.17)	(-2.04)	(-1.28)	(-0.92)
share of long-term unemployed	-29.378***	-2.340**	-75.227***	-2.952***
	(-2.62)	(-2.56)	(-10.39)	(-3.94)
dummy for eastern Germany	3.149	-0.127	-2.782	-0.350
	(1.42)	(-0.41)	(-1.24)	(-1.09)
constant	-79.531***	7.310	-104.427***	5.188
	(-2.99)	(1.60)	(-3.18)	(1.16)
spatial lag Business Services	18.832*	8.025***	26.592**	8.518***
	(1.76)	(5.97)	(2.31)	(5.28)
spatial lag Public Sector	-24.218**	0.989	-54.471***	5.409***
	(-2.36)	(0.59)	(-5.71)	(4.04)
spatial lag probability of failure	6.609***	-2.049***	8.003***	-3.351***
	(3.41)	(-3.19)	(4.09)	(-13.59)
spatial lag $\ln$ ALMP	0.114	0.313***	0.275	0.498***
	(0.24)	(3.15)	(0.48)	(6.55)
Number of observations	2634	2634	2634	2634
R^2	0.919	0.833	0.892	0.961

to be continued . . .

Table A.2 continued:

	SARAR		Random Effects	
	Γ	F	Γ	F
(Centered) R^2	0.787	0.788		
Hansen J Statistics	1.281	1.972		
part. R^2 of excluded instruments at the first stage	0.032	0.032		

Z-values in parentheses; ***significant at the 1% level, **significant at the 5% level, *significant at the 10% level.

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Imprint

IAB-Discussion Paper 4/2009

Editorial address
Institute for Employment Research
of the Federal Employment Agency
Regensburger Str. 104
D-90478 Nuremberg

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Technical completion
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