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Establishment survival in East and West Germany: A comparative analysis*

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Abstract: Using a large administrative dataset and methods of survival analysis, I analyze for the period 1994-2008 whether new establishments' survival chances differ between East and West Germany and whether they converged over time. I find that new establishments in East Germany had relatively good survival chances between 1994 and 1997, with no big differences between East and West Germany. In 1998 and 1999 the exit hazard increased strongly in East but not in West Germany, which is likely to be due to a change in the subsidy policy affecting East Germany. Since 2000 the difference in establishments' exit hazard between East and West Germany has become smaller and towards the end of the observation period it is not statistically significant anymore.

Zusammenfassung: Anhand umfangreicher administrativer Daten untersucht diese Studie für die Jahre 1994 bis 2008 mit Methoden der Verweildaueranalyse, ob sich die Überlebenschancen neu gegründeter Betriebe zwischen West- und Ostdeutschland unterscheiden und ob sie sich im Zeitablauf angenähert haben. Die Ergebnisse zeigen, dass Betriebe in Ostdeutschland von 1994 bis 1997 relativ gute Überlebenschancen aufweisen, die sich kaum von denen westdeutscher Betriebe unterscheiden. In den Jahren 1998 und 1999 steigt die Schließungswahrscheinlichkeit in Ostdeutschland stark an, in Westdeutschland jedoch nicht, was vermutlich auf eine Änderung der Subventionspolitik für Betriebe in Ostdeutschland zurückzuführen ist. Seit dem Jahr 2000 haben sich die Schließungswahrscheinlichkeiten von Betrieben in West- und Ostdeutschland angenähert und unterscheiden sich gegen Ende des Beobachtungszeitraums nicht mehr signifikant voneinander.

Keywords: startups, firm exits, East Germany

JEL-Classification: L2, D22, M13, P27, C41

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1. INTRODUCTION

The German reunification in 1990 and the subsequent transformation of East Germany from a state-directed to a market economy after 40 years of socialism came along with several major challenges for all parties involved – be they policy makers, firms, or employees. When opening the markets it became evident that East German firms were not competitive at all. Their capital stock was antiquated and productivity was very low. Suddenly they faced enormous competitive pressure that they were often not able to withstand. In 1990, industrial production in East Germany collapsed dramatically and many workers that were employed in formerly state-owned firms lost their jobs due to firm exits or employment reductions that were a consequence of privatization.[1] Therefore, entry and survival of new firms played an important role with respect to the economic transformation and development of East Germany. This paper thus compares the development of new establishments' survival chances in East Germany, an economy undergoing a transformation process, and West Germany, a long-established market economy.

Especially in the early years after reunification, the conditions faced by new firms in East Germany differed strongly from those in West Germany. Not least because many formerly state-owned firms had to exit the market, the number of suppliers, resp. the density, in many markets was initially quite low. In this context Carrol and Hannan (1989) argue that the density at the time of entry has persistent effects on organizations' mortality risk. One can therefore expect that the low density increased the survival chances of firms in East Germany that were founded relatively early after reunification (Fritsch 2004). Besides the low density in the early years after reunification, various subsidies were granted in order to improve the economic situation in East Germany, since economic convergence between East and West Germany was a major goal of economic policy. It can be assumed that these subsidies had substantial effects on firm survival in East Germany. Another important aspect is that the socialist regime of the former GDR systematically undermined self-employment and entrepreneurial activity, which is why self-employment rates in East Germany were much lower than in West Germany in the early years after reunification (Fritsch et al. 2012, Paqué 2010). One can assume that people in East Germany often did not have the skills and knowledge how to establish and manage their own firms which made it difficult for East German entrepreneurs to successfully compete with West German firms that had more experience in coping with the competitive pressure in a market economy.

[1] See e.g. Fels and Schnabel (1991) or Paqué (2010) for a more comprehensive treatment of various economic aspects of German reunification.

Empirical studies that compare firms' survival prospects in East and West Germany are relatively scarce and focus mainly on the 1990s.[2] Investigating survival rates of the entry cohorts 1993-1998 Fritsch (2004) finds that the survival chances of those cohorts that entered early after reunification were relatively good in East Germany compared to West Germany but declined for subsequent cohorts. While survival rates for the entry cohorts 1993 and 1994 are clearly higher in East Germany, they do not differ much between East and West Germany for the cohorts 1995-1997. For firms that entered in 1998 he finds that their survival rates are clearly lower in East Germany. The survival rates of entries in West Germany remained relatively constant over the period of observation. Similar evidence for entry cohorts between 1991 and 1995 is provided by Brixy and Grotz (2004). Heckmann and Schnabel (2006) find a higher probability of survival in East Germany for firms that were founded in 1995 and 1996. For young firms founded between 2005 and 2007 Egeln et al. (2010) find a higher probability of exit due to bankruptcy in East Germany while the probability of exit due to other reasons does not differ significantly between East and West Germany.

Taken together, the existing empirical evidence shows that survival chances of firms that were founded shortly after reunification were relatively good, even better than in West Germany, and deteriorated for subsequent entry cohorts during the 1990s. With respect to more recent entry cohorts the evidence is far from conclusive. The good survival chances of the early entry cohorts in East Germany may be due to the low density in many markets (Fritsch 2004), as well as various subsidies that were provided in order to improve the economic situation in East Germany.

Since previous studies consider only the 1990s or focus on very few entry cohorts, this paper contributes to the literature by analyzing the development of new establishments' survival chances in East and West Germany for the period 1994-2008, thus comprising 15 cohorts of startups. For this purpose I use a large administrative dataset that is generally similar to the data used by Frisch (2004) and Brixy and Grotz (2004) but which, in contrast, makes it possible to identify entries and exits more reliably based on a worker flow approach. As studies for the 1990s find that the survival prospects of new establishments in East Germany deteriorated during that period, a central question of this paper is whether this trend continued or whether convergence between East and West Germany with respect to survival rates can be observed.

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[2] There is a substantial international literature on the survival chances of newly founded firms. For surveys see Geroski (1995) or Caves (1998). For Germany most studies focus on West Germany or single federal states (e.g. Wagner 1994, Boeri and Bellmann 1995, Fritsch et al. 2006, Brixy and Grotz 2007, Strotmann 2007, Schindele and Weyh 2011).

The paper proceeds as follows: In Section 2 the dataset and the procedure to identify entries and exits are described. Section 3 provides descriptive evidence on establishment survival in East and West Germany and in Section 4 the determinants of establishment exit are examined econometrically. Section 5 concludes.

2. DATA

For the following analysis I use the German Establishment History Panel (BHP), a large and representative administrative dataset provided by the Research Data Centre of the Federal Employment Agency at the Institute for Employment Research. The BHP contains a random sample of 50 percent of all establishments with at least one employee liable to social security and currently covers the period 1975-2010 for West Germany and 1991-2010 for East Germany, but because of the bad data quality in East Germany shortly after reunification it is recommended to use the East German data only from 1993 onwards (Gruhl et al. 2012: 9).[3] The data are annual and reflect the situation in the establishment on June 30th of each year. They are created by aggregating the underlying social security data – the "Employment History" (BeH) – at the establishment level. The BHP contains information on industry[4], location, number of employees, composition of the workforce, and wage structure (for more detailed information, see Spengler 2008, Gruhl et al. 2012). Major advantages of the BHP compared to other datasets are that it covers all industries and a longer time span and that it can be considered very reliable as it is based on mandatory social security announcements.

Since every establishment is allocated a unique identification number which normally does not change, one can follow establishments over time. Generally establishments are regarded as entries in that year when they appear in the data for the first time, that is when they report for the first time having employees who are liable to social security.[5] Analogously, establishments are considered to be exits in the year when they appear in the data for the last time. For establishments in East Germany that already appear in the data in 1993 one does not know whether

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[3] Berlin, including West Berlin which belonged to West Germany before reunification, is regarded as part of East Germany in this study. To make sure that the results are not driven by this classification, I conducted a robustness test removing Berlin from the sample which did not affect the results.

[4] Since there are breaks in the industry classification, a time-consistent industry classification variable based on the procedure by Eberle et al. (2011) was provided by the Research Data Center.

[5] Since establishments first appear in the dataset when they report for the first time having employees liable to social security, entry might have occurred earlier than recorded in the data. Similarly, exit could have occurred later.

they entered in 1993 or earlier. Thus, it is possible to identify entries for the first time in 1994. Exits are considered ultimately in 2008, i.e. at the current edge establishments are regarded as exits only if they do not reappear in the data for the following two years.[6]

Identifying entries and exits only based on newly appearing or disappearing establishment numbers has an important shortcoming: events like a change of ownership or legal form, outsourcing, or other administrative changes can result in a change of the establishment number, which would lead to an overestimation of the number of entries and exits.[7] To solve this problem I use extension files on establishment histories provided by the Research Data Center that are based on the work by Hethey and Schmieder (2010) who analyzed worker flows between establishment numbers in the underlying personal level data.[8] They use maximum clustered in- and outflows, that is the largest groups of workers switching from one establishment number to another, to classify newly appearing and disappearing establishment numbers into seven categories each.

For very small establishments (with 1-3 employees), it would not be very meaningful to calculate the maximum clustered inflow relative to employment and it is therefore not possible to distinguish between different types of entry. Newly appearing establishments with less than four employees are therefore always regarded as true entries. Among entrants with more than three initial employees I exclude establishments in which 30 or more percent of the initial workforce was employed together in the same establishment in the year before and in which this group of workers, i.e. the maximum clustered inflow, made up more than 80 percent of that establishment's, i.e. the predecessor's, workforce. These cases are labeled "ID changes" or "unclear" by Hethey and Schmieder (2010), based on whether a meaningful interpretation is possible or not. They remaining categories, namely "new establishments (mid & big)", "new establishments (chunky)", "Spinoffs pulled"

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[6] Exits are considered ultimately in 2008 because perforated establishment histories (e.g. if an establishment does not have any employees except the owner for some time) may become a problem at the current edge. One might argue that a similar procedure should be applied to entries at the beginning of the observation period. However this is not a problem for West Germany since entries in 1994 did not appear in the data since 1975. For East Germany it should be noted that establishments that are regarded as entries in 1994 did not appear in the data in the three preceding years.

[7] For a more detailed description of the problems concerning the identification of entries and exits, see Brixy and Fritsch (2002).

[8] Since 1999 marginal part-time workers are included in the BLH and therefore also in our BHP data set. For time-consistency those employment relationships were dropped in the analysis of Hethey and Schmieder (2010) that makes use of personal level data. For the identification of establishments' entries and exits I follow their approach. However, as I do not have access to the worker-level data, I am not able to construct a fully time-consistent data set, e.g. by calculating employment shares without marginal part-time workers in the numerator. Nevertheless, I decided not to exclude all establishments with marginal workers from the sample.

and “Spinoffs pushed”, are considered to be true entries (see Appendix Table 1 for the number of entries by year).[9]

Spinoffs are new establishments in which a large fraction of the initial workforce, i.e. more than 80 percent, was employed together in the same establishment in the year before. They are regarded as “pulled” if the predecessor continues and as “pushed” if the predecessor exits. New establishments (mid & big) are entries in which less than 30 percent of the initial workforce was employed in the same establishment in the year before. These startups are likely to be founded without a parent firm. The remaining category with the maximum clustered inflow making up between 30 and 80 percent of a new establishment’s initial workforce, which is labeled “chunky” by Hethey and Schmieder (2010), may contain both spinoffs and startups without a parent firm.[10]

Concerning the identification of exits, if establishment A exits in period t and more than 80 percent of that establishment’s workforce is employed in establishment B in t+1, it is likely that establishment A does not cease to exist. Depending on whether B is a new or an existing establishment, the disappearance of establishment A is regarded as “ID change” or “takeover”, respectively. In some cases a meaningful interpretation is not possible. These cases, which are labeled “unclear” by Hethey and Schmieder (2010), are excluded. A more detailed description how these extension files are used to identify true exits is provided by Fackler et al. (2013).

The following empirical analysis is usually restricted to newly founded establishments for several reasons: First, new firms are regarded as particularly important with respect to economic development. Second, for East Germany I do not know the exact age of establishments that already appeared in the data in 1993. Among these establishments it is also not possible do distinguish clearly between those that were founded after reunification and those that already existed during the socialist regime of the former GDR. In order to compare new establishments’ survival chances between East and West Germany the sample is restricted to establishments that were founded (i.e. that reported having employees who are liable to social security for the first time) between 1994 and 2008. The

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[9] A potential problem of the data is that it is not possible to distinguish between new firms (i.e. legal units) and newly established branch plants. This, however, should not be a serious problem for this investigation. As 86 percent of all establishments (i.e. local units) in Germany are separate firms comprising only one establishment (Koch and Krenz 2010), one can expect that new establishments are also new firms in most cases.

[10] I also conducted a robustness test applying a more rigorous definition of entries, namely regarding only small entrants with less than four initial employees and new establishments (mid & big) as true entries and restricting the sample to establishments with maximum 20 initial employees. Removing implausibly large entrants additionally reduces the probability of observing formations of branch plants rather than new firms (see Fritsch and Brixy 2004). Running this robustness test did not change the main insights.

sample is further restricted to the private sector, i.e. the public sector and other non-profit sectors are excluded from the analysis. I also exclude the agriculture and the mining sector because entries and exits in these sectors are strongly subject to political influence (e.g., subsidization, EU downsizing plans) that goes beyond the policy measures to foster economic development in East Germany.

3. DESCRIPTIVE EVIDENCE

Although the main focus of this study is on newly founded establishments, I start my empirical investigation by comparing average annual exit rates (related to all establishments, not only new entrants) in East and West Germany for the period 1993-2008 in order to get a first impression of the survival patterns. The respective figures are depicted in Figure 1. In 1993 the “initial transformation shock” (Fritsch 2004: 532) was over and the situation in East Germany was more stable than immediately after reunification.

In West Germany annual exit rates have developed relatively stable without huge fluctuations between 1993 and 2008. The probability of exit increased slightly and is quite high in 2002, a year that falls in the economic downturn from 2001 to 2003. The high exit rate of more than nine percent in 2008 may be due to the Great Recession in 2008/09 but it should be interpreted with care since one cannot rule out that the number of exits is overestimated a the current edge (see Section 2). In East Germany the picture is somewhat different. Starting with the years 1993 to 1997 the exit rate is always about eleven percent, roughly three percentage points higher than in West Germany which is likely to be due to composition effects, in particular a higher share of young establishments in East Germany. In the years 1998 and 1999 the probability of exit increases dramatically, reaches its maximum of 14.6 percent in 1999, and decreases afterwards. From the year 2000 onwards the exit rates in East and West Germany seem to converge since the difference becomes smaller over time and is less than one percentage point in 2007 and 2008.

(Figure 1 about here)

The fact that exit rates in East Germany rise exceptionally in 1998 and 1999 is remarkable. Since a similar development cannot be observed in West Germany it is likely that this is due to a policy change affecting firms in East but not in West Germany. A potential reason for this development is the expiration of the Development Area Law *(Fördergebietsgesetz)* by the end of 1998. The Development Area Law allowed for bonus depreciations of up to 50 percent on investment in order to reduce capital costs and stimulate investment in East

Germany (see Eichfelder and Schneider 2013 for a more detailed description).[11] Since the Development Area Law was one of the most expensive policy measures that aimed on improving the economic situation in East Germany one can expect that its expiration in 1998 considerably raised firms' capital costs and reduced their liquidity and profitability, thus affecting the decision whether to stay in the market or not. With respect to business investment, Eichfelder and Schneider (2013) report that the bonus depreciations according to the Development Area Law had strong effects on both the volume and the probability of investment. Since declining investment reduces aggregate demand it can be expected that the profitability of establishments that were not directly affected by the expiration of the Development Area Law also worsened which might have led to an increasing number of closures.

Now focusing on newly founded establishments, Table 1 provides descriptive evidence on establishment survival in East and West Germany from a cohort perspective. It shows Kaplan-Meier survival estimates (see e.g. Kalbfleisch and Prentice 2002: 14-19) for the entry cohorts 1994 to 2008. In West Germany, the survival chances of newly founded establishments have worsened slightly over time in the short and the long run, but the development is quite stable. For establishments that entered between 1994 and 1999 the survival rates are always greater than 80 percent after one year, greater than 60 percent after three years, and still greater than 50 percent after five years. For subsequent entry cohorts the respective figures are always below 80, 60, and 50 percent. In East Germany, the one-year survival rates for establishments that entered between 1994 and 1997 are very similar to those in West Germany while the three-, five, and ten-year survival rates are lower and worsened over time. The following three cohorts 1998-2000 exhibit the overall lowest survival rates but from 2001 onwards new establishments' survival chances become better again. For establishments that entered between 2006 and 2008 the survival functions are very similar in East and West Germany. This is also confirmed by log-rank and Wilcoxon tests (see Kalbfleisch and Prentice 2002: 20-23) which do not indicate significant differences in the survival functions on the one percent level for the entry cohorts 2006-2008. For earlier entry cohorts, the survival functions always differ significantly on the one percent level between East and West Germany.

(Table 1 about here)

[11] Besides public investments in infrastructure, the promotion of economic development in East Germany mainly focused on the stimulation of private investment by means of investment subsidies, bonus depreciations, investment grants in the context of the joint task for the improvement of the regional economic structure *(Gemeinschaftsaufgabe zur Verbesserung der regionalen Wirtschaftsstruktur)*, as well as cheap credits and grants in order to foster entrepreneurship. Except for the bonus depreciations according to the Development Area Law, these policy measures are with some modifications still at work (see Paqué 2010: 92 f.).

This evidence is similar to what Fritsch (2004) found for the entry cohorts 1993-1998. It is consistent with the view that firms in East Germany that entered relatively early benefited from the low density, i.e. the number of firms in a market, but also from various subsidies, and therefore exhibited higher survival rates than subsequent entry cohorts. It is further remarkable that new establishments' survival chances in East Germany worsened considerably for entries in 1998-2000 compared to earlier cohorts and that the long run survival rates for the cohorts 1994-1997 are also clearly lower than in West Germany. These results are therefore consistent with the view that the expiration of the Development Area Law in 1998 has increased establishments' mortality risk in East Germany. The results for entry cohorts from 2001 onwards show that establishments' survival chances converged between East and West Germany.

4. Econometric Analysis

In this section the results of a multivariate analysis are presented in order to see whether the results from the descriptive analysis still hold when controlling for several variables that influence the probability of exit. I estimate the probability of establishment exit using semi-parametric Cox proportional hazards models (see e.g. Cameron and Trivedi 2005: 592-597). The major advantage of this model is its flexibility since it does not make any assumption about the shape of the baseline hazard, i.e. the relationship between the hazard rate and establishment age (resp. analysis time) when all other covariates are zero. Applying different estimation methods, namely a discrete time proportional hazards model (complementary log-log) or a piecewise constant exponential model, does not affect the results.

I analyze the development of establishments' exit hazard in East and West Germany from a time and a cohort perspective. In the first case year dummies are included in the model and interacted with a dummy variable which is one if the establishment was founded in East Germany and zero otherwise. In the second case the procedure is almost the same but instead of the year dummies I include cohort dummies (i.e. year of entry). In this model I additionally include real GDP growth rates at the level of federal states to control for business cycle fluctuations, as well as an interaction term with the dummy for East Germany to take into account that the effect of business cycle fluctuations on establishments' exit hazard might differ between East and West Germany. In the first model aggregate business cycle fluctuations are captured by the year dummies and it is therefore not necessary to include an additional business cycle indicator. As further control variables I include initial establishment size, i.e. the number of employees at the time of entry (4 dummy variables, to take account of potential non-linearities), the

structure of the initial workforce (percentages of low qualified employees, of skilled occupations, of highly skilled occupations,[12] and of females, as well as the median age), and two-digit industry fixed effects.[13] The variables for establishment size and workforce composition are also interacted with the dummy for East Germany in order to take account of potential differences in the determinants of establishment exit between East and West Germany.[14]

Estimation results are presented in Table 2 for the model with year fixed effects and in Table 3 for the one with cohort fixed effects. In order to illustrate the developments over time graphically, the hazard ratios, i.e. exponentiated (sums of) coefficients, for East and West Germany are displayed in Figures 2 and 3, respectively. In both figures the year resp. cohort 1994 in West Germany constitutes the reference (with a hazard ratio of one).[15]

Starting with the model incorporating year fixed effects (Table 2 and Figure 2) one can see that the exit hazard of new establishments in both East and West Germany has developed similar to the average exit rates (related to all establishments) depicted in Figure 1. In West Germany the development can largely be attributed to business cycle fluctuations. The peak in 2002 with the hazard rate being 20 percent higher than in 1994 might be due to the economic downturn from 2001 to 2003 and the high exit hazard at the end of the observation period in 2008, where it is about 26 percent higher than in 1994, might be due to the Great Recession in 2008/09. However, the latter explanation should be treated with caution since one cannot rule out that the number of exits is overestimated at the current edge (as already stated in Section 3). In East Germany the exit hazard rises slightly between 1994 and 1997 but the difference between East and West Germany is relatively small in these years with maximum 10.5 percent in 1997. In 1998 and 1999 the hazard rate in East Germany rises strongly, probably due to the expiration of the Development Area Law by the end of 1998, remains on a high level in 2000 and decreases afterwards. The difference to West Germany between 1998 and 2000 is always

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[12] Low qualified employees are those who do not have an upper secondary school leaving certificate as their highest school qualification or do not have a vocational qualification. Skilled and highly skilled occupations are defined according to the occupational classification by Blossfeld (1987). Skilled occupations include skilled manual occupations, skilled services, skilled commercial and administrative occupations and technicians; highly skilled occupations include semiprofessions, engineers, professions and managers.

[13] See Appendix Table 2 for descriptive statistics of explanatory variables.

[14] Prantl (2003) investigates potential differences in the determinants of firm survival between East and West Germany and differentiates between involuntary exit due to bankruptcy and voluntary exit due to other reasons. Inter alia she finds that small firms in East Germany, in contrast to West Germany, do not face a higher risk of voluntary exit than large firms.

[15] For example, the exponentiated coefficient of the East Germany dummy in the model with year fixed effects (Table 2), i.e. exp(-0.0303)=0.9702, shows that in 1994 (the reference year) the hazard rate in East Germany is about three percent lower than in West Germany.

greater than 30 percent and the maximum difference is reached in 1999 with 47.8 percent. Until 2006 the exit hazard for establishments in East Germany decreases and rises again at the end of the observation period which, as in West Germany, might be due to the Great Recession. Comparing East and West Germany during the years 2001 to 2008, one can see that the difference in establishments' exit hazards becomes smaller, being between eight end twelve percent from 2002 to 2005 and less than four percent from 2006 onwards. In 2006 and 2007 the difference is statistically not significant.

(Table 2 and Figure 2 about here)

The results of the multivariate analysis with cohort fixed effects, which are presented in Table 3 and Figure 3, are very similar to those in the descriptive analysis (presented in Table 1). Starting with West Germany one can see that new establishments' survival chances worsened slightly over time. Looking at the hazard ratios for East Germany it is visible that establishments that entered between 1994 and 1997 have the overall lowest exit hazards among all entry cohorts in East Germany. Although the hazard rates for these entry cohorts are 11 to 18 percent higher than in West Germany the difference is never significant on the one percent level. The cohorts 1998 and 1999 again exhibit the overall highest hazard rates with the difference between East and West Germany being 26.9 percent for the 1998 cohort and 31.1 percent for the 1999 cohort. For subsequent entry cohorts the exit hazard becomes smaller and the development appears quite stable from 2000 onwards. For establishments that entered in 2002 or later the difference in the hazard rates between East and West Germany is less than 10 percent and they are also sometimes lower in East Germany. For entry cohorts from 2001 onwards, the difference in the exit hazards does not differ significantly between East and West Germany. This indicates that new establishments' survival chances have converged between East and West Germany.

(Table 3 and Figure 3 about here)

Turning to the effects of further covariates on establishments' exit hazard, one can see from both models (Tables 2 and 3) that the exit hazard decreases with initial establishment size. This relationship is referred to as the "liability of smallness" (Aldrich and Auster 1986) and is often regarded as a stylized fact in the literature (see e.g. Geroski 1995). For example, establishments in West Germany with initially 1-3 employees face a 41-42 percent higher exit hazard than establishments with 4-6 employees. In East Germany the relationship between initial establishment size and the exit hazard seems to be slightly weaker, but this should not be over-interpreted since the coefficients of the respective interaction terms are statistically not significant in some robustness tests. One can rather conclude that the

relationship between initial establishment size and the probability of exit is very similar in East and West Germany.

Concerning the composition of the initial workforce the results show that establishments with a better qualified workforce are less likely to exit which is in line with existing empirical evidence (e.g. Geroski et al. 2010, Fackler et al. 2013). One can further see that that a higher share of females in the initial workforce is associated with a lower exit hazard. This is in line with empirical results by Weber and Zulehner (2010) showing for Austria that firms with females among their first hires are less likely to exit. They argue that gender diversity is crucial concerning the success of newly founded firms. In addition, this result might reflect that – if discrimination is costly – discriminatory employers are more likely to exit due to lower profitability (Weber and Zulehner 2009). Concerning the age structure the results point to a positive relationship between the median age of the initial workforce and the exit hazard. On the one hand the experience of older workers might be helpful for young firms, on the other hand older workers are often less willing to take risks and might therefore be not the right ones to successfully implement new business ideas (Koch et al. 2013). According to my results the second effect seems to be more important. The coefficients of the interaction terms between the workforce composition variables and the dummy for East Germany show that some of these effects seem to be slightly weaker in East Germany but the statistical significance of the interaction terms sometimes changes when running robustness tests. This suggests that the composition of the initial workforce, just as establishment size, plays a very similar role with respect to establishment survival in East and West Germany.

Furthermore, one can see from the model with cohort fixed effects (Table 3) that favorable macroeconomic conditions make it easier for establishments to survive. The growth rate of real GDP has a significant negative effect on establishments' exit hazard. The coefficient of the interaction term with the East Germany dummy is not significant, suggesting that new establishments' survival chances are similarly affected by business cycle fluctuations in East and West Germany.

The main insights of this study still hold when performing several robustness tests. In order to additionally reduce the probability of observing formations of branch plants rather than new firms I applied a more rigorous definition of entries, namely regarding only small entrants with less than four initial employees and new establishments (mid & big) as true entries (see also Section 2) and restricting the sample to establishments with maximum 20 initial employees. Since West Berlin which is regarded as part of East Germany in this study but which belonged to West Germany already before reunification, might be a very special case which potentially biases the results I ran a robustness test removing Berlin from the

sample. I further applied different estimation methods, namely a discrete time proportional hazards model (complementary log-log) and a piecewise constant exponential model. By and large, the picture is also the same when running the analyses separately for single selected entry cohorts or for three economic sectors, namely manufacturing, construction, and services. The results of these robustness tests are available on request.

5. CONCLUSION

Using a large administrative dataset, this paper has compared the development of new establishments' survival chances between East and West Germany for the period 1994 to 2008. The empirical analysis has revealed the following insights: First, establishments' survival chances in East Germany were relatively good during the early years after reunification with no big differences to their West German counterparts. This suggests that they benefited from a low market density (Fritsch 2004, Carrol and Hannan 1989) and from various subsidies. Second, the exit hazard increased strongly in 1998 and 1999 in East but not in West Germany. This indicates that a change in the subsidy policy for East Germany by the end of 1998, namely the expiration of the Development Area Law (*Fördergebietsgesetz*), a policy measure which aimed on stimulating investment by means of generous bonus depreciations (see e.g. Eichfelder and Schneider 2013), has reduced the liquidity and profitability of establishments in East Germany which resulted in a higher number of closures. Third, since the turn of the millennium the difference in establishments' exit hazard between East and West Germany has become smaller and towards the end of the observation period it is no longer statistically significant.

Concerning the aim of economic convergence between East and West Germany the recent development of new establishments' survival chances reported here sounds like a good message. The economic situation in East Germany seems to have stabilized and improved so far that establishments in East Germany face survival prospects that do not differ significantly from those of their West German counterparts. Relatedly, Fritsch et al. (2012) report that self-employment rates have converged between East and West Germany. This is an important aspect in the transformation process since the socialist regime of the former GDR systematically undermined self-employment and entrepreneurial activity (Fritsch et al. 2012, Paqué 2010). With respect to the economic development in East Germany one can therefore assert that some success has been achieved. At the same time one should keep in mind that firms in East Germany still receive more subsidies than their West German counterparts (Paqué 2010, Bundesministerium der Finanzen

2013). It thus remains an open question how firms in East Germany would perform without that higher level of subsidization.

One should also note that more than 20 years after reunification, the overall economic situation in East Germany is still not equal to that in West Germany. In 2012 per capita GDP in East Germany was still about 30 percent lower than in West Germany and East Germany still faces several problems such as a high level of unemployment and a strongly ageing society.[16] This suggests that a lot of work remains to be done until the economic conditions in East Germany achieve a level which is comparable to that in West Germany.

[16] See e.g. Ragnitz (2009) for a detailed evaluation of the economic situation in East Germany 20 years after the fall of the Berlin wall.

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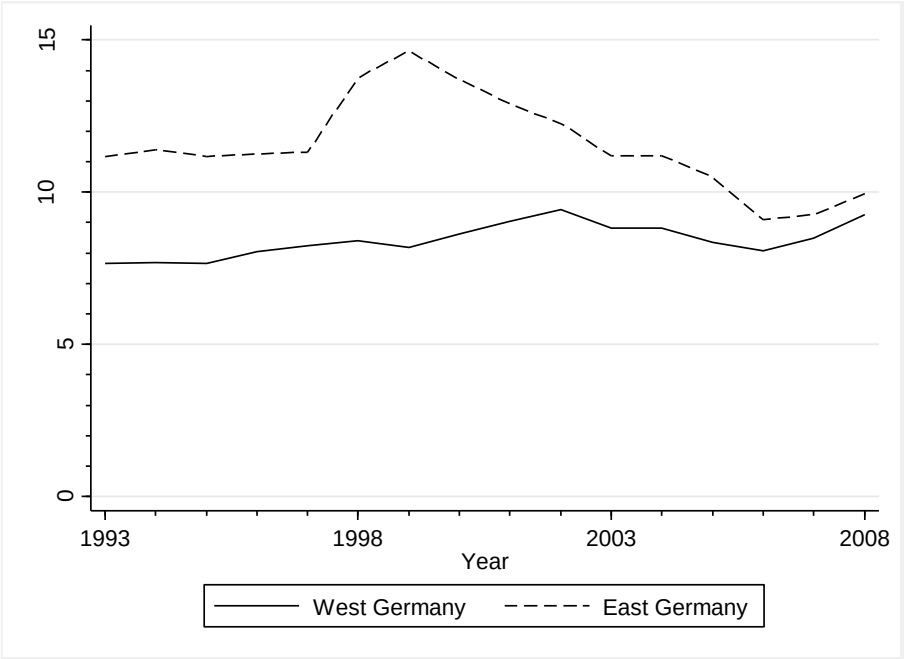
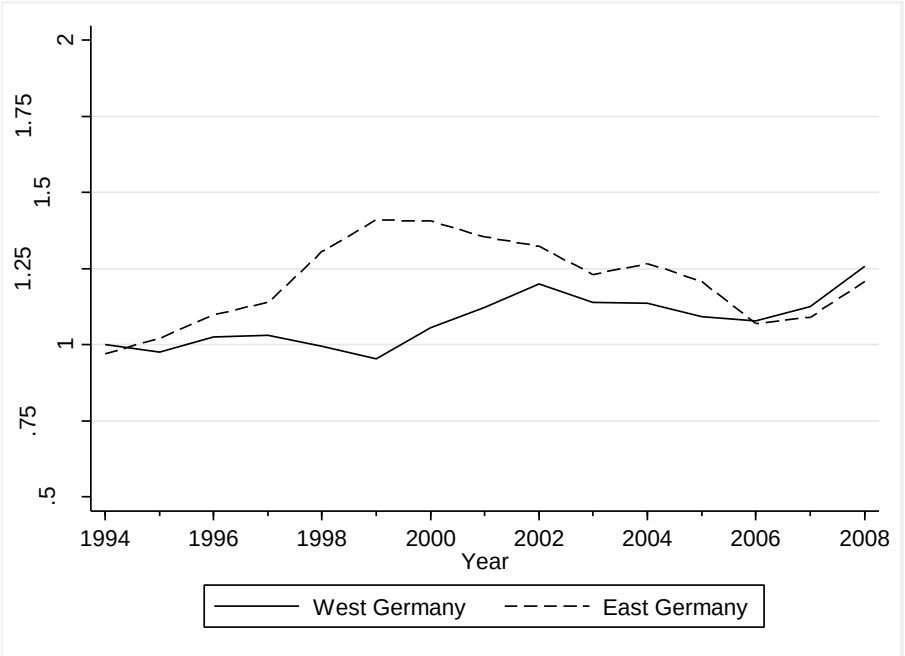
Figure 1: Annual exit rates, 1993-2008



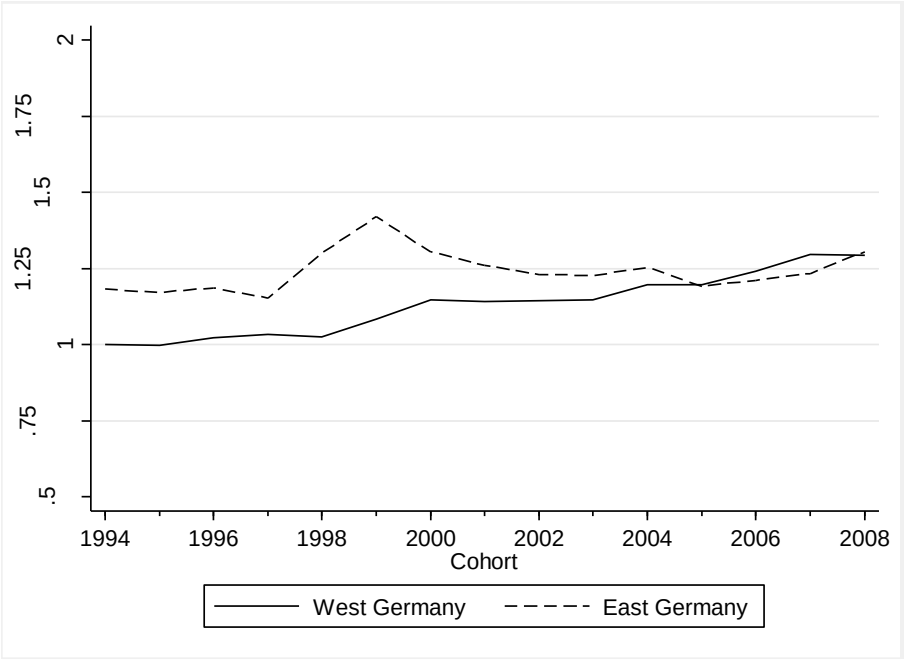
Notes: private sector without agriculture and mining.

Figure 2: Hazard ratios of newly founded establishments by year, 1994-2008



Notes: private sector without agriculture and mining, reference: West Germany 1994 (hazard ratio=1), Cox proportional hazards model, see Table 2 for the corresponding regression results.

Figure 3: Hazard ratios of newly founded establishments by cohort (year of entry), 1994-2008



Notes: private sector without agriculture and mining, reference: West Germany 1994 (hazard ratio=1), Cox proportional hazards model, see Table 3 for the corresponding regression results.

Table 1: Survival rates of newly founded establishments after 1, 3, 5 and 10 years by year of entry (in percent), 1994-2008

Year of entry	West Germany				East Germany			
	1 year	3 years	5 years	10 years	1 year	3 years	5 years	10 years
1994	80.35	63.07	52.73	36.83	81.66	62.99	51.20	32.71
1995	80.95	62.48	52.32	35.92	81.05	61.27	48.49	31.10
1996	80.15	62.07	51.43	35.26	79.27	58.15	45.39	29.78
1997	80.22	62.47	51.05	35.18	79.32	58.23	45.63	30.08
1998	81.21	63.10	51.17	35.55	71.90	50.60	39.55	25.95
1999	81.10	62.02	50.35	34.84	68.00	46.98	36.89	24.12
2000	79.40	58.68	47.72	---	71.83	50.21	40.32	---
2001	78.86	58.45	47.90	---	74.80	52.79	42.06	---
2002	77.47	58.31	48.45	---	75.72	53.77	43.77	---
2003	78.20	59.40	48.44	---	76.27	54.48	44.46	---
2004	77.83	58.95	47.22	---	75.53	55.29	44.50	---
2005	78.53	59.28	---	---	76.67	58.24	---	---
2006	78.84	58.05	---	---	78.79	58.27	---	---
2007	77.87	---	---	---	78.08	---	---	---
2008	75.95	---	---	---	75.66	---	---	---

Notes: Kaplan-Meier survival estimates, private sector without agriculture and mining.

Table 2: Determinants of establishment exit with year fixed effects, 1994-2008, Cox proportional hazards model, coefficient estimates

Variable	Baseline effect	Interaction effect with dummy for East Germany
East Germany (dummy)	-0.0303 (-1.55)	---
Year 1994 (reference)	---	---
Year 1995 (dummy)	-0.0247 (-2.16)**	0.0749 (3.77)***
Year 1996 (dummy)	0.0242 (2.23)**	0.0999 (5.27)***
Year 1997 (dummy)	0.0299 (2.81)***	0.1303 (7.01)***
Year 1998 (dummy)	-0.0048 (-0.46)	0.3023 (17.06)***
Year 1999 (dummy)	-0.0468 (-4.53)***	0.4206 (24.31)***
Year 2000 (dummy)	0.0547 (5.40)***	0.3166 (18.24)***
Year 2001 (dummy)	0.1152 (11.48)***	0.2184 (12.50)***
Year 2002 (dummy)	0.1827 (18.33)***	0.1273 (7.27)***
Year 2003 (dummy)	0.1299 (12.90)***	0.1083 (6.11)***
Year 2004 (dummy)	0.1264 (12.59)***	0.1402 (7.92)***
Year 2005 (dummy)	0.0887 (8.80)***	0.1309 (7.33)***
Year 2006 (dummy)	0.0744 (7.38)***	0.0224 (1.24)
Year 2007 (dummy)	0.1166 (11.66)***	-0.0003 (-0.02)
Year 2008 (dummy)	0.2292 (23.20)***	-0.0103 (-0.58)
1-3 employees (dummy)	0.3444 (78.37)***	-0.0127 (-1.57)
4-6 employees (reference)	---	---
7-9 employees (dummy)	-0.0980 (-11.91)***	0.0617 (4.19)***
10-19 employees (dummy)	-0.1367 (-16.77)***	0.0637 (4.40)***
20 and more employees (dummy)	-0.3644 (-35.67)***	0.0988 (5.42)***
Percentage of low qualified employees	0.0006 (13.77)***	-0.0001 (-1.26)
Percentage of skilled occupations	-0.0019 (-57.45)***	0.0007 (12.17)***
Percentage of highly skilled occupations	-0.0021 (-31.81)***	0.0006 (5.39)***
Percentage of females	-0.0013 (-39.28)***	0.0001 (1.24)
Median age of the workforce (in years)	0.0042 (30.16)***	-0.0011 (-4.23)***
2-digit industry fixed effects	Included	
No. of observations	5,044,443	

Notes: newly founded establishments, size and workforce composition refer to the initial workforce; private sector without agriculture and mining; t-values in brackets, standard errors adjusted for clustering at establishment level, ***/**/* indicates statistical significance at the 1/5/10% level.

Table 3: Determinants of establishment exit with cohort fixed effects, 1994-2008, Cox proportional hazards model, coefficient estimates

Variable	Baseline effect	Interaction effect with dummy for East Germany
East Germany (dummy)	0.1669 (2.38)**	---
Cohort 1994 (reference)	---	---
Cohort 1995 (dummy)	-0.0009 (-0.14)	-0.0076 (-0.55)
Cohort 1996 (dummy)	0.0225 (2.06)**	-0.0187 (-1.02)
Cohort 1997 (dummy)	0.0323 (4.56)***	-0.0561 (-6.54)***
Cohort 1998 (dummy)	0.0244 (3.04)***	0.0717 (2.60)***
Cohort 1999 (dummy)	0.0804 (7.92)***	0.1037 (3.37)***
Cohort 2000 (dummy)	0.1367 (11.91)***	-0.0370 (-1.83)*
Cohort 2001 (dummy)	0.1332 (14.11)***	-0.0687 (-4.54)***
Cohort 2002 (dummy)	0.1342 (13.64)***	-0.0934 (-6.55)***
Cohort 2003 (dummy)	0.1374 (10.47)***	-0.1000 (-6.66)***
Cohort 2004 (dummy)	0.1797 (11.09)***	-0.1204 (-7.00)***
Cohort 2005 (dummy)	0.1806 (13.42)***	-0.1725 (-5.80)***
Cohort 2006 (dummy)	0.2163 (11.77)***	-0.1912 (-5.71)***
Cohort 2007 (dummy)	0.2589 (17.89)***	-0.2159 (-7.00)***
Cohort 2008 (dummy)	0.2582 (13.67)***	-0.1586 (-3.25)***
1-3 employees (dummy)	0.3525 (36.91)***	-0.0170 (-1.50)
4-6 employees (reference)	---	---
7-9 employees (dummy)	-0.0990 (-15.44)***	0.0641 (5.32)***
10-19 employees (dummy)	-0.1374 (-15.12)***	0.0663 (2.92)***
20 and more employees (dummy)	-0.3634 (-21.17)***	0.0982 (3.79)***
Percentage of low qualified employees	0.0007 (9.03)***	-0.0002 (-1.11)
Percentage of skilled occupations	-0.0019 (-37.43)***	0.0006 (5.32)***
Percentage of highly skilled occupations	-0.0020 (-15.17)***	0.0005 (1.91)*
Percentage of females	-0.0013 (-16.52)***	0.0001 (0.41)
Median age of the workforce (in years)	0.0039 (9.92)***	-0.0008 (-1.43)
Real GDP growth (percent)	-0.0229 (-8.26)***	-0.0037 (-0.75)
2-digit industry fixed effects	Included	
No. of observations	5,044,443	

Notes: newly founded establishments, size and workforce composition refer to the initial workforce; private sector without agriculture and mining; t-values in brackets, standard errors adjusted for clustering at federal state level, ***/**/* indicates statistical significance at the 1/5/10% level.

APPENDIX

Appendix Table 1: Number of entries by year

Year	West Germany	East Germany
1994	51,904	27,634
1995	52,496	24,945
1996	51,860	21,391
1997	51,801	20,116
1998	54,330	28,655
1999	64,304	30,239
2000	61,128	22,017
2001	58,142	19,590
2002	53,882	17,876
2003	50,416	16,798
2004	52,911	15,883
2005	54,049	15,718
2006	53,945	15,068
2007	55,787	15,336
2008	54,426	14,692
Total	821,381	305,958

Notes: private sector without agriculture and mining.

Appendix Table 2: Descriptive statistics, 1994-2008

Variable	West Germany		East Germany	
	Mean	Std. Dev.	Mean	Std. Dev.
No. of employees	4.7496	23.2397	4.3601	17.2945
Percentage of low qualified employees	11.7474	27.9453	6.1979	20.6308
Percentage of skilled occupations	50.2021	44.5366	47.4700	44.7240
Percentage of highly skilled occupations	7.6037	23.3894	8.1543	23.9768
Percentage of females	48.5168	43.6825	48.6766	44.5463
Median age of the workforce (in years)	35.5888	9.7883	36.3633	9.7192
No. of establishments	821,381		305,958	

Notes: newly founded establishments, private sector without agriculture and mining, variables refer to the initial workforce.

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