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Employment Growth Determinants in New Firms in Eastern Germany

- Based on a Combination of IAB Establishment Database and IAB Establishment Panel[1]-

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[1] The IAB Establishment Panel is financially supported by the EU Social Fund

0 Abstract

The unification of both Germanies and the introduction of the market economy in eastern Germany came as a shock to existing firms and led to an enormous boom in the establishment of new firms. The first section of this paper shows that during the period under observation (January 1991 - June 1995) the number of firms nearly doubled and in 1995, nearly 50% of all jobs were to be found in firms established after 1991. Shortly after unification, a kind of "start-window" existed during which the conditions for establishment, growth and survival of firms were extraodinarily good. The next section deals with the determinates of the growth of these newly founded firms, using data from the first wave (1996) of the IAB-Establishment Panel in eastern Germany. Most determinants have been selected on the basis of the most recent studies by Brüderl, Preisendörfer and Ziegler, (1996), and Storey, (1994). The analysis included not only company characteristics but also strategic factors such as the technological status of the company, the proportion of sales in interregional markets, and a corporate competitive strategy indicator. A comparison of these results with other studies shows that the determinants that affect employment growth in new firms in eastern German are apparently the same as in western Germany and Britain, albeit to different extents.

1 Introduction

German unification and the introduction of the market economy in the former GDR triggered a complete restructuring of corporations and an enormous boom in the establishment of new firms. Most of the larger businesses that had been founded prior to unification were being administered by the *Treuhandanstalt,* a special body charged with privatising these formerly state-owned enterprises. The majority of these enterprises usually manufactured a number of extremely diverse products or offered a broader range of services than western European companies. Before they could be privatised, they had to be subdivided into a number of smaller viable business units. The process could be graphically termed a ‘top-down reform’. In December 1994, the *Treuhandanstalt* was dissolved, bringing this restructuring of the eastern German corporate scene to an end.

However, a parallel ‘bottom-up reform’ played the greater part in the regeneration of eastern German company structures by establishing many new firms and thereby creating new jobs.

After unification, attention was initially directed to the privatisation of former state-owned enterprises (see e.g. Wahse et al, 1996). According to more recent literature, now the focus is on new establishments and their success. Some authors (see e.g. Brezinski/Fritsch 1996: pp.254) attribute the ability to breathe new life into the former GDR economy and to create jobs almost exclusively to these new firms. They base this conclusion mainly on the fact that almost all new jobs have been created by these new firms, while former *Treuhand* companies have so far shed more than three million workers and will continue to shed jobs in their new incarnation as private companies (see e.g. Wahse et al, 1996).

Rapidly expanding new firms like these are hiring, thus easing the burden on the eastern German labour market and are therefore important for labour market policy. With the help of the IAB Establishment Database it is possible to show the significance of these

new firms for the eastern German labour market (see Lehmann, 1996). However, because of the absence of relevant additional economic ans business data on firm level in this dataset, it was not possible to investigate the economic reasons of the indeed fairly diffrent employment trends in individaul firms. The IAB Establishment Panel First Wave for eastern Germany appeared in December 1996. A connection of this establishment survey and the IAB Establishment Database reveals the operational and economic reasons for the new firms' growth. This research profits from a number of studies in this field published in recent years (e.g. Hinz/Wilsdorf/Ziegler, 1997; Barkham et al., 1996; Brüderl/Preisendörfer/Ziegler 1996; Storey 1994).

This paper is structured as follows: Chapter 2 describes the development of new firms in eastern Germany chronologically. Chapter 3 discusses the determinants driving the growth of new firms. These are subsequently tested in an econometric model of the growth of new eastern German firms (Chapter 4). Chapter 5 summarises the most important results.

2 New Business Growth in Eastern Germany

2.1 The IAB Establishment Database

The IAB Establishment Database is derived from German Federal Labour Office (*Bundesanstalt für Arbeit, BA*) employment statistics. These employment statistics are based on the total number of workers liable to pay social security contributions on file on certain given reference dates. These figures are essentially based on employers' notifications to the social security funds of new employees, out-going employees and end-of-year totals. Because the periods during which an individual holds employment are important for any future payments of benefits by the funds, the figures for the number of workers employed at a given point in time are very reliable. All worker employment notifications are compiled under a business number assigned by the Labour Offices - this data appears as a file listing all participating enterprises together with the exact number of employees on any given reference date. Since by definition only those enterprises are included which provided information about their employees liable to pay social security contributions on one of the reference dates, fewer firms are included than actually exist. The misrepresentation of the number of enterprises and/or the number of workers is particularly pronounced in sectors incorporating a large number of civil servants (public services, railways, postal service) or family helpers (agriculture). For this reason these sectors have been excluded from the survey.

The IAB Establishment Database does not include any historical data to reflect types of business (i.e. already existing firm/ new firm/ hive-off). In order to understand the big picture, a number of assumptions are necessary; these can then be applied to classify the firms, if approximately, into four categories according to their profile.

The first two categories include companies which had provided totals of employees liable to make social security contributions by January 1, 1991 when notification became mandatory in the former GDR. These are referred to in this paper as incumbent firms. However, because many firms had already been established in 1990 and some small businesses existed in the GDR even before unification, it is a good idea to subdivide these firms according to size as determined by the number of employees liable to make social security contributions on 1 January 1991. Most firms established in 1990 and the

private companies that existed in former east Germany must have been quite small at that time; the limit has been defined at 20 employees maximum. Any larger incumbent firms were probably former state-owned companies.

Unlike incumbent firms, new firms have only been providing employee information since 1 January 1991. As with incumbent firms, it makes sense to establish two categories according to the number of workers employed on the first reference date. This makes it possible to distinguish approximately firms that have just been established from hive-offs or new branches.[2]

2.2 Employment Trends in Eastern German Firms

Starting from these assumptions, it is possible to describe employment trends in all firms after January 1991. Figure 1 shows the number of all firms in each of the four categories derived from the IAB EstablishmentDatabase from January 1991 to June 1995.

The number of firms in the sectors surveyed almost doubled in the period under review (January 1991: approximately 178.000; June 1995: 353.000). Most of this increase is attributable to the smaller newly founded firms. By mid-1995 they accounted for nearly 30% of total employment and had become just as significant for the labour market in the former GDR (see Figure 2) as larger, incumbent firms. In mid-1995, a good 50% of the workforce was still working for incumbent firms (small & large). Almost half worked in the new firms (‘bottom-up reform’). The proportion of new firms expanded so rapidly because on the on hand many new firms were being established (see Table 1) and successfully surviving, and on the other hand because there were so many lay-offs by former state-owned enterprises (see e.g. Wahse et al, 1996).

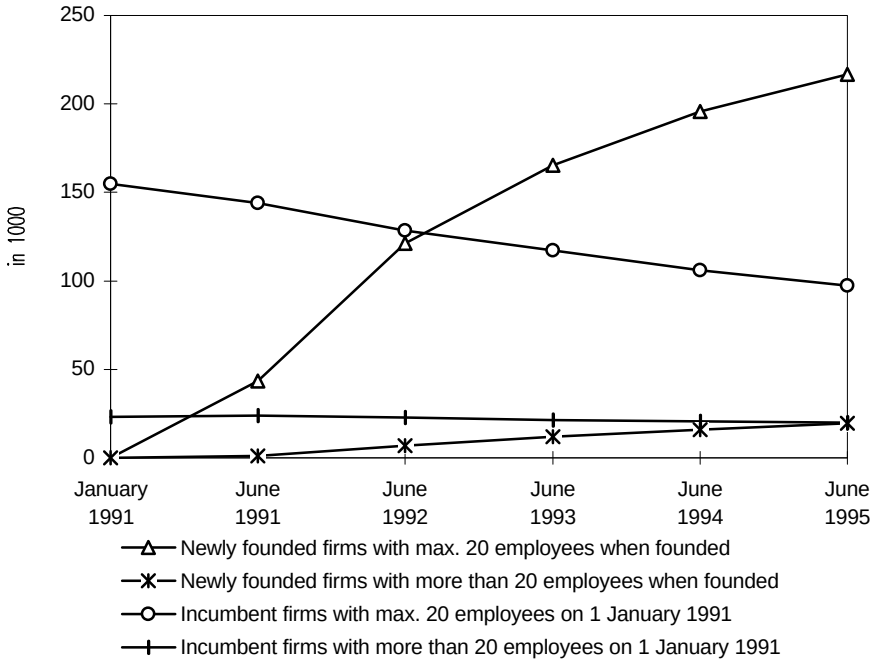
Table 1 shows the number of newly founded firms per 1,000 employees liable to pay social security contributions in 1991. Although the rate of establishment of new firms in eastern Germany is declining during the period under review, it is still significantly higher even in the last twelve month period (1994/95) than the western German average throughout the entire period. It comes as no surprise that many more firms were established in the services sector than in manufacturing[3].

The construction industry was enjoying a boom during the period studied: many new businesses were established and the trend persists throughout the entire period under review. Although it is not the intention of this paper to consider western German conditions as being virtual ‘benchmarks’ for eastern Germany (see Lutz, 1996: 1-3), it is nevertheless interesting to see that in eastern Germany at the beginning of the period under review, 2.7 times more firms were established per 1,000 workers than the western German average. As many as 3.6 times more firms were created in the capital goods sector. More recently, manufacturing and service sectors have been almost on a par: only the construction industry still has a significantly higher rate.

[2] A comparison with data on the firms’ history from the IAB Establishment Panel showed that more than 90% of the companies that were defined as long-established firms in this way, actually were former GDR companies. The proportion of new firms is about 75%.

[3] In this paper, when the manufacturing industry is referred to, it always excludes construction.

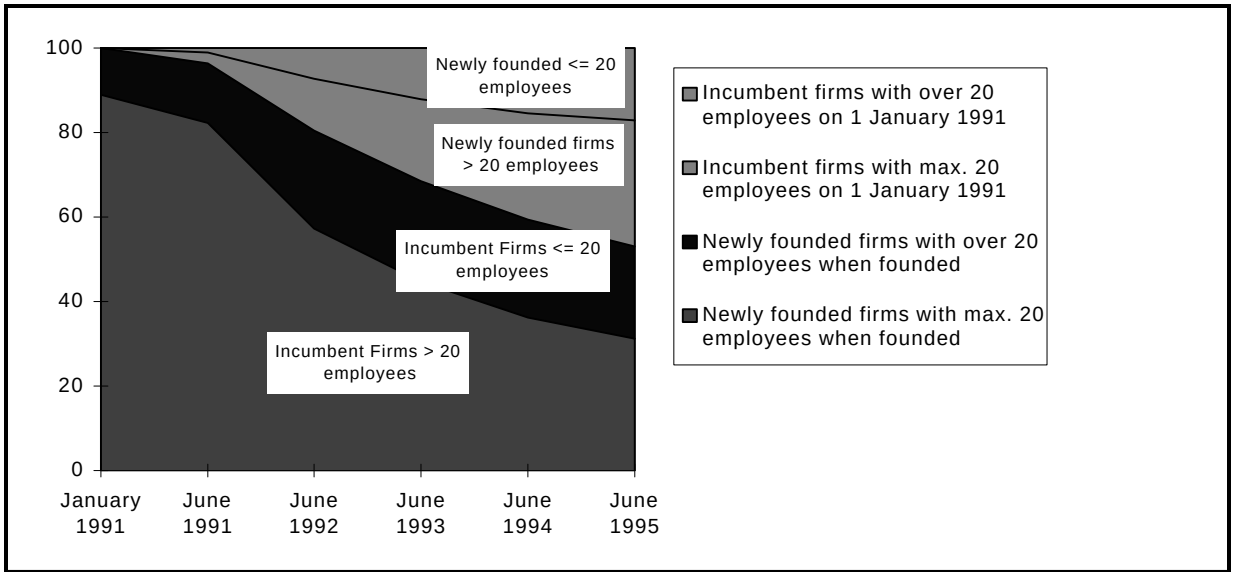
Figure 1 Number of Incumbent Firms, New Firms and Hive-Offs in Eastern Germany 1991-1995



Source: IAB Establishment Database

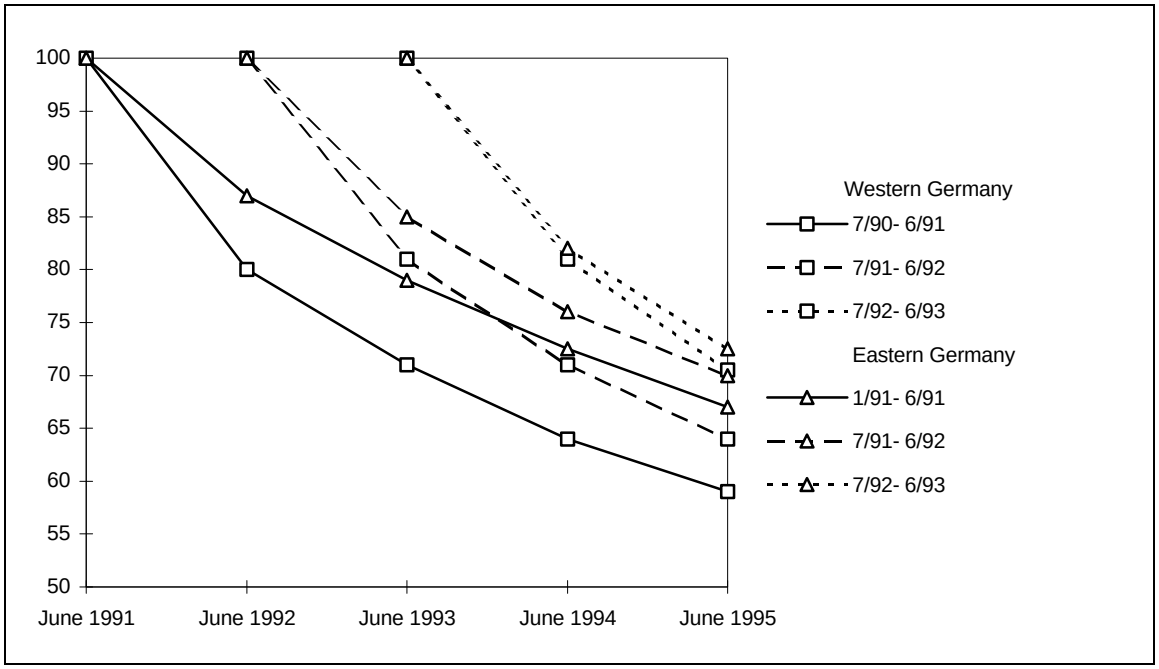
The success of the new firms can be measured by their rate of survival and growth (i.e. employment growth). It would be desirable in both cases to have firms under observation for as long as possible. Obviously no long term figures are available for eastern Germany: the figures that go back the furthest are for firms established in the first six months of 1991. In order to obtain results that are meaningful and given the length of the observation period, this paper will take into consideration only those new firms established prior to 1 July, 1993.

Figure 2 Percentages of Employment Provided by Incumbent Firms and by Newly Founded Firms in Eastern Germany 1991-1995



Source: IAB Establishment Database

Figure 3 Comparison of Survival Rates of Cohorts of Newly Founded Firms in Eastern and Western Germany



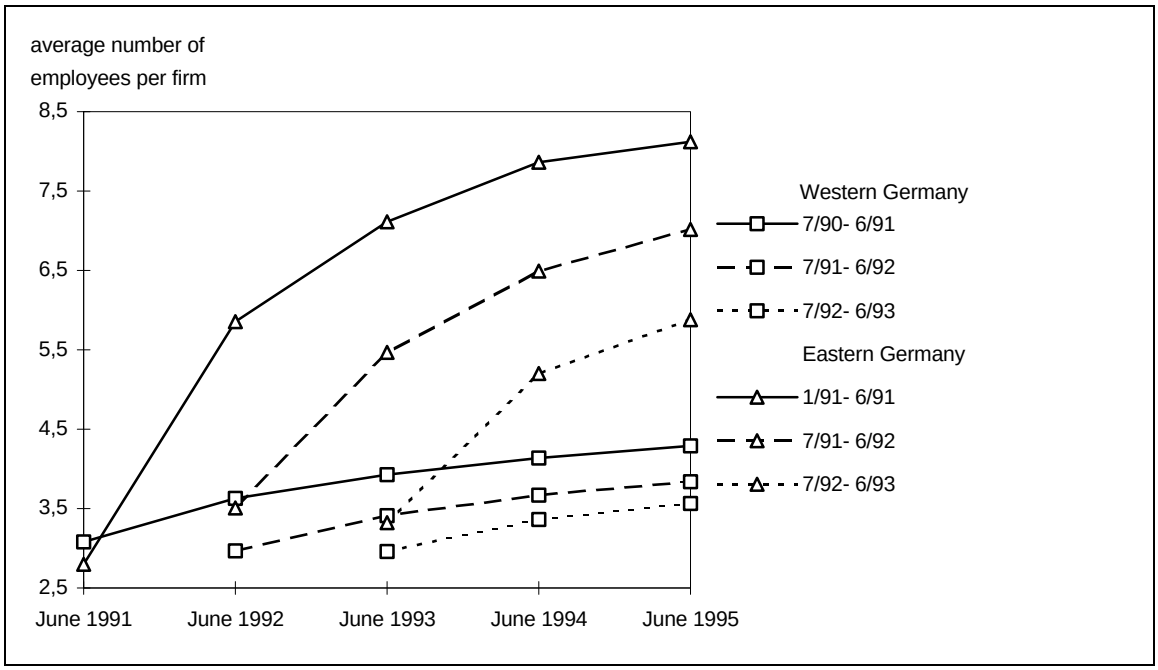
Source: IAB Establishment Database

Figure 3 compares the survival rates of three cohorts of new firms[4] with the corresponding western German cohorts. In all eastern German cohorts, the survival rates are higher than they are for western German cohorts. This is especially true for those firms established at the beginning of the period under study, while differences in the third cohort are less pronounced. Thus it seems that prospects for survival were especially positive shortly after unification. Of the oldest cohorts (1990/91), almost 70% were still in business and providing employment four years later in eastern Germany compared to 60% in western Germany.

The differences between the average growth rates in the work forces employed by these new firms in eastern and western Germany are even more pronounced (see Figure 4). New eastern German firms have grown much more than their western counterparts. The average company size for the oldest new firm cohort increased from just 3 to about 8 workers (in the FRG firms increased on average from 3 to 4 workers). We can see the cohort effect here: the earlier a firm was established, the stronger its growth. However, by June 1995, in eastern Germany even the firms in the third cohort were about 1.6 times bigger than their western counterparts, although there had only been a minor difference in size at the time of establishment.

[4] The first cohort includes firms formed between 1 July 1990 and 30 June 1991; the second and the third cohorts refer to the periods 1 July 1991 to 30 June 1992, and 1 July 1992 to 30 June 1993 respectively.

Figure 4 Comparison of the Development of Average Size of Cohorts of Newly Founded Firms in Eastern and Western Germany



Source: IAB Establishment Database

Table 2 Average Number of Persons Employed in Firms Founded in 1990/91*

	June 1991		June 1995		Growth factors	
					Quotients of columns:	
	(1)	(2)	(3)	(4)	(3) / (1)	(4) / (2)
	East	West	East	West	East	West
Industry	3.5	3.7	11.2	5.2	3.2	1.4
Construction	3.4	3.8	15.0	5.7	4.4	1.5
Commerce	3.1	3.0	6.7	4.0	2.1	1.3
Transport / Communication	2.2	3.0	7.4	4.4	3.4	1.5
Finance / Insurance	2.0	2.0	6.9	2.9	3.5	1.4
Consumer Services	2.2	2.6	4.5	3.4	2.1	1.3
Business Services	2.3	2.8	9.6	4.5	4.1	1.6
Total	2.8	3.1	8.1	4.3	2.9	1.4

* Eastern Germany 1/91 - 6/91
Western Germany 7/90 - 6/91

Source: IAB Establishment Database

As Table 2 shows, new firms in the manufacturing sector experienced stronger growth than those in services, as was to be expected. Individual sectors differ more in eastern Germany than in western Germany; this is also reflected in the broad range of growth factors which allows for the different sizes at the time of establishment in the various sectors.

It appears that the difference between new firms' employment growth in the territory of the former GDR and FRG is still more pronounced than between their survival rates[5]. After unification there must have been a relatively short period when conditions for new firms were particularly favourable and which positively affected their prospects for survival and growth. Semlinger (1997) says that for a short period after unification there was an exceptionally positive 'start-up window' for new firms. One explanation might be that these firms initially encountered a wide open market where they were able to establish themselves quickly. Subsequent new firm cohorts did not enjoy the same advantage; just like their western German counterparts, they had to compete against existing firms. In addition, the economic climate for the more recent cohorts deteriorated, which was also detrimental for these new firms' survival and employment growth. Many new firms were founded after unification which explains why the stock of companies in the eastern states of Germany is now very young and on average much smaller than in western Germany (see Lehmann, 1996). Therefore it could be assumed that the thorough restructuring process that the east German company scene has been through is almost complete. As Semlinger (1997) puts it, 'the contribution the small business sector can make to the economic reconstruction of eastern Germany will depend less on the future dynamics of the establishment of new firms than on the ability of existing new firms to grow'. This will in turn largely depend on the overall economic situation that these new firms encounter. Given the right circumstances, young firms in particular have huge potential for development.

3 Employment Growth Determinants in New Eastern German Firms

3.1 The IAB Establishment Panel

It has been possible to follow the development of companies in eastern Germany since 1990 using the IAB Establishment Database. It has been particularly useful for tracking the significance of new firms for the labour. However, the IAB Establishment Panel must be used as additional source of data to complete an employment growth determinant analysis, because the Establishment Database does not include any original data on company business development. Since only one wave of the IAB Establishment Panel is available for eastern Germany for 1996, i.e. as a cross section, a combined dataset ofboth IAB Establishment Database and IAB Establishment Panel are needed for any employment growth analysis.

The IAB Establishment Panel surveys the same establishments every year taken from all branches of industry and different size categories. In western Germany this survey has been conducted on a regular basis since 1993. In 1996 a representative sample of establishments in eastern Germany was surveyed for the first time.

The IAB Establishment Panel is a random sample from the IAB Establishment Database according to the principle of optimum stratification[6]. The stratification cells are defined

[5] It must be pointed out that this difference might be slightly exaggerated in the case of the first cohort, especially the difference in survival rate. The IAB Establishment Panel indicates that this corhort includes a relatively large number of companies that are not new firms at all but smaller long-established firms (hive-offs, private GDR firms).

[6] This procedure allocates the sample proportionally to variance. The resulting sample approximately corresponds to a sample drawn in proportion to employment. (see Pfanzagl, 1978, pp.162)

by ten classes for the size of the establishment and by 16 economic sectors. This selection process means that the selection probability of an establishmentincreases with its size. Any projections required are based on the Establishment Database as well (see Bellmann,1996).

Data on 4313 enterprises in eastern Germany may be used. The density of coverage is much higher than in western Germany, which means that it is also feasible to conduct studies at state level for eastern Germany.

With the exception of a few additional questions for eastern Germany, the questionnaires are identical for all enterprises. It includes questions on the development of employment, business policy and business development, the level of the technology used, and specifically for eastern German enterprises, the date of establishment and questions on the legal form and ownership of the company.

3.2 Survey of New Firms in Eastern Germany

Combining the two data sources for eastern Germany reveals how the employment situation in the new firms included in the panel has changed. It is then possible to analyse the economic factors behind these changes. Looking at the Establishment Database and the IAB Establishment Panel together helps to identify new firms much more precisely, thanks to the data from the questionnaires. This means that the assumptions described above have been superseded.

The enterprises in the new *Laender* were not only asked for their date of establishment, but also whether they were genuinely new businesses. This made it possible to distinguish relatively accurately new firms/new businesses from other types of establishments (like hive-offs). Businesses were also asked to state whether they were an independent establishmentor not.

For a new firm to be included in the sample, it had to have fewer than 50 employees on the first sampling date after establishment (30 June following the date of establishment) and fewer than 250 employees subject to social security contributions on 30 June, 1996 (reference date for the IAB Establishment Panel questions). Although this might seem rather big for a newly formed business, the questionnaire explicitly asked if the establishment were genuinely new; in any case, in our view, a larger firm can be a genuinely new business too (e.g. an independent authorised garage, or a franchise establishment). This is why larger new firms were also included in the analysis. Maximum limits were defined to make sure that very large new branch operations were excluded from the analysis.[7] Moreover, no new firms in the agricultural or public sector were included.

Since any analysis of employment growth only makes sense for firms which have already survived for a certain period (in this case three years minimum[8]), only those firms which were established prior to 30 June, 1993 were included. The first cohort is comprised of

[7] Growth factors differ drastically as a function of size. "The differences in the administrative structure of very small and very large firms are so great that in many ways it is hard to see that the two species are of the same genus. ... we cannot define a caterpillar and then use the same definition for a butterfly." (Penrose, 1959, p.19).

[8] As shown in chapter 2.2 the new firms' average growth dropped already considerably in the third year after formation.

314 firms established between 1 July 1990 and 30 June 1991. The second cohort is comprised of 201 firms established between 1 July 1991 and 30 June 1992, and the third cohort includes 125 firms established between 1 July 1992 and 30 June 1993. This gives a total of 640 firms for the analysis.[9]

The variable under analysis was the companies' employment growth. It was calculated by establishing the difference between the logarithm of the firm size on 30 June 1996 as stated by the company in the questionnaire and the logarithm of the firm size according to the IAB Establishment Database at the time of establishment for each of the three new establishmentcohorts.

3.3 Determinants

A number of relevant studies have investigated determinants affecting employment growth in new firms. In Germany the most comprehensive study to date was probably the *Münchener Gründerstudie* (The Munich New Establishment Study); Brüderl, Preisendörfer and Ziegler analysed the outcome of this study in detail in 1996. The Leipzig New EstablishmentSurvey builds on the experience of the Munich study (see e.g. Hinz, Wilsdorf, Ziegler, 1997) and provides results specifically on employment trends in new eastern German firms. In the UK, the most significant representative study is by Storey (1994). He summarises the results of a broad-based research programme on UK and Northern Irish SMEs. Recently a study was published by Barkham et al (1996) focusing on small firm growth determinants.

Brüderl, Preisendörfer and Ziegler agree with Storey that there are three categories of determinants that affect the growth of small firms and therefore the growth of new firms. The first category of factors relates to the person who founded the enterprise: his/her professional qualifications, family history, knowledge of the industry, etc. The second set of factors have to do with the organisation and characteristics of the organisation or firm itself, e.g. the branch of industry or the legal form. The third category relates to strategic factors such as dependence on exports or technological standards, the competitive situation of the firm, or public subsidies. The majority of the employment growth determinants examined below are drawn from this theoretical classification. The variables relating to the founder's background cannot be considered however, because the only establishmentdata available comes from the IAB Establishment Panel which is not specifically intended to be a survey of new firms. Table 3 shows the variables used and their function. Annex 1 summarises the means and variances of selected company growth determinants for the sample and the projections.

The IAB Establishment Panel includes the industrial sector, the legal form, firm size at the time of formation - expressed as firm size when first included in the Establishment Database - and ownership data from the company characteristics category. The reason for specifying the branch of industry the firm belongs to is that it helps explain the different market conditions that the new firms have had to cope with. For example, in the construction industry, publicly subsidised investment created a special boom which promoted more favourable growth conditions for firms in the sector than normally prevailed.

[9] The relatively small number of new firms results from the disproportionality of the IAB Establishment Panel sample, because the Panel selection probability for small businesses compared to larger ones is very low.

The IAB Establishment Panel also includes the companies' legal form. British empirical studies show that incorporated firms seem to grow faster than sole proprietorships or unincorporated firms (partnerships). About half of the new firms in the sample are sole proprietorship/unincorporated firms and half incorporated firms (generally in the form of a *GmbH* - i.e. limited liability incorporated company).

The size of the firm at the time of formation is also considered to be a major growth determinant. It can generally be assumed that smaller firms grow faster than larger ones. This is usually explained by the need for an establishmentto establish a minimum optimal firm size.

Because of the special situation in former east Germany, ownership data are included as well. This variable indicates whether majority ownership of a firm is in the hands of eastern German or west Germans. About 80% of the surveyed firms are owned by a majority of eastern German owners. There is reason to believe that firms with west German majority ownership have more funds. These firms also have greater access to know-how from the west which explains why they tend to succeed more frequently.

Regional location is another factor that influences a firm's operational environment. Two variables were built into study to reflect this: firstly, the number of employed persons at their place of residence in 1993, and secondly, a dummy variable which has the value '1' where an establishmentis located in a district bordering onto one of the old *Laender*. A positive relationship between employment growth and employment density indicates that firms in conurbations enjoy stronger growth, while conversely, a negative relationship indicates that firms located in peripheral regions or in rural areas show stronger growth. The dummy location variable was included to test whether companies in a region that borders onto an old *Land* benefit from that proximity in any way.

Most of the company characteristics that are theoretically relevant can be captured with the existing variables. However, the **strategic factors** category is relatively comprehensive and not all factors can be included in the analysis.

One of these strategic factors is a variable that describes the technological status of a company. Several empirical studies (e.g. Phillips, Kirchhoff, 1989 - on the USA) indicate that firms with better technology also grow faster. Good technological resources may generally serve as an indicator of a more successful corporate strategy and therefore stronger growth. However, it should be borne in mind that empirical studies measure technological status in very different ways and that it is not of equal importance to different industries (e.g. high-tech versus services). To represent the technological input to operational performance, the IAB Establishment Panel uses a variable for 'technological status' that is defined in broad terms. Companies are asked to assess their own technological status compared to other firms in the same industry on a five point scale from 1 = 'state-of-the-art', to 5 = 'completely outdated'. The model then distinguishes only two types for analytical purposes, i.e. whether the firm considers its technological status to be state-of-the-art or almost state-of-the-art relative to the remainder of the industry or not. More than 70% of the companies surveyed say that they work with state-of the-art or new technology.

Table 3 Employment Growth Determinants

Determinant	Type of variable	Expected relationship
1. Company characteristics/corporate environment		
Industry	1: Energy and mining 2: Manufacturing 3: Construction 4: Commerce (Reference group) 5: Transportation and banking 6: Business services 7: Private services	Positive effect, because trade was the reference group
Legal form	1: Sole proprietorships and partnerships (unincorp. companies = reference group) 2: *GmbH* (limited liability company) or other legal form	Stronger growth for *GmbH* than for sole proprietorships and partnerships
Firm's size at formation	(logarithmic) number of employees at the time of survey	Negative relationship
Common border with old *Laender*	1: in case of common border	Positive effect due to small-scale geographic shifts
Employed persons at place of residence in 1993	(logarithmic)	Two alternatives feasible: positive effect in case of stronger growth in centres, negative effect in case of stronger growth on periphery or in rural areas
Ownership (Majority holding)	1: eastern German ownership (reference group) 2: western German or non-German ownership 3: no majority interests, or not known	Positive effect of western German capital
2. Strategic factors		
Technological status	1, if state-of-the-art or new technology compared to other firms in the same industry	Positive effect
Weight of sales to old Laender or abroad	1, if some sales go outside new *Laender*	Positive effect
Corporate competitive strategy	Number of measures cited/ corporate policy objectives	Positive effect
3. Additional control variables		
Cohort marker	1: company formed between 1 July, 1990 and 30 June, 1991 2: company formed between 1 July, 1991 and 30 June, 1992 3: company formed between 1 July, 1992 and 30 June, 1993	Negative relationship, because conditions for growth are poorer for more recent cohorts
Age at the time of the survey	Number of months elapsed between establishment as stated in the company questionnaire and inclusion in the Establishment Database (max. 12)	Negative, because growth data are only fully captured if measured soon after foundation

Although most small firms do not export and are active only on the domestic market, it seems reasonable to include in the analysis a factor describing the sales markets. It may be assumed that firms which are exporting are ready and able to face stronger competitive pressure in international markets. This may also indicate that the firm is more successful and growing faster. A broad definition of this determinant may also be useful in view of the peculiarities of the eastern German market. Exports are therefore not only defined as the proportion of sales made abroad, which they are in the strict sense of the term, but also as sales 'exported' to the old *Laender*. The only distinction that is made, however, is where more than 5% of a company's sales leave Germany or go to the old *Laender*.

According to Smallborne, Leigh and North (1993), a small company's ability to adapt to changing market conditions has a major impact on its growth. Firms that can adapt are in a better position to respond to changes and crises, and thus ensure their survival and growth. The 'corporate competitive strategy' variable is built into the analysis to indicate flexibility and ability to adapt. Businesses are asked: 'Which corporate policy objectives are most important to you at the moment?'. Respondents had to choose between seven corporate policy objectives, e.g. 'improving the quality of services or products'.[10] The number of objectives selected (a maximum of seven) is considered be the indicator of a company's flexibility, or its effort to adapt to changes and thus to upgrade its competitiveness. Consequently, a positive relationship between the indicator for corporate competitive strategy and growth in employment might be expected.

In addition to the employment growth determinants described above, there are two **control variables** in the survey: one is a cohort marker, and the other is the real age when they were first included into the IAB Establishment Database. The number of cases in the different cohorts is relatively low so that only a joint assessment for all three of the cohorts is possible: the cohort marker is meant to control any potential cohort effect.

Establishment Database data is entered against specific reference dates; this means that the size of a firm at the time of its first inclusion in the Establishment Database is not necessarily identical to its size at establishment, especially if the firm were formed shortly after one reference date and has been operational for almost twelve months already. In order to allow for this imprecision in data acquisition in the analysis, the number of months elapsed between Establishment Panel date of establishment and first inclusion in the Establishment Database is also recorded.

4 Impact of Employment Growth Determinants

An unweighted multiple regression model was estimated to analyse the employment growth determinants in new firms in eastern Germany.[11] The results of this unweighted

[10] The other objectives or options were: 'Improvement of the services/products offered, improvement of customer service, more PR/advertising/marketing, technological upgrading of the company, starting or expanding research and development, improving human resource qualifications and higher productivity'.

[11] A Breusch-Pagan test for homoskedacity (see Greene, 1993, pp. 394) showed that the residuals might be heteroskedastic. This is why a weighted regression model was also estimated. The results of both regression models largely coincide, therefore the weighted results need not be presented. Certainly one reason for the residuals' heteroskedacity is that a complete set of factors, i.e. the data on the individual who founded the company, could not be considered in the regression model.

regression estimation are shown in Table 4. The model fits quite well with a determination coefficient of 43% and is generally highly significant. The sign of all significant variables point to results that would theoretically have been expected.

Company characteristics

The first step was to establish in which sectors the new firms were growing more strongly. Clearly, new firms in energy and mining, transportation and banking, manufacturing, construction and business services were enjoying considerably more growth than the commercial sector (reference group). These results come as no surprise, because of the publicly subsidised construction boom during the period under review and because business services hardly existed in the GDR. One explanation for the growth of new firms in energy/mining might be the larger minimum optimal company sizes required in this sector. Employment growth in private services does not significantly differ from growth in the commercial sector.

In contrast to the study by Hinz, Wilsdorf and Ziegler, (1997), the 'ownership' variable proves significant in the model estimated here. New firms with western German majority ownership grow faster than new firms under eastern German ownership. The 'no majority holding' category with positive signs is also estimated to be significant. This type of ownership involves several investment sources - which usually means that several persons founded the firm together. This result is not surprising, because it is already known that firms established by several persons are more successful than those started up by one person alone. Other studies also confirm that there is a positive correlation between the number of founders and corporate success. This paper once again shows what has been demonstrated in many other studies (see e.g.. Brüderl, Preisendörfer and Ziegler, 1996): incorporated companies grow more than unincorporated ones. This suggests that individuals who know they want to expand right from the start prefer to establish corporate companies. Thus, there will be more firms with several founders that are incorporated, which, it is worth repeating, may be viewed as an additional growth determinant.

The only corporate characteristics category variable that is not significant is the location variable (where an establishmentis in a region close to one of the old *Laender*). This means that a common 'border' with one of the old Federal *Laender* apparently does not affect a new firm's growth. This finding is supported by other studies (see Steil, F., 1996; Blien and Hirschenauer, 1994; Lehmann, 1994). It can therefore be inferred that there was apparently no special advantage enjoyed by new firms established close to where the old border used to be.

However, the second location criterion - population density - proves to be significant and negative. That is to say that new firms on the edges of urban areas or in rural areas grow better than new businesses in urban areas. This contradicts the results of the Leipzig study on new firms (see Hinz, Wilsdorf and Ziegler, 1997) which found that new firms established in the city of Leipzig were growing more than others in the administrative district of Leipzig further from the centre. It could be that the Leipzig region is not representative of new business growth in eastern Germany as a whole.

As was expected, the size of a company at the time of establishment has a significant, negative impact on employment growth; in other words, the size of a firm when it is established signals its own expectations of growth. However, this may also be attributed to

the fact that only survivor companies are included in the analysis[12]. It may be assumed that in the majority of cases, these new firms were bigger to begin with and thus relatively more likely to survive (see Wagner, 1994).

Table 4 Employment Growth Determinants in New Firms in Eastern Germany (OLS - estimates) 1)

Variables	Coeff.	T Score
1. Company characteristics		
Industries:		
Energy / mining	0.84	4.49 ***
Manufacturing	0.21	1.88 *
Construction	0.64	6.28 ***
Transportation/banking	0.60	3.61 ***
Consumer services	-0.07	-0.61
Business services	0.35	3.24 ***
Ownership:		
Western German majority interest	0.40	4.07 ***
No majority interest	0.28	1.76 *
Legal form:		
Incorporated company	0.69	8.69 ***
Location:		
Firm is located in a district bordering on an old *Land*	0.16	1.45
Population density (ln)	-0.04	-1.79 *
Size at start-up:		
Firm's size (ln) at time of establishment	-0.53	-16.49 ***
2. Strategic factors		
Over 5% sales outside of new *Laender*	-0.07	-0.86
New or state-of-the-art technology	0.22	3.09 ***
Upgrading of competitivity	0.08	3.92 ***
3. Control variables		
Age at time of first inclusion in survey	-0.03	-2.68 ***
2nd cohort marker	-0.01	-0.16
3rd cohort marker	-0.24	-2.78 ***
Constant	1.11	6.75 ***

significant at 90 % level, ** significant at 95 % level, *** significant at 99 % level adjusted r^2 0.43

1) Dependent variable: employm. growth in new firms before 30 June 96 (no. of employees on 30June96,(ln) - No. of employees at time of first inclusion in survey (ln))

[12] The present model only considers survivor companies that were still in business on 30 June, 1996.

Strategic factors

Three strategic variables were considered in the regression estimate: one measuring inter-regional sales, one for technology and one to indicate the corporate competition strategy.

The sales market variable does not significantly affect employment growth. It must be noted that the variable was defined very loosely to allow for the special situation of the new federal states. A firm's activities are considered to be inter-regional when more than 5% of sales go outside the new *Laender*, i.e. abroad or to the old *Laender* of the former FRG. This percentage could only be applied to the 1996 fiscal year because no other information is available. This might be the reason why this variable has no visible effect on new firm employment growth in our model. Any attempt to measure the relationship between inter-regional sales activities and growth would have required data since the year of establishment.

However, a company's technological status does positively affect its employment growth. Firms which state that their technological resources are relatively up-to-date compared to the industry average grow faster than others. Consequently, modern technology should not be considered as bad news for jobs, at least not in the case of new firms.

The indicator for a firm's corporate strategy to cope with competition is also highly significant and positive. This means the greater the effort a firm makes to improve its competitiveness, the more it will grow. This outcome also matched theoretical expectations.

Control variables

Two dummy variables were included as additional control variables, one to indicate that the firm belongs to the second or the third cohort, and a spacer variable for the period elapsed between the firm's establishment and its first inclusion in the Establishment Database. Both are technical variables which had to be included to control the effects of the common regression estimate for three cohorts and administrative shortcomings. Indeed, the firms in the third cohort (established between July 1992 and June 1993) grew to a significantly smaller extent than those in the first cohort (reference group). However, no perceivable difference in employment growth between the first and second cohorts was noted. This might be because firms show most growth in the first two years. The spacer variable also becomes highly significant and negative. The sign corresponds to theoretical expectations, since growth can only be fully recorded if it is measured as soon after the business was established as possible.

5 Summary

The IAB Establishment Database and the IAB Establishment Panel have been connected for the first time in this paper. By undertaking this exercise, it was possible to generate a sample of new firms in east Germany that could be used to conduct an econometric analysis of employment growth and its determinants.

Most determinants have been selected on the basis of the most recent studies by Brüderl, Preisendörfer and Ziegler, (1996), and Storey, (1994). The analysis included not only company characteristics but also strategic factors such as the technological status of the

company, the proportion of sales going to in interregional markets, and a corporate competitive strategy indicator. In the 'company characteristics and environment' category, all variables except one turn out to be significant and exhibit the expected sign. The only variable that is not significant is the one indicating proximity to 'the west', i.e. whether a firm is located in a region which borders onto one of the old *Laender* or not. Both strategic factors indicating the status of technology and the corporate competitive strategy are significant. Whether or not a company is selling into markets outside the new *Laender* does not significantly affect employment growth in the estimated regression model.

A comparison of these results with other studies cited above shows that the determinants that affect employment growth in new firms in eastern German are apparently the same as apply in western Germany and Britain, albeit to different extents. When comparing with new firms in the old *Laender*, however, there is a major crucial difference: the first two cohorts of new businesses in the new *Laender* enjoy a considerably higher probability of survival and stronger employment growth.

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7 Annex 1

Means and Variances of Selected Firm Growth Determinants

Type of variable	**Sample**		**Extrapolation**	
	Mean	Variance	Mean	Variance
1: Sole proprietorships and partnerships (unincorporated companies = ref. group)	0.51	0.25	0.77	0.18
2: *GmbH* or other legal form	0.49		0.23	
(Logarithmic) number of employees at the time of survey	1.40	1.47	0.71	0.69
1: Eastern German ownership (reference group)	0.80	0.16	0.90	0.90
2: Western German or non-German ownership	0.14	0.12	0.05	0.05
3: No majority interests, or not known	0.06	0.06	0.05	0.05
1: State-of-the-art or new technology compared to other firms in the same industry	0.72	0.20	0.69	0.21
2: Average or outdated technology (reference group)	0.28		0.31	
1: If some sales go outside new *Laender*	0.25	0.19	0.18	0.15
2: If no sales go outside new *Laender* (reference group)	0.75		0.82	
Improvement of competitiveness	3 (median)		3 (median)	