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Do Newly Founded Firms Pay Lower Wages? First Evidence from Germany

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ABSTRACT. Using a linked employer–employee data set for Germany, this paper analyses wage setting in a cohort of newly founded and other establishments from 1997 to 2001. While theory provides alternative explanations for higher or lower wages in newly founded firms, we show empirically that start-ups tend to pay lower wages, ceteris paribus. On average, wages in newly founded establishments are 8% lower than in similar incumbent firms. This negative wage differential is substantially smaller in eastern than in western Germany. The wage differential is shown to decline over time as the newly founded firms become more mature.

KEY WORDS: Wages, newly founded firms, linked employer-employee data

JEL CLASSIFICATION: D21, J30

1. Introduction

In recent years, newly founded firms (or business start-ups) have increasingly received attention by academics as well as by economic policy. Quite a few studies have been published that analyse the success of newly founded firms over the years in terms of survival rates, employment growth, sales growth and other indicators of firm performance (see, e.g., Dunne et al., 1989 for the US, Storey, 1994 for the UK and Brüderl et al., 1996 for Germany). Due to high and persistent unemployment, in Germany a special focus has been on the employment effects of new firms (see, e.g., Wagner, 1994; Brixy and Kohaut, 1999; Almus, 2002), and economic policy strongly stimulates the founding of new firms in order to improve the dismal labour market situation.

Interestingly, the level and development of wages in newly founded firms have received little attention so far although they provide interesting information on the performance of new firms and on the quality of the jobs provided. Newly founded firms are usually equated with small firms, and for these we know that they tend to pay lower wages, *ceteris paribus* (Oi and Idson, 1999). We do not know in detail, however, whether newly founded firms pay higher or lower wages than incumbent firms of the same size. We also do not know whether such a wage differential – if it exists – vanishes over time once the new business matures and how fast such a convergence in wages takes place (i.e. how long it takes until a new firm becomes an incumbent firm).

This paper seeks to overcome this research deficit by analysing the wage differential between newly founded and other firms in Germany in the period 1997–2001. It makes use of a representative sample of establishments that were founded in 1995/1996 and that form part of a large-scale set of establishment data in Germany. After a brief discussion of the main hypotheses and the extant evidence in Section 2, this unique data set is described in Section 3. Econometric wage analyses are conducted in Section 4, and the identified wage differential of the cohort of newly founded establishments is traced over time. Section 5 provides some concluding remarks and suggestions for future research.

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2. Wages in small, in young and in newly founded firms

There are several reasons why wages in newly founded firms may differ from those in incumbent firms (for a general discussion of the firm age and wages nexus see Brown and Medoff, 2003). They imply alternative hypotheses on the direction and the persistence of this wage differential. In the following, some considerations suggesting higher wages in newly founded firms are presented first and are then contrasted by several arguments for a negative wage differential. This theoretical reasoning will be supplemented by a brief look at the related empirical evidence.

Since newly founded firms, by definition, have no current employees and cannot fill vacancies through training and promotion in internal labour markets, they need to attract employees from the external labour market.[1] Potential employees will compare the compensation and working conditions offered with what they receive from their current employers (or with what they are offered by other firms).[2] If they take into consideration that newly founded firms are much more likely to expire than older ones, they can be expected to demand higher wages in the sense of a wage differential compensating for the increased risk of a job loss. Wage demands will also be higher if potential employees recognize that newly founded firms offer fewer fringe benefits (such as pension plans) than long-established firms. With a falling risk of failure (and an increase in fringe benefits) over time, the size of this compensating wage differential can be expected to fall (unless there is a sort of ratchet effect that makes employees stick to their relative starting wages).

In contrast, wages in newly founded firms may be lower than in incumbent firms because of their lower ability to pay. Most new firms operate at such a small scale of output that they are confronted with an inherent cost disadvantage and thus need to pursue a strategy of compensating factor differentials, which includes paying lower wages (Audretsch et al., 2001). This sub-optimal scale of operation may be related to the fact that younger firms also face tighter financial constraints (either in the form of lower ability to raise funds or in the form of higher cost of funds) than older firms. By paying lower wages today, the new firm generates higher cash flows in the current period, implicitly borrowing from workers (Michelacci and Quadrini, 2005).

Put more general, in the start-up phase of a business it is essential for survival to keep labour costs as low as possible, and any claim of inability to pay higher wages is much more credible (and more likely to be accepted by the employees) when made by a newly founded firm than by a long-surviving firm. In this case, the new firm may not be able to poach employees from other firms but may rely more on attracting workers who are currently unemployed or out of the labour force. This selection and the lower wages offered do not necessarily imply that these employees are less qualified, since newly founded firms do not have to pay the wage premiums for tenure and firm-specific knowledge which employees in incumbent firms command.[3] There also may exist non-monetary incentives that help newly founded firms to hire employees in spite of lower wages. These include enthusiasm for the business idea and the attractiveness of a situation with flat hierarchies where structures can still be formed. Some employees could also speculate that they are first in line and therefore in a good position for a career within the firm.

Over time, this negative wage differential should become smaller since a firm's ability to pay can be expected to rise, and since its employees acquire tenure and valuable firm-specific human capital. Similarly, the strategy of financially constrained new firms to pay low wages in exchange of higher future wages also suggests that the negative wage differential should vanish over time.

These contrasting theoretical hypotheses suggest that an empirical investigation may be worthwhile. To the best of our knowledge, however, no empirical studies seem to exist that have explicitly addressed these issues with German or international data on newly founded firms. To be sure, there is a vast literature demonstrating that *small* firms pay lower wages for reasons that are not always perfectly well understood (standard references include Brown et al., 1990; Oi and Idson, 1999; for Germany, see Schmidt, 1995; Wagner, 1997). Since newly founded firms are usually small, it is fairly save to conclude that they

also pay low wages, but it remains an open question whether they pay higher or lower wages than incumbent firms of the same size.

There is also an emerging literature (consisting of a handful of econometric studies up to now) that tries to find out whether the age of a firm has an influence on the wages paid to its employees and that provides some information on the wage differential of *young* firms. With Dutch firm data, Audretsch et al. (2001) identify a positive impact of firm age on productivity and wages, even after controlling for the size of the firm. For the U.S., Brown and Medoff (2003) find that firms which have been in business longer pay higher wages, but tend to pay lower wages after controlling for worker characteristics (see also Doms et al., 1997). Similar results are obtained for western Germany by Kölling et al. (2005) who state that, if anything, younger firms seem to pay more ceteris paribus. Heyman (2004) investigates the employer age-wage effect in Sweden and finds considerable heterogeneity across years, along segments of the firm age distribution and across industries.[4] All of these studies, however, do not pay special attention to *newly founded* firms and do not follow an age cohort of firms over time. Such a line of investigation will be pursued now.

3. The data

The data used in this study is derived from two sources that are closely interrelated and together form an employer–employee data set. The employee side of the data set is the "German Employment Statistics" (sometimes also called the "German Social Insurance Statistics"). It requires all public and private employers to report certain information about every employee who is subject to obligatory social insurance, i.e. health and unemployment insurance along with pension funds. Misreporting is legally sanctioned. The information collected is transformed into an establishment file that provides longitudinal information about the establishments and their employees and which is called "IAB Establishment Register".[5] A great advantage of this database is that it covers all establishments that employ at last one employee who is liable to social insurance. The attributes of each firm covered in this database are the number of employees, their sex, age and qualification (four levels) as well as the wages and salaries paid and the exact duration of the engagement in days. Although these data refer to individuals, only aggregate data at establishment level were available to us.

The employer side of our data set is given by the "IAB Establishment Panel", a random sample of establishments from the comprehensive IAB Establishment Register drawn according to the principle of optimal stratification. The stratification cells are defined by 10 classes for the size of the establishment and by 16 economic sectors. This selection process means that the selection probability of an establishment increases with its size. Every year since 1993 (1996) the IAB Establishment Panel has surveyed the same establishments from all branches and different size categories in western (eastern) Germany. In order to correct for panel mortality, exits and newly founded establishments, the panel is augmented regularly. The questionnaire covers a wide variety of questions which can be used for our analysis, such as information on the legal form, the profit situation and the location of the establishment, the state of production technology and on bargaining coverage. Data are collected in personal interviews with the owners or senior managers of the establishments by professional interviewers.[6]

In 1997 a representative sample of establishments that reported under a new firm-identification-number in the employment statistics was drawn and integrated into the IAB Establishment Panel. From this sample 826 newly founded establishments can be used in our analysis, 368 of which can be traced every year until 2001 (although not all of these establishments provide information on all variables in every year). Each of these newly founded establishments hired its first employee between 1 July, 1995 and 30 June, 1996. Our sample was restricted to establishments that had less than 200 employees in 1997[7] and that were in private ownership of one or more founders but were not owned by other firms, so there are no derivative foundations or new establishments of multi-establishment firms. The development of these newly founded establishments is contrasted with 5897 incumbent

establishments from the private sector that had already existed in 1996 and had employed at least one person in 1997. Of these establishments 3207 could be traced in every year until 2001, the last year for which information from the employees' and employers' side is available.

In our empirical analysis, we predominantly make use of the data from the IAB Establishment Panel, thus more or less taking an employers' perspective. In addition, exact data on the composition of the workforce and the number of employees as well as on the amount of wages and salaries paid in the establishment are supplied from the quasi-official German Employment Statistics via the IAB Establishment Register. The data are linked through a plant identifier that is available in both data sets.

A short description of the data used with summary statistics can be found in the Appendix tables. The comparison of newly founded and incumbent establishments shows that there are substantial differences between both groups in our samples. On average, newly founded establishments are much smaller than incumbent establishments, they are less likely to be covered by collective agreements and their average wage per employee is lower. It will be interesting to see whether the latter result still holds in multivariate analyses.

4. Empirical analyses

In order to empirically investigate the wage differential of firms founded in 1995/1996 we estimate OLS regressions for the period 1997–2001, making use of stacked cross section models for each year as well as pooling the data. The dependent variable is the log of daily wages per (full-time equivalent) employee at establishment level. It is calculated by dividing the annual sum of all wages and salaries in an establishment by the sum of (calendar) days worked by all employees in this establishment. Since the number of days with part-time work is multiplied by 0.5, we in fact calculate a sort of "full-time equivalents" of employment.[8] Because of part-time work and fluctuations in employment our denominator is more precise than just using the number of employees at some point in time. The data stem from the "German Employment Statistics" and include all wages and salaries paid to each employee during a job up to the contribution assessment ceiling of the social security system. Since higher earnings are censored at this ceiling, wages in firms of high-income sectors are underreported. Although there is a certain downward bias in our wage variable, this should not systematically and seriously affect our results on the wage differential.[9]

The main interest of our analysis is on the wage behaviour of newly founded firms, which are represented by a dummy variable indicating whether an establishment hired its first employee between 1 July, 1995 and 30 June, 1996. The other independent variables used are standard in wage regressions of this sort.[10] They include the number of employees in the establishment and its square (which are expected to exhibit the well-known positive but decreasing establishment size effect on wages) as well as a dummy variable indicating whether the establishment is a branch plant or subsidiary (thus probably paying higher wages than similar independent firms). The structure of the workforce is represented by the employment shares of female, fixed-term and low-skilled employees (all of which are expected to receive lower wages) and of high-skilled and part-time employees. Although there is no such thing as a unionized establishment in Germany, it is necessary to control for the existence of sectoral or firm-level collective bargaining agreements, both of which are expected to raise wages. The ability to pay of an establishment is expressed by a dummy variable reflecting its subjective assessment of the ("very good or good") profit situation. We also take into account the export share of an establishment and its state of production technology, both of which should be positively correlated with wages. Further controls refer to the existence of wage subsidies and the legal form of the establishment, although we have no clear-cut priors on the likely influence of these variables on the wages paid. We also include 10 industry dummies and three dummies for the degree of urbanization at the location of the establishment. Since wages in western Germany are still substantially higher than in post-communist eastern Germany and since both labour markets still differ considerably, we include a dummy

variable for western Germany in the aggregate analysis and also provide disaggregated estimates for western and eastern Germany.

The results of the pooled estimations for the period 1997–2001 (which also include dummies for each year) are presented in Table I. For Germany as a whole and for its western and eastern part alike, almost all coefficients estimated are highly significant and of the expected sign. While the impact of control variables needs not to be discussed in detail, the principal result is of course the negative effect of the newly founded establishment dummy on log wages. Over the entire period and the full sample, wages paid in newly founded establishments were 8.0% lower than in other firms.[11] In western Germany, the average wage differential amounted to 12.8%, whereas it was just 6.1% in eastern Germany. This difference probably reflects the fact that wages in eastern Germany are generally about 20% lower, ceteris paribus (see the dummy variable for western Germany in column 1), and that new establishments thus may have less scope for paying even lower wages there.

In addition to the average effects over the whole period shown in Table I, Table II presents the results of cross section estimations for each single year. The models estimated are almost identical to those shown in Table I[12] and by and large they are equally well determined. In order to economize on space, Table II just presents the estimated coefficients of the dummy variable for newly founded establishments (full results are available from the authors on request). From the upper part of this table it can be seen that the point estimates of the wage differential tend to fall over time: While in 1997 wages were 13.4% lower in newly founded western German plants than in other plants, ceteris paribus, in 2001 the wage differential between these two groups of plants had narrowed to 7.7% (and lost significance over time). In eastern Germany, the wage differential fell from 6.3% in 1997 to 4.9% in 2001. Figure 1 displays (in intervals of 2 years) the development of the wage differential over time by presenting point estimates as well as 95% confidence intervals. Although the confidence intervals are quite large and samples vary from year to year, there is some indication that (at least in western Germany) wage differentials narrow over time.[13]

These estimates, however, might be biased in various ways due to the failure (or non-reporting) of newly founded and other establishments in the panel. On the one hand, those newly founded establishments that paid higher wages (i.e. had a smaller wage differential in 1997) may not have survived until 2001 due to excessive labour costs. On the other, the survivors should be those with the best business models, the most favourable economic prospects and the highest ability to pay throughout (i.e. those with higher wage differentials already in 1997). In addition, the rest of the firms in the sample also changed from year to year due to panel attrition. Since the number of newly founded (of all) establishments fell from 667 (5611) in the 1997 regression for Germany to 239 (2517) in 2001, it seems to make sense to pay a closer look to these surviving establishments in order to better identify the development of the wage differential over time.

The lower part of Table II presents the results of estimations for a balanced panel of 1955 establishments that survived until 2001. It can be seen that in most years the estimated coefficients are in the same range as the estimates for all establishments and do not seem to differ systematically.[14] However, the significance levels of these coefficients are much lower (in particular in western Germany) which might reflect the fact that standard errors increase when the number of observations is reduced. From these results we may still conclude (albeit with less confidence) that newly founded establishments tend to pay lower wages than incumbent ones and that this wages differential seems to narrow (or even disappear) over time.

As a further test of robustness of our results we restricted the sample to small and medium-sized establishments that had less than 200 employees in our starting year 1997 (as noted above, all newly founded firms fall into this group) and to small establishments with less than 50 employees. Although the estimations above with the full sample of all establishments included plant size as a determinant of wages, experience suggests that this may not suffice to capture all the effects of different establishment sizes of newly founded and incumbent firms. Therefore it might be helpful to compare groups of plants that are more similar with respect to establishment size. The

TABLE I
Determinants of wages in German establishments (1997–2001) (OLS estimations; dependent variable: ln wage; pooled data)

Variable	Germany	Western Germany	Eastern Germany
Constant	3.9606**	4.2470**	3.9199**
	(454.62)	(311.73)	(354.06)
Newly founded establishment (*dummy: 1 = yes*)	−0.0837**	−0.1368**	−0.0631**
	(−11.46)	(−8.62)	(−8.17)
Establishment size (*number of employees*)	0.00006**	0.00004**	0.0004**
	(15.63)	(9.48)	(13.03)
Establishment size squared	−2.89e−09**	−1.68e−09**	−1.60e−07**
	(−11.07)	(−8.08)	(−7.08)
Branch plant/subsidiary (*dummy: 1 = yes*)	0.0734**	0.0483**	0.0917**
	(15.15)	(8.39)	(11.53)
Female employees (*percentage*)	−0.0030**	−0.0030**	−0.0029**
	(−30.60)	(−19.97)	(−24.87)
Part-time employees (*percentage*)	0.0025**	0.0019**	0.0035**
	(17.06)	(8.64)	(18.68)
Fixed-term employees (*percentage*)	−0.0005**	0.0006	-0.0011**
	(−3.41)	(1.53)	(−6.36)
High-skilled employees (*percentage*)	0.0063**	0.0069**	0.0062**
	(41.53)	(23.14)	(35.01)
Low-skilled employees (*percentage*)	−0.0010**	−0.0019**	−0.0001
	(−12.30)	(−14.80)	(−1.53)
Covered by sectoral collective agreement (*dummy: 1 = yes*)	0.1059**	0.0908**	0.0977**
	(23.32)	(11.89)	(17.63)
Covered by firm-level collective agreement (*dummy: 1 = yes*)	0.0805**	0.1016**	0.0573**
	(13.06)	(9.66)	(7.80)
Firm receives wage subsidies *(dummy: 1 = yes)*	−0.0268**	0.0250**	−0.0560**
	(−7.20)	(4.45)	(−11.86)
Profit situation (*dummy: 1 = very good/good*)	0.0439**	0.0327**	0.0545**
	(11.44)	(5.80)	(10.74)
Export share (*percentage*)	0.0021**	0.0019**	0.0010**
	(19.81)	(15.87)	(5.05)
Production technology (*dummy: 1 = state of the art*)	0.0517**	0.0577**	0.0414**
	(12.96)	(9.72)	(8.03)
Legal form of the establishment (*dummy: 1 = family-owned firm*)	−0.1915**	−0.1963**	−0.1705**
	(−42.71)	(−28.81)	(−28.69)
Year 1998 (*dummy*)	0.0161**	0.0096	0.0197**
	(3.13)	(1.26)	(2.90)
Year 1999 (*dummy*)	0.0393**	0.0326**	0.0420**
	(7.39)	(4.15)	(6.02)
Year 2000 (*dummy*)	0.0478**	0.0424**	0.0507**
	(8.78)	(5.23)	(7.21)
Year 2001 (*dummy*)	0.0696**	0.0547**	0.0794**
	(11.94)	(6.32)	(10.59)
Western Germany (*dummy: 1 = yes*)	0.2365**	–	–
	(54.70)		
Industry dummies	Yes**	Yes**	Yes**
Urbanization dummies	Yes**	Yes**	Yes**
n	20,177	9721	10,456
R^2	0.5966	0.5321	0.5295

Note: Heteroscedastic-consistent *t*-values in parentheses.
**/* denote statistical significance at the 0.01 and 0.05 levels, respectively.
Source: IAB Establishment Panel.

TABLE II
Wage differentials of newly founded establishments over time (coefficients of OLS estimations similar to Table I)

All establishments	1997	1998	1999	2000	2001
Germany	−0.0890**	−0.0720**	−0.0779**	−0.0858**	−0.0541**
	(−6.79)	(−4.64)	(−4.51)	(−4.38)	(−2.70)
	$n=5611$	$n=4526$	$n=3773$	$n=2883$	$n=2517$
Western Germany	−0.1435**	−0.1259**	−0.1333**	−0.0976*	−0.0799
	(−5.30)	(−3.92)	(−3.45)	(−2.05)	(−1.92)
	$n=2719$	$n=2175$	$n=1817$	$n=1369$	$n=1192$
Eastern Germany	−0.0651**	−0.0547**	−0.0602**	−0.0782**	−0.0499*
	(−4.59)	(−3.20)	(−3.27)	(−4.15)	(−2.30)
	$n=2892$	$n=2351$	$n=1956$	$n=1514$	$n=1325$
Survivors only	1997	1998	1999	2000	2001
Germany $n=1955$	−0.0866**	−0.0676**	−0.0769**	−0.0726**	−0.0592**
	(−3.68)	(−2.92)	(−3.25)	(−3.11)	(−2.75)
Western Germany $n=906$	−0.1045	−0.1263*	−0.1086	−0.0889	−0.0862
	(−1.88)	(−2.46)	(−1.87)	(−1.61)	(−1.84)
Eastern Germany $n=1049$	−0.0733**	−0.0358	−0.0566*	−0.0573*	−0.0412
	(−3.05)	(−1.43)	(−2.49)	(−2.50)	(−1.77)

Note: Heteroscedastic-consistent *t*-values in parentheses.
**/* denote statistical significance at the 0.01 and 0.05 levels, respectively.
In 2001, the number of observations and the estimated coefficients are not exactly identical between all establishments and survivors since the latter group includes only those establishments for which we have information in each single year (balanced panel).
Source: IAB Establishment Panel.

summary statistics reported in Appendix tables show that in these sub-samples heterogeneity between incumbent and newly-founded establishments is substantially lower.

Table III presents the results of the estimations with the restricted samples, again concentrating on the coefficients of the dummy variable for newly founded establishments. The pooled estimations for 1997–2001 shown in the first column confirm the significant negative effect of this dummy on log wages found in the unrestricted sample. It is interesting to see, however, that the wage differential is smaller once large incumbent establishments are left out. In the sub-sample of establishments with less than 200 employees, wages paid in newly founded establishments were 5.7% lower than in similar incumbent establishments in Germany (with the average wage differential amounting to 8.5% in western and 5.6% in eastern Germany). In the

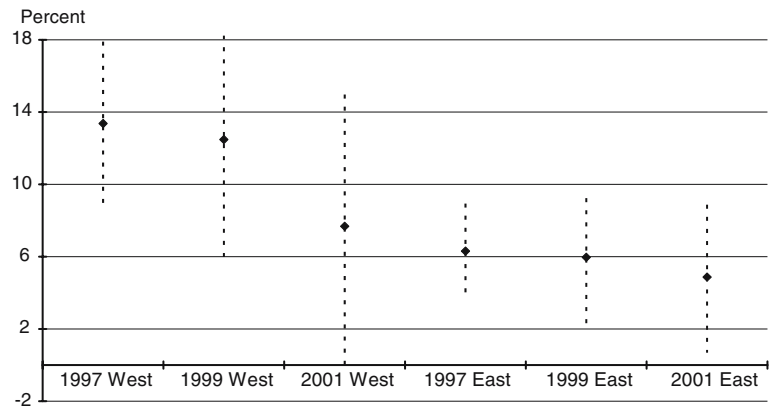

Figure 1. Wage differentials of newly founded establishments over time. Point estimates from Table II and 95% confidence intervals.

TABLE III
Wage differentials of newly founded establishments: sample restricted to establishments with less than 200/50 employees in 1997 (coefficients of OLS estimations similar to Table I)

Establishments < 200 employees	1997–2001 (pooled)	1997	1998	1999	2000	2001
Germany: All establishments	−0.0589**	−0.0644**	−0.0509**	−0.0565**	−0.0667**	−0.0340
	(−8.08)	(−4.90)	(−3.27)	(−3.27)	(−3.43)	(−1.71)
	$n = 16293$	$n = 4529$	$n = 3671$	$n = 3039$	$n = 2343$	$n = 2045$
Survivors only	$n = 1613$	−0.0688**	−0.0490*	−0.0590*	−0.0563*	−0.0411
		(−2.92)	(−2.11)	(−2.51)	(−2.46)	(−1.92)
Western Germany	−0.0892**	−0.0992**	−0.0883**	−0.0864*	−0.0576	−0.0394
	(−5.62)	(−3.63)	(−2.72)	(−2.24)	(−1.21)	(−0.95)
	$n = 7052$	$n = 1962$	$n = 1588$	$n = 1316$	$n = 1006$	$n = 871$
Eastern Germany	−0.0571**	−0.0580**	−0.0472**	−0.0603**	−0.0721**	−0.0401
	(−7.37)	(−4.07)	(−2.75)	(−3.25)	(−3.80)	(−1.84)
	$n = 9241$	$n = 2567$	$n = 2083$	$n = 1723$	$n = 1337$	$n = 1174$
Establishments < 50 employees	1997–2001 (pooled)	1997	1998	1999	2000	2001
Germany: All establishments	−0.0520**	−0.0594**	−0.0467**	−0.0437*	−0.0660**	−0.0189
	(−6.84)	(−4.36)	(−2.88)	(−2.45)	(−3.31)	(−0.93)
	$n = 12545$	$n = 3502$	$n = 2859$	$n = 2318$	$n = 1801$	$n = 1585$
Survivors only	$n = 1238$	−0.0584*	−0.0412	−0.0559*	−0.0495*	−0.0306
		(−2.41)	(−1.73)*	(−2.32)	(−2.12)*	(−1.40)
Western Germany	−0.0566**	−0.0749**	−0.0456	−0.0404	−0.0357	−0.0084
	(−3.42)	(−2.64)	(−1.38)	(−1.04)	(−0.75)	(−0.20)
	$n = 5407$	$n = 1508$	$n = 1235$	$n = 1003$	$n = 768$	$n = 672$
Eastern Germany	−0.0589**	−0.0629**	−0.0509**	−0.0594**	−0.0751**	−0.0284
	(−7.40)	(−4.30)	(−2.91)	(−3.06)	(−3.89)	(−1.24)
	$n = 7138$	$n = 1994$	$n = 1624$	$n = 1315$	$n = 1033$	$n = 913$

Note: Heteroscedastic-consistent *t*-values in parentheses.
**/* denote statistical significance at the 0.01 and 0.05 levels, respectively.
Source: IAB Establishment Panel.

sub-sample of establishments with less than 50 employees, the negative wage differential was 5.1% (with no substantial differences between western and eastern Germany).

The cross section estimations for each year presented in the following columns of Table III show again that the point estimates of the wage differential tend to fall and become less significant over time (for all and for surviving firms alike[15]). The wage differential between newly founded and incumbent plants in western Germany becomes statistically insignificant after 4 years in the sub-sample of establishments with less than 200 employees and after 2 years in the sub-sample of establishments with less than 50 employees. In eastern Germany, this process takes 5 years in both sub-samples. Put differently, these results imply that – at least concerning wages – it takes a new establishment not more than 4 or 5 years to become an incumbent establishment.

5. Concluding remarks

Our empirical analysis of a cohort of newly founded and other establishments in Germany from 1997 to 2001 has indicated that start-ups tend to pay lower wages, ceteris paribus. This negative wage differential is substantially smaller in eastern Germany where the wage floor is lower and where establishments may have less scope for paying wages that are still lower. The wage differential was shown to decline over time as the newly founded establishments become more mature. In the fifth (and last) year of our observation period the wage differential had become insignificant in most of the alternative samples inves-

tigated, but it needs additional waves of our panel data set before we can safely conclude whether and when this differential disappears completely.

The reasons for the negative wage differential found are difficult to identify and disentangle. One reason could be that newly founded establishments rely more on workers (of a given quality) that are recruited from the pool of unemployed or from out of the labour force and that are less expensive, but currently we do not have reliable information yet on the origin of employees in an establishment. Lower wages might also be paid if the establishment compensates for this disadvantage by additional fringe benefits or by increased use of employee participation schemes. However, higher monetary fringe benefits should have been picked up by our comprehensive wage variable, and our newly founded establishments are not more likely to use employee participation schemes than other firms.[16] Finally, ability to pay may play a role, and although we have included a crude dummy variable for the profit situation of the establishment (plus indicators of the state of technology and of the share of exports), these variables may capture ability to pay imperfectly, so that the dummy variable for newly founded establishments could pick up part of this effect.

In addition to overcoming these data problems, promising avenues for future research on the firm age and wage nexus would be to investigate how the wage of a given employee changes when he or she moves from an incumbent to a newly founded establishment or to analyse whether the wages of (similar) entrants into incumbent establishments and into start-ups differ. An equally interesting question is how the income of the owner of a firm evolves over time, compared to that of his employees and to his (fictional) income if he had stayed employed instead of becoming self-employed. Wages and income are still a largely neglected source of information on the performance of new firms and on the quality of the jobs provided that should be tapped more intensively.

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Notes

[1] Although the issue of firm age is not addressed in such models, see also wage posting games such as Burdett and Mortensen (1998) where firms face a trade-off between paying high wages to attract and retain a large number of workers or paying low wages (with opposite results). Here in equilibrium there are firms that pay low wages and remain small and firms that pay high wages, make more profit and have larger workforces.

[2] Lewin and Mitchell (1995, 33f.) thus stress that the human resource strategy of a start-up business should focus most strongly on selection/sourcing and on compensation and reward systems (which may include equity participation of employees in start-ups).

[3] For new hires in existing firms in Germany, Gernandt and Pfeiffer (2005) show that the wages of such entrants are lower than the wages of incumbent workers, after controlling for firm size, industry and human capital variables. However, they are not able to analyse the wage differential of entrants in new firms.

[4] A different line of investigation is pursued by Brüderl et al. (1996: 101f.) who investigate how long it takes the founder of a firm to reach the personal income he or she received in previous employment.

[5] IAB is an acronym for Institut für Arbeitsmarkt- und Berufsforschung, which is the research institute of the Federal Labour Office in Germany.

[6] Details regarding the IAB Establishment Panel (including information on the questionnaires and how to access the data) are given in Kölling (2000).

[7] There is only one newly founded establishment that was larger, on average the start-ups had five employees.

[8] While we do not exactly know the (average) number of part-timers' weekly hours, both our data from the IAB Establishment Panel and surveys of individuals (such as Bauer et al. 2002) indicate that the (relative) majority of part-time workers fall in the category of 15–24 hours per week. Therefore, it has become standard practice to use a factor of 0.5 when calculating full-time equivalents, which also reflects the fact that in Germany jobs are often split into two when creating part-time jobs. Parallel regressions (available upon request) show that our results do not change when using a factor of 0.7 instead.

[9] This contribution assessment ceiling is relatively high, amounting to 148 € in western and 124 € in eastern Germany per calendar-day in 2001. As the wage variable used is calculated at the establishment level whereas the contribution assessment ceiling refers to the individual level, there is no clear-cut truncation point which could be taken into account by choosing appropriate estimation methods (such as Tobit or truncated regression). At the other end of the spectrum, there was a small number of wages reported that were obviously too low and that probably reflected errors in the data base. We therefore omitted all incomes that were lower than twice the wages paid for so-called "mini jobs" (for which only

flat-rate taxes are paid). This lower threshold was 21.18 € per day in 2001 in both parts of Germany.

[10] Although we have a relatively rich data set, selection of control variables was limited by the fact that information on some potential explanatory variables was either never asked (this is the case for the capital stock and for fringe benefits) or was not available in all years of our observation period (e.g., existence of a works council and profit sharing).

[11] The percentage wage effect is calculated from the estimated coefficient β as $(e^{\beta}-1)\cdot 100$.

[12] The only differences are that the year dummies are not included, of course, and that for all years except 1999 (where information is lacking) a dummy variable on the existence of overtime work is included which always proves to be significant.

[13] While we compare newly founded and incumbent establishments, wages in the latter group could also vary, depending on establishment age. Unfortunately, in the waves of the IAB Establishment Panel we use there is no variable that directly captures the age of the establishment, but we can distinguish establishments that were founded before 1990 (although this leads to a reduction in sample size of about 10% due to missing data). We used this information for creating a second dummy variable reflecting older establishments and included this in addition to the dummy for newly founded establishments (so that establishments that were 2–7 years old in 1997 formed the reference group). The results of running such augmented wage regressions (in which the dummy for older establishments was insignificant in most years) did not substantially change our insights concerning the size and evolution of wage differentials. Results are available from the authors on request.

[14] We also tested this by including a dummy variable for surviving establishments and an interaction term of surviving and newly founded establishments in the regressions on which the upper part of Table III is based. Since both variables did not prove to be statistically significant we may conclude that the wages paid in surviving plants do not differ significantly from those in other plants. This confirms the finding of Audretsch et al. (2001, 818) that "differentials in employee compensation are far more attributable to firm size than to whether the firm ultimately survives or fails."

[15] We again tested for a survivors' bias using the procedure described in endnote 14, but both the dummy variable for surviving establishments and an interaction term of surviving and newly founded establishments proved to be insignificant in all restricted-sample regressions.

[16] For the year 1998, the first year with corresponding information, a simple probit estimation was conducted with the existence of an employee participation scheme as the dependent variable and establishment size (plus its square), industry dummies and the dummy for newly founded establishments as explanatory variables. Neither for Germany nor for its western and eastern parts we found a significant influence of newly founded establishments on the probability that an employee participation scheme exists.

Appendix

TABLE A1
Summary statistics (pooled data for 1997–2001; full sample and sample of establishments with less than 200 employees; all newly founded firms fall into this category)

Variable	Incumbent firms		Incumbent firms < 200 employees		Newly founded firms	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Log of daily wage per employee (*full-time equivalents, in Euros*)	4.13	0.39	4.05	0.37	3.81	0.38
Establishment size (*number of employees, full-time equivalents*)	205.38	780.13	33.97	60.40	5.16	10.32
Branch plant/subsidiary (*dummy: 1 = yes*)	0.15	0.36	0.11	0.31	0.04	0.20
Female employees (*percentage*)	36.03	31.58	38.44	33.31	45.03	41.45
Part-time employees (*percentage*)	9.43	20.44	9.83	21.61	10.66	26.02
Fixed-term employees (*percentage*)	3.60	10.49	3.11	10.11	2.79	10.89
High-skilled employees (*percentage*)	6.23	13.13	5.22	13.34	5.38	18.50
Low-skilled employees (*percentage*)	19.94	28.65	19.90	30.15	22.18	36.59
Covered by sectoral collective agreement (*dummy: 1 = yes*)	0.53	0.50	0.46	0.50	0.26	0.44
Covered by firm-level collective agreement (*dummy: 1 = yes*)	0.10	0.31	0.10	0.29	0.06	0.24
Firm receives wage subsidies (*dummy: 1 = yes*)	0.28	0.45	0.25	0.43	0.27	0.44
Profit situation (*dummy: 1 = very good/good*)	0.31	0.46	0.31	0.46	0.33	0.47
Export share (*percentage*)	7.39	18.09	3.42	12.09	1.48	8.99
Production technology (*dummy: 1 = state of the art*)	0.69	0.46	0.67	0.47	0.71	0.45
Legal form of the establishment (*dummy: 1 = family-owned firm*)	0.37	0.48	0.45	0.50	0.74	0.44
Western Germany (*dummy: 1 = yes*)	0.51	0.50	0.46	0.50	0.28	0.45
n	18040		14156		2137	

Source: IAB Establishment Panel.

TABLE A2
Summary statistics (pooled data for 1997–2001, establishments with less than 50 employees)

Variable	Incumbent firms		Newly founded firms	
	Mean	Std. Dev.	Mean	Std. Dev.
Log of daily wage per employee (*full-time equivalents, in Euros*)	3.99	0.37	3.81	0.38
Establishment size (*number of employees, full-time equivalents*)	13.82	49.35	4.29	5.81
Branch plant/subsidiary (*dummy: 1 = yes*)	0.09	0.28	0.04	0.19
Female employees (*percentage*)	40.87	35.20	45.26	41.64
Part-time employees (*percentage*)	10.33	22.99	10.79	26.20
Fixed-term employees (*percentage*)	2.67	9.84	2.76	10.95
High-skilled employees (*percentage*)	4.40	13.54	5.26	18.26
Low-skilled employees (*percentage*)	20.61	31.89	22.18	36.66
Covered by sectoral collective agreement (*dummy: 1 = yes*)	0.41	0.49	0.25	0.43
Covered by firm-level collective agreement (*dummy: 1 = yes*)	0.08	0.27	0.06	0.24
Firm receives wage subsidies (*dummy: 1 = yes*)	0.20	0.40	0.27	0.44
Profit situation (*dummy: 1 = very good/good*)	0.30	0.46	0.33	0.47
Export share (*percentage*)	1.96	9.49	1.51	9.06
Production technology (*dummy: 1 = state of the art*)	0.66	0.47	0.71	0.45
Legal form of the establishment (*dummy: 1 = family-owned firm*)	0.56	0.50	0.75	0.43
Western Germany (*dummy: 1 = yes*)	0.46	0.50	0.28	0.45
n	10443		2102	

Source: IAB Establishment Panel.

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