

Establishment Age and Wages*

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Abstract

This paper investigates the relationship between establishment age and wages. A key challenge is that new establishments differ from mature establishments along many dimensions due to non-random survival of establishments. Furthermore worker composition changes as establishments age. To get around this, the paper uses linked employer-employee data from Germany and estimates the establishment age - wage relationship controlling for establishment and worker fixed effects and focuses on starting wages of workers. I show a striking pattern: starting wages in new establishments are 9 percent higher than in mature establishments (older than 20 years). I also report evidence that this difference is not driven by differences in hours, compensation for unemployment risk or slower future wage growth. Instead, I show that the difference is driven by, on average, high growth rates in new establishments as would be predicted by monopsonistic search models.

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1 Introduction

A long literature in labor economics has shown that observably identical workers are paid differently in different jobs. While an older literature has focused on industry wage differentials (e.g. [Krueger and Summers, 1988](#), [Katz et al., 1989](#), [Davis et al., 1991](#)) and firm size differentials (e.g. [Brown and Medoff, 1996](#) and [Oi and Idson, 1999](#)), starting with the seminal paper by [Abowd et al. \(1999, henceforth AKM\)](#), the empirical literature has emphasized wage differentials between individual firms or establishments. This recent literature has shown that firm level wage differentials play a key role in explaining a wide number of labor market phenomena, such as rising wage inequality ([Card et al., 2013](#); [Song et al., 2019](#)), the gender wage gap ([Card et al., 2016](#)), domestic outsourcing ([Goldschmidt and Schmieder, 2017](#)), or wage losses after job displacement ([Lachowska et al., 2019](#); [Schmieder et al., 2020](#)). While this literature has shown the importance of such wage differentials for understanding the wage structure, the wage differentials are (mostly for simplicity reasons) largely treated as constant within firms over time with limited attention how such differentials might vary over the lifecycle of a firm. This is perhaps surprising given the large literature studying start-ups and new firm dynamics (e.g. see [Decker et al., 2014](#), for an overview).

In this paper I seek to fill this gap, by investigating how wage differentials vary with establishment age, using linked employer-employee data from Germany. I focus on wages for newly hired workers (that is with tenure=0), to avoid having to control for returns to tenure and since mechanically all workers at new firms have 0 tenure. I show that there are large pay differences for newly hired workers between new and old establishments.¹ I find that newly founded establishments pay approximately 9 percent higher starting wages than establishments older than 20 years. These differences persist when controlling for unobservables and selection using worker and establishment fixed effects as in the AKM model. Furthermore, the differential in the starting wage is not compensated by different tenure wage profiles between establishments of different ages, nor do other time varying establishment characteristics (such as overtime hours) seem to be important drivers of the wage differential.

What can explain the sizable wage premium at new establishments? One leading explanation for wage dispersion and wage premia is that labor market frictions lead to monopsony power of firms.² In these models firms do not face a set market price for labor, but instead

¹I frame the discussion in terms of establishments (I use the terms employers and producers interchangeably) rather than firms, to be consistent with my data, which is on the establishment level. In the empirical section, I will show that my findings are driven by establishments that are not part of multi-establishment firms and where the firm thus coincides with the establishment.

²See [Burdett and Mortensen \(1998\)](#); [Mortensen \(2003\)](#); [Manning \(2003\)](#); [Card et al. \(2018\)](#).

face a firm specific upward sloping labor supply curve and wages determine the number and quality of workers a firm can hire. The second key explanation for wage premia are compensating differentials (Sorkin, 2018), whereby higher paying firms are compensating workers for undesirable characteristics of the job.³

In principle both the monopsony channel and the compensating differentials channels seem plausible explanation for the wage premium in new establishments. First, new establishments exhibit high employment growth rates which decline as they grow older.⁴ Since employment growth and hiring rate correlate strongly with establishment age, new establishments should pay higher wages if the labor market were monopsonistic. Second, new establishments face a very high risk of going out of business which declines rapidly with establishment age. This corresponds to a high risk of unemployment for workers and it seems, *a priori*, plausible that new establishments compensate workers for this risk with higher wages.

I provide suggestive evidence that the monopsony channel is indeed the driver of the new establishment pay premium. First I document that the relationship between unemployment risk and establishment age differs substantially across industries: while in some sectors the risk of going out of business is very high for very young establishments and then declines, in other sectors risk levels do not vary much with establishment age. I use this cross industry variation in risk-age gradients to see whether compensation for unemployment risk is the likely explanation for the establishment age wage differential. I find the opposite: in industries where unemployment risk is steeply declining with establishment age, wages are relatively flat, while in other industries where risk is relatively flat wages are declining steeply. Compensating differentials, at least for unemployment risk, thus seem unable to explain the wage premium.

I then show that the wage differentials are driven by fast employment growth in new establishments: controlling for establishment growth renders the establishment age-wage gradient flatter and statistically insignificant. Furthermore, the Burdett and Mortensen (1998) model would predict that new establishments pay higher wages because they hire more workers with high reservation wages, which in their model are on-the-job searchers. This is exactly what I find in the data: new employers hire a larger fraction of their workforce from the pool of on-the-job searchers and a smaller fraction from the pool of unemployed.

³Another class of explanations are theories of efficiency wages (e.g. Shapiro and Stiglitz, 1984; Akerlof and Yellen, 1990). In the absence of data on monitoring costs compensating differentials and efficiency wages are essentially empirically indistinguishable. Apart from some rare exceptions, e.g. Krueger (1991), such data is not available.

⁴Presumably this is partly because they start with zero employees and have to reach some optimal positive level of employment, and partly because this optimal level of employment itself is increasing as they grow older, because of learning or capital investments, for example.

I interpret this as suggestive evidence for the importance of monopsonistic search frictions of the kind suggested by [Burdett and Mortensen \(1998\)](#) and [Shimer \(2005\)](#): Employers face an upward sloping labor supply curve and thus they are forced to offer higher wages when quickly increasing their workforce.⁵

Estimating the elasticity of labor supply to the firm has proven to be challenging.⁶ Chapter 4 in [Manning \(2003\)](#) carefully reviews the existing estimates of the elasticity of labor supply and discusses the identification problems. He concludes that “it would probably be unwise to base one’s belief in the market power of employers too much on these estimates” and “progress really needs good firm-level instruments although these are likely to be hard to find.” Insofar as I succeed in ruling out explanations other than monopsonistic search frictions for the link between establishment age and wages, establishment age can be used as such an instrument for establishment growth. Thus it is possible to consistently estimate the elasticity of labor supply to the establishment, although this requires some additional and admittedly strong assumptions. My estimate indicates that an establishment with 10 percent employment growth pays about 0.5 percent higher wages, while an establishment which doubles its employment over the course of one year, pays about 3 percent higher wages.⁷

Despite many possible links between wages and firm or establishment age, relatively few papers investigate this relationship empirically. [Dunne and Roberts \(1990\)](#) and [Davis et al. \(1991\)](#) find that older establishments pay higher wages. These papers however face important data limitations and are not able to control for worker characteristics. Controlling for worker characteristics, [Doms et al. \(1997\)](#) present regressions where plant age is included as a control variable. The coefficient on plant age is sizable and negative but due to the small sample size not significant. [Brown and Medoff \(2003\)](#), using a survey of workers, also find that conditional on worker characteristics young establishments pay higher wages, though this is not always statistically significant. [Heyman \(2007\)](#) finds mixed results using data from Denmark and [Brixy et al. \(2007\)](#) report lower wages in new establishments in Germany. All of these papers use a cross sectional approach where neither establishments nor workers are followed over time. This makes it impossible to gauge the importance of

⁵There are other factors that may explain wage differences between new and old establishments. For example, higher wages may compensate for other job characteristics besides unemployment risk or there may be reasons for new establishments to pay higher efficiency wages. Throughout the paper I will address these issues by either arguing or showing empirically that they are unlikely to drive the results.

⁶Perhaps the cleanest evidence of monopsony power can be found in [Dube et al. \(2020\)](#), who run an RCT on an online job platform where they can randomly vary offered wages. But it is much harder to run such an RCT in the broader economy, for jobs that are not relatively small gig jobs.

⁷A nice recent example of a paper estimating the relationship between firm growth and wages is ([Kroft et al., 2020](#)), which uses procurement auctions in the construction sector as a shock to firm growth and shows that on average firms grow by about 8 percent after winning an auction with associated wage gains of around 2 percent.

selection and unobserved heterogeneity on the worker and firm side. For example, it might be that young establishments that pay high wages over time go out of business, while those with lower wages stay. This gives rise to a negative age/wage correlation but has very different implications than if establishments actually face different labor costs as they grow older. Similarly [Burton et al. \(2018\)](#) and [Adrjan et al. \(2018\)](#) investigate wages in young firms for Denmark and the UK respectively and find a pay premium, but neither of these fully control for worker and firm effects, nor dive deeper into possible mechanisms.

The closest paper to this one is the recent paper by [Babina et al. \(2019\)](#), which estimates a new firm pay premium, controlling for worker and firm fixed effects using data from the United States. Their paper also shows a sizable wage premium in new firms: firms age 0 or 1, pay about 6.4 percent higher wages than firms older than 20 years (Table 5, Column 4). Some key differences between their paper and my paper are that their data has fewer characteristics (like whether workers are paid overtime, etc.) and they do not focus on newly hired workers. The paper also does not attempt to empirically disentangle reasons for the new firm pay premium. Nevertheless, their evidence is very consistent with my results from Germany.

The paper proceeds as follows. Section 2 describes the data and section 3 explains the estimation strategy and discusses various econometric issues. Section 4 presents the main empirical results of this paper. In section 5 I discuss potential explanations for differences in wages in young and old establishments, in particular compensating differentials or search frictions and I show that establishment growth seems to be an important driver of higher wages.

2 Data

This paper uses two linked employer-employee datasets provided by the Research Data Center of the Institute for Employment Research (IAB). Both datasets are based on administrative data stemming from social security data.

The first data I use is the IEBS, consisting of the universe of social security data from 1975 to 2009. This data consists of detailed work histories of all employees in Germany subject to social security contributions (which covers about 85 percent of all workers, excluding public servants and self-employed). For the purpose of this paper I use a 100 percent sample of this data, but focus only on the main job held on June 30th of each year and further restrict to fulltime jobs. Focusing on fulltime jobs has the advantage that wages are daily wages, without information on hours worked beyond the fulltime / parttime indicator. The data also has information on education, nationality, age, gender and occupation. Furthermore, each

job has information on the employer on the establishment level as well as various information on the establishment such as industry or total number of employees.

Establishment age can be imputed from the first time an establishment appears in the data. One complication is that establishment IDs are not entirely consistent through time and there are circumstances where establishments change their ID-number (for example in situations of mergers or ownership changes). Thus a new establishment identifier might be due to a spin-off or outsourcing event as in [Goldschmidt and Schmieder \(2017\)](#) as opposed to a truly new establishment.

To obtain valid measures for establishment age and establishment deaths, I use year-to-year worker flows as in [Hethy-Maier and Schmieder \(2013\)](#) and define new establishments as establishments with a new identifier, where workers in the birth year come from a diverse set of employers (or non-employment) in the previous year. This rules out establishment ID changes or outsourcing events, where workers would already have worked together in the prior year under a different ID. The data appendix contains more information on the creation of the age variable. [Hethy-Maier and Schmieder \(2013\)](#) describe the flow methodology in more detail.

Since establishment age is censored in 1975 (West Germany) and 1993 (East Germany), I restrict the sample to post 1995 where I know the exact age of establishments at least for plants that are younger than 20 years (and that came out of the identified establishment births). This sample comprises 1.3 million establishments and 17 million workers.

The IEBS has the important advantage that it comprises the universe of establishments and workers and there are no sample selection issues. The drawback is that information on the establishment level is relatively limited (apart from industry codes, it contains only information on what can be aggregated from the worker level, such as size or average wages).

I therefore also use a second dataset, the LIAB data. The LIAB is an establishment level panel dataset based on extensive interviews with managers. This panel data is linked with micro data from the IEBS for all workers working at the establishment during the survey year. Due to the establishment surveys, very detailed information is available on the employer side. Furthermore, establishments are followed for many years (I use the version of the LIAB covering 1993 to 2005) with yearly updates on the establishment side. The information on workers is the same as in the IEBS and also focuses on the jobs held on June 30th of each year. The LIAB over-samples large establishments and thus covers a significant portion of the German economy (about 8 percent of all social security liable jobs in each year).

Establishment age in the LIAB is derived from survey questions regarding the year when the establishment was created. There are some checks on whether this date truly reflects

the creation of a new establishment (rather than just a change in ownership). The question design changed from year to year and in some years birth year was censored, I therefore keep only establishments for which the exact age is known or which are at least 30 years old during the sample period. This leaves about 32,000 establishments, which are in the sample for an average of 3.2 years.

Relative to the IEBS, the downside is that sample attrition of establishments in the LIAB is non-negligible and it is plausible that this is correlated with business conditions. Thus it is not possible to estimate displacement rates or the risk of going out of business convincingly with this data. The LIAB provides sampling weights and I use these weights in the LIAB regressions below. Table 1 shows summary statistics for the two datasets. The LIAB data has somewhat larger establishments, higher paid workers and a larger share of female workers.

3 Estimating Wage Differentials in New Establishments

3.1 The wage regression function

The main econometric estimates in this paper are built on regressions that include worker characteristics, employer characteristics and establishment age. The basic wage regression function is given as:

$$\log w_{it} = \lambda(a_{j(i,t),t}) + \gamma_{j(i,t)} + Z_{j(i,t),t}\alpha + \xi_i + X_{it}\beta + \theta_t + \epsilon_{it} \quad (3.1)$$

where w_{it} is the wage of a worker i in year t who works in establishment $j = j(i,t)$. Age of establishment j at time t is denoted as $a_{j(i,t),t}$ and $\lambda(a_{j(i,t),t})$ is a flexible function modeling the relationship between wage and establishment age. θ_t is a vector of year dummies to control for business cycle effects.

Following AKM, the regression controls for establishment fixed effects γ_j and individual fixed effects ξ_i in order to control for selection and unobserved heterogeneity. $Z_{j(i,t),t}$ is a vector of time varying establishment level controls. X_{it} is a vector of time varying individual control variables: potential experience polynomials interacted with education (following [Card et al., 2013](#)).

Wages are only available as daily pay and no individual level information on hours is available beyond an indicator for working fulltime. To deal with this I restrict to fulltime workers in my analysis. Furthermore in the LIAB data, there are a number of variables on the establishment level on average number of hours worked and overtime, so I include those variables in $Z_{j(i,t),t}$.

Other time varying establishment level controls are size (flexible spline) and collective bargaining coverage. The size and industry composition for young and old establishments is quite different (See [Bartelsman et al. \(2005\)](#) for evidence on this): Young establishments are smaller and concentrated in industries such as services. It is well documented now that large firms and certain industries (for example technology intensive industries and mining) pay higher wages and a large theoretical and empirical literature has attempted to find the mechanism behind this form of wage dispersion. Similarly firm turnover has been shown to depend on regional characteristics (e.g. see [Asplund and Nocke, 2006](#) for the association with market size) and thus differences in regional wages may give rise to correlation between firm age and wages. While these differentials are interesting and possibly caused by mechanisms similar to those discussed in this paper, I focus on wage differentials associated within establishments with establishment age abstracting from the selection of firms and therefore take the industry, size, and location differentials as given. Several papers show that labor market conditions in the first year of a worker’s job can have long lasting effects on wage trajectories during the job.⁸

Establishments may find it difficult to pay drastically different wages to new workers who are hired later because current workers resist such changes in the pay structure. While these cohort effects are interesting in their own right, the main focus of this paper is how wages differ between old and new establishments that are otherwise comparable, and thus conditional on cohort effects. Wages may rise with seniority for many reasons, e.g. learning, human capital accumulation, contracts, etc. It is therefore difficult to judge whether wage differences between high tenure and low tenure workers correspond to differences in labor costs or simply reflect differences in marginal product. This is important for the comparison of wages in new and old establishments, since the tenure composition is mechanically very different (in a new establishment all workers have tenure zero). While one way to address this is to control for tenure profiles in a flexible way, this may be problematic if returns to tenure are different in establishments of different age. In my main specification, I circumvent this issue by focusing only on workers who have been at the establishment for less than a year. This makes the interpretation of the wage differentials much easier.

The inclusion of establishment fixed effects in (3.1) serves as an important control for selection in which establishments survive. If establishments that start by paying high wages (too high) selectively go out of business, while establishments with low wages survive, one might see a downward sloping profile driven entirely by selection. Establishment fixed effects solve the problem of omitted variable bias due to establishment variables that do not vary over time. Furthermore the selection problem is solved, since the comparison of wage levels

⁸For example [Oreopoulos et al. \(2012\)](#); [Kahn \(2010\)](#).

happens within establishments over time. Thus if high or low paying establishments selectively go out of business this does not affect the estimate. Selection is only a problem if there is heterogeneity in the wage-age profiles. For example establishments with decreasing entry wages may be more likely to go out of business than establishments with increasing wages. In such a case the wage-establishment age relationship could be downward sloping for young relative to old establishments because of a different composition of increasing and decreasing wage trends among old and new establishments. To deal with this I will show estimation on a more balanced sample (establishments surviving at least 10 years) as a robustness check.

Perhaps the most likely link between establishment age and wages is the systematic selection of workers of different skill levels into young establishments. For example, new establishments may have newer capital, use more modern technology, or newer production processes.⁹ If these factors are complementary with worker skills one would expect younger establishments to hire more skilled workers.¹⁰ To address this, the inclusion of worker fixed effects and education-experience polynomials seek to control for heterogeneity in workers' ability. It is not completely obvious whether one should also control for occupation, since this may be correlated with unobserved ability, in which case it should be conditioned on, but also may correspond to differences in labeling that arise endogenously in which case one should not control for occupation. For the main results I show estimates with and without controlling for 3 digit occupation fixed effects and find very similar results, so that in practice this is less of a concern.

3.2 Identification

There is a classic identification problem for the estimation of $\lambda(a_{jt})$: In a model that allows for full flexibility in (establishment) cohort and year effects, the linear component of $\lambda(a_{jt})$ is not identified.¹¹ In models that contain establishment fixed effects, cohort effects are implicitly included. Furthermore, it is important to control for the business cycle and other time trends by including year effects. Therefore it is only possible to estimate the non-linear component of $\lambda(a_{jt})$. It is possible to compare the speed of wage growth of young and old

⁹This is not necessarily the case: Dunne (1994) finds no clear relationship between plant age and technology use.

¹⁰Doms et al. (1997) analyze the relationship between worker composition and the production technology within firms. While in their cross section analysis, firms with very modern technology have a significantly more educated work force, this is not the case in their longitudinal analysis: firms that adopt more modern production technologies have higher quality workers even before the upgrade. Even if changes in technology are not correlated with changes in worker quality, it can still be the case that an establishment that starts with high level of technology will find it advantageous to hire high skill workers.

¹¹This problem is well known when estimating experience profiles (say in wages or worker productivity) in models that control for individual fixed effects and year fixed effects. E.g. Rockoff (2004); Card et al. (2013).

establishments, but it is impossible to distinguish wage growth in all establishments due to a general time trend or due to the aging of all establishments. To interpret the results I make the identifying assumption that the age effect eventually plateaus after reaching age 20 in the IEBS. In the LIAB where I can observe many older establishments (about 1/3 are older than 30 years) I make the assumption that the plateau starts at age 30. I will show that in practice the effect becomes zero after age 20, so this assumption fits the data well. This assumption means that trends in the wages of new workers of establishments older than 20 (30) are driven by a general time trend (business cycle and economic growth) rather than the fact that the establishments get older. This assumption allows one to draw inferences about whether wages in young establishments are decreasing or increasing (controlling for everything else).

Two specifications for $\lambda(a_{jt})$ are used: The first is a set of dummies for different establishment ages (dummies for age 1 to 20, the omitted category being older than 20 years). This is very flexible and the coefficients can be nicely graphed to show the wage-age profile, but the large number of dummies makes it difficult to read a regression table or to include interactions. The second specification for λ therefore breaks the age variable up into flexible splines ($\mathbf{1}$ is the indicator function):

$$\begin{aligned}\lambda(a_{jt}) = & \lambda_1(a_{jt}\mathbf{1}_{a_{jt}<10} + 10 \times \mathbf{1}_{a_{jt}\geq 10}) + \lambda_2((a_{jt} - 10)\mathbf{1}_{10\leq a_{jt}<20} + 10 \times \mathbf{1}_{a_{jt}\geq 20}) + \\ & \lambda_3((a_{jt} - 20)\mathbf{1}_{20\leq a_{jt}<30} + 10 \times \mathbf{1}_{a_{jt}\geq 30}) + \lambda_4 a_{jt}\end{aligned}\quad (3.2)$$

The first spline is the age of the establishment at values 0 to 10 and takes the value 10 for older establishments. The second [third] spline is the age of the establishment minus 10 [20] at values 10 [20] to 20 [30] and 20 [30] at higher ages. This is equivalent to a regular spline function with three kink points at 10, 20 and 30.¹² The advantage is that the interpretation of the estimated parameters is very easy. $\lambda_4 a_{jt}$ is the linear component of the function. As explained, this component is not identified and will therefore be omitted in the estimation. The other parameters then have a straightforward interpretation: λ_1 is the marginal effect of establishment age on wages between age 0 to 9, λ_2 is the marginal effect between age 10 to 19 and λ_3 is the marginal effect between age 20 and 29.

¹²The conventional way of specifying such a spline function would be:
 $\lambda(a_{jt}) = \pi_1 a_{jt} + \pi_2(\mathbf{1}_{a_{jt}\geq 10}(a_{jt} - 10)) + \pi_3(\mathbf{1}_{a_{jt}\geq 20}(a_{jt} - 20)) + \pi_4(\mathbf{1}_{a_{jt}\geq 30}(a_{jt} - 30)).$
Define $\pi_1 \equiv \lambda_4 + \lambda_1$, $\pi_2 \equiv \lambda_2 - \lambda_1$, $\pi_3 \equiv \lambda_3 - \lambda_2$, $\pi_4 \equiv -\lambda_3$ and plug in to get the equation in the text.

3.3 Estimation

It is well known, that the AKM model is identified off of workers moving between establishments. Restricting to workers in the first year at an establishment does not really affect the precision of these estimates since this still leads to the same number of establishment to establishment transitions. Furthermore the age gradient $\lambda(a_{jt})$ is only identified from workers being hired at different points during an establishment's lifecycle.

In principle one could estimate equation (3.1) directly using the AKM model. The downside is that establishment age is not known for all establishments, e.g. because of missing in formation in the LIAB or because an establishment appeared after an ID change or outsourcing event in the IEBS. E.g. in the IEBS only about 40 percent of workers are working at establishments where the establishment birth (and thus age) is observed. Simply restricting to establishments where establishment age is known, is inefficient. Consider the case where a worker works at establishment A and B and another worker at B and C, but establishment age is only known for A and C. If B is dropped from the sample than neither of these workers contributes anything to the identification. Instead I estimate equation (3.1) in a two step procedure. In the first step, I regress log wages on all individual level variables (including the fixed effect) and establishment by year fixed effects (similar to [Lachowska et al., 2022](#); [Engbom et al., 2022](#)):

$$\log w_{it} = \pi_{jt} + \xi_i + X_{it}\beta + \epsilon_{it} \quad (3.3)$$

This is basically a generalization of the AKM model, that allows for a wage effect that varies by year. From this regression I obtain the predicted establishment-year effects which can be interpreted as the wage premia paid in a given establishment and year. In the second step I then regress this predicted establishment-year effect on the establishment level variables of equation (3.1), as well as year effects:

$$\hat{\pi}_{jt} = \lambda(a_{j(i,t),t}) + \gamma_{j(i,t)} + Z_{j(i,t),t}\alpha + \theta_t + u_{it} \quad (3.4)$$

This two step method is equivalent to estimating (3.1) directly if the sample is the same for estimating equation (3.3) and (3.4). However since establishment age is not available for all observations I restrict the sample in the second step to establishment year cells where establishment age is known (or censored but known to be above the threshold for the plateau). This is more efficient than the single step approach, where the sample would have to be restricted to establishments with non-missing establishment age from the outset.

In this second step I cluster standard errors on the establishment level to take into account that establishment age varies on the establishment level and that there maybe correlation

within establishments over time. I also restrict the estimation to the largest connected set of observations (see [Abowd et al., 1999](#)). In practice this is not very restrictive in the IEBS data and only drops about 5% of observations, but matters substantially where I lose more than half of the observations.

The two step method is much more important for the LIAB data, where the largest connected set is much smaller if immediately drop all establishments with missing age. In the appendix I provide the main results for the IEBS data using a simple 1-step estimation of equation (1) and show that the results are very almost identical to the 2-step approach, just slightly noisier.

4 Results

4.1 The Wage - Establishment Age Relationship

The main results on the establishment age - wage relationship are shown in Table 2. The first column shows estimates of equation (3.1), but only controlling for year effects. In this basic specification the association is positive: young establishments pay substantially lower wages than older establishment and as establishment age increases, wages rise by about 2 percent per year. This wage-establishment age profile becomes flatter when adding industry controls (3 digit) and is reversed when also adding establishment size controls.

The estimates in column (3) may be biased in that many unobservable factors may be correlated with the age variables. One particular concern is that the relationship may be driven by selection. Column (4) therefore adds establishment fixed effects to the regression.

Controlling for unobserved heterogeneity in this way reduces the wage - establishment age gradient in the first 10 years to a decline of 0.7 percent per year. From age 10 to 20 the marginal effect is now also slightly negative, with 0.16 percent wage decrease per year but not statistically significant. Estimates thus still show a strong negative and significant relationship. The estimates suggest that wages paid to newly hired workers are about 9 percent higher in newly born establishments, than in establishments 20 years or older.

The wage - establishment age profile might also be affected by worker selection. For example, young establishments might higher particularly high skilled workers, which could explain the wage premium. Column (5) adds worker fixed effects and worker experience by education profiles to the model to control for unobserved worker characteristics (and thus completing the AKM model). The age gradient in the first 10 years is just slightly reduced, now implying that wages fall by about 0.62 percent per year for the first 10 years and then by about 0.17 percent. This still suggests a wage premium of about 8 percent when comparing a newly born establishment vs. an establishment age 20 or older. It is possible that workers

who move to young establishments take on different task that are reflected in their wages. I therefore add 3 digit occupation effects in Column (3) to see whether young establishments are more likely to hire higher paying observations, but this does not substantially alter the results.

A non-parametric version of this regression, that includes a full vector of establishment age dummies for age 1 to 20 (with larger than 20 being the omitted category) is shown in Figure 1. This non-parametric version confirms the main message of the regression results: Wages are about 9-10 percent higher in new establishments relative to establishments age 20 or older. Furthermore early on there is a clear non-linearity in that wages decline even faster initially and then slowly flattens out as establishments get older. Due to the non-linearity the wage premium in a newly born establishment is actually slightly higher than what one might expect from the spline regression alone.

The pattern could also be generated by another form of selection: it may be that there is heterogeneity in the age wage profiles: Some firms increase their wages over time while other lower theirs. It is conceivable that this heterogeneity is also related to establishment selection, perhaps young establishments in distress lower their wages just before they finally go out of business, while the set of surviving establishments exhibit basically no wage-age profile. This is essentially heterogeneity in the second derivative and thus not controlled for by establishment fixed effects alone. To rule this out, I estimate the same model as in column (6) but restricting (in the second step) to establishments that survived for at least 10 years. This specification is reported in column (7). It appears that this type of selection does not drive the results, as the estimates are very similar to the full sample specifications.¹³

While the IEBS covers the universe of establishments in Germany, the downside is that there is relatively little information about characteristics of the establishment. In Table 3, I therefore show complementary evidence using the LIAB data, where I can observe additional variables from the survey part. To establish a baseline, I first show in column (1) the same specification as Table 2 Column (5), that is controlling for establishment and worker effects, but without adding the additional controls. Since I do observe establishment age (based on survey information) further back, I include an establishment age spline up to age 30. The

¹³Unobserved ability may bias the estimates even when controlling for worker and establishment fixed effects, if ability (or the knowledge about ability) is not constant over a worker's career and transitions between establishments are correlated with the changes. This point has been made in the context of industry and occupation differentials by Gibbons and Katz (1992) and more recently by Gibbons et al. (2005). This could explain the downward sloping establishment age wage profile if returns to ability are higher in new establishments and therefore workers go to new establishments when their ability increases (or when they learn that their ability is higher). Since it is usually assumed that skills are more stable and better known for older workers, this would be more pronounced for younger workers. Since estimating equation 3.1 separately for old and young workers (older and younger than 35 years) gives very similar results for both groups, this story is unlikely to explain the establishment age differentials. See Appendix Figure 8.

results is quite similar to the results from the IEBS. The new establishment pay premium is around 11 percent, just slightly above the IEBS results. In column (2), I add controls for average hours worked at the establishment, collective bargaining coverage, the availability of childcare and value added per worker. These are all possible channels that could explain higher wages in new establishments. However, most of these additional controls do not show statistically significant effects and the wage - establishment age gradient remains very similar. Thus it does not seem that new establishment simply pay more due to longer hours or offer more profit sharing.

While the LIAB data (like the IEBS) is on the establishment level, it does contain information on whether an establishment is part of a multi-establishment firm or constitutes a single-establishment firm. Though in the first case firm age is not known, in the latter case establishment age and firm age coincide. This allows me to indirectly compare the effect of firm age and establishment age on wages, by splitting up the sample in single- and multi-establishment firms. Columns (3) and (4) correspond to the baseline model estimated separately for these two samples. In the single-establishment firm sample the relationship between wages and establishment age (or firm age in this case) is nearly identical to the full sample: negative and large. In the multi-establishment sample the relationship is much smaller and less precisely estimated. This strongly suggests that firm age rather than establishment age is the relevant characteristic. This finding has important implications for understanding possible channels and interpreting the results.

These results provide clear evidence that establishment age is negatively related to starting wages, particularly during the first ten years of an establishment's life.

4.2 Returns to tenure and backloaded compensation

So far the analysis has focused on wages of newly hired workers. It is conceivable that the higher starting wages in new establishments are compensated by slower wage growth and flatter tenure profiles, making the expected cost of hiring a worker over the expected duration of the job the same for new and old establishments. For example, backloaded compensation schemes (Lazear, 1979, 1981) may be more important in older establishments, perhaps because they can more credibly commit to such schemes. Analyzing tenure profiles is also interesting for a second reason: if the differences in starting wages would somehow reflect differences in productivity of the workers, one might expect tenure profiles to be of the same shape in new and old establishments. On the other hand, if the differences in starting wages reflect some sort of rents (e.g., because of search frictions), then one would expect the differences to become weaker over time.

One way to look at this is to see whether the downward sloping wage establishment age -

profile for workers with less than one year of tenure also holds for workers with higher levels of tenure. I therefore reestimate equation 3.1 for all workers (not just the newly hired), including indicator dummies for each tenure $\times$ establishment age combination, instead of just the flexible function for establishment age $\lambda(a_{jt})$.

Figure 2 shows the estimated log wage differentials for different tenure - establishment age combinations. The y-axis shows the log wage differential of a given establishment age $\times$ tenure group relative to workers who are starting in establishments older than 15 years. The figure clearly shows starting wages decline with age, as revealed in the regressions. Furthermore it shows that tenure profiles are steeper in older establishments, indicating that the initial differences do fade over time which is at least suggestive that the initial differences are in part rents.¹⁴ However, the steeper wage growth in older establishments is clearly not large enough to make up for the initial differences.

5 The New Establishment Wage Premium - Compensating for Risk or Search Frictions?

5.1 Risk and compensating differentials

New establishments are characterized by high probabilities of going out of business and this is associated with high risks of job loss to their workers.¹⁵ It seems plausible therefore that the observed differences in starting wages in new establishments are compensating these workers for the unemployment risk. A few papers estimate whether workers in industries or regions with higher unemployment risk get compensated for the increased unemployment risk (e.g. Abowd and Ashenfelter (1980), Diamond and Simon (1990), and Moretti (2000)). While small, this literature found consistent evidence of higher wages in high risk sectors.

If a measure of the risk a worker faces when starting a job with a particular employer were available, then controlling for this should eliminate the observed wage differential between new and old establishments, in so far as this differential is a compensation for the risk. Of course, ex ante risk is not observed directly, and the best proxy for this is estimating the expected probability of business exit (or similar measures) conditional on observables. For example one could calculate the fraction of establishments that go out of business conditional

¹⁴To assess whether differences in returns to tenure are statistically significant, I estimated equation 3.1 for all workers controlling for a quartic polynomial in tenure and an interaction term of tenure and establishment age. The interaction term is statistically significant and positive, indicating again that wages rise faster in older establishments.

¹⁵A large literature on job displacement has shown that workers are scarred for many years after job loss (e.g. Jacobson et al., 1993; Couch and Placzek, 2010; Lachowska et al., 2019). For Germany, Schmieder et al. (2020) show that earnings losses after job loss are as high as 40 percent in the short run and even 15 years after job loss still around 15 percent below pre-displacement earnings.

on establishment age. Unfortunately controlling for this fraction in the described manner does not work without implausibly strong functional form assumptions.¹⁶

This approach can work if risk is predicted using a richer set of variables than just the establishment age. For example if some types of establishments are very stable over their lifetime (e.g., the risk of death is constant), compensating differentials provide no reason for a downward sloping wage - establishment age profile. On the other hand, if the risk of death declines quickly with age then the profile should be steep. Comparing risk profiles with the age-wage profiles for different types of establishments thus provides a test for the compensating differentials hypothesis.

To assess whether new establishments compensate workers for the high layoff risk, I therefore group establishments by initial characteristics, such as size and industry, that are correlated with the age-risk profile of establishments. The top part of Figure 3 plots establishment death rates - the probability for an establishment to go out of business within one year - by establishment age for establishments that started off with less than 30 employees and establishments that started off with more than 30 employees. There is a clear pattern: Initially smaller employers have a very high initial risk of going out of business, which then quickly declines as the establishment gets older. This relationship is much less pronounced for establishments that are initially bigger. If compensating differentials drive the wage differences between new and old establishments, then the pattern should be stronger among establishments that start smaller. The bottom part of Figure 3 shows mean log wages (after adjusting for observables and establishment fixed effects) by establishment age for the same initial size groups. While there is clear heterogeneity in risk profiles by initial size, this does not correspond at all to differences in wage profiles. In fact the wage differentials between new and old establishments appear to be even larger for establishments that start out big.

Figure 4 shows the same type of plots but using industries as the initial characteristic. While the variation in the shape of risk profiles is less pronounced, it is still substantial. Overall there is very little correlation between the risk and the wage profiles. For example in the health sector the death rate declines very rapidly over the first 10 years, but starting wages are essentially flat. The results are similar if instead of establishment death rates, direct estimates for layoff risk or unemployment risk (e.g. average number of days unemployed over the next five years) are used. I interpret this as reasonably strong evidence that risk premia are unlikely to play an important role in explaining the age wage differentials.

To assess whether there is a statistically significant correlation between the risk and the starting wage profiles across different groups of establishments I implement the following

¹⁶This would amount to estimating: $\log w_{it} = \lambda(a_{j(i,t),t}) + f(\hat{P}(\text{exit}|a_{j(i,t),t})) + \dots + \epsilon_{it}$. Clearly $\lambda(\cdot)$ and $f(\cdot)$ are not both non-parametrically identified.

test: First I estimate starting wage profiles by establishment types (1 digit industry and initial size) using the same specification as for the main regressions. This creates estimates of the marginal effect of age on starting wages. Then I estimate the same regressions but putting the risk of going out of business on the left hand side, thus I get estimates of the marginal effect of age on risk. In each specification I estimate 3 slope coefficients for each type of establishment, measuring the marginal effects between age 0 to 5, 6 to 10, and 11 to 15. Finally I regress the slope coefficients that measure the marginal age effect on risk on the slope coefficients that measure the marginal effect on starting wages, controlling for dummies for the 3 age groups of the marginal effects. When I use initial establishment size to categorize establishments, the correlation is positive with a coefficient of 0.05 and a standard error of 0.42. Similarly when I use industry, the coefficient is 0.12 and a standard error of 0.53.¹⁷ Thus the correlation is very weak and far from being statistically significant.

Finally, I also estimate the average risk of establishments going out of business in the next 5 years for 3 digit industry by establishment age groups. I then estimate equation (3.1), include this risk measure as a control variable. Table 4 shows these regressions for the IEBS (Panel A) and LIAB data (Panels B and C), the baseline specifications from Tables 2 and 3 are included in column 1 for comparison. Adding the predicted establishment death risk as a control has virtually no impact on the establishment age - wage relationship.

Overall, there is no evidence that starting wages vary systematically with the risk profile of different establishments.

5.2 Search Frictions and Monopsony

Monopsony models of the labor market predict an upward sloping labor supply curve to the firm, which means there is a positive relationship between the wage a firm pays and its hiring rate of a firm. This could offer a natural explanation for the new establishment pay premium, since new establishments tend to grow rapidly in both relative and absolute terms and in the presence of market frictions (monopsony) might have to pay a premium to attract enough workers.

The literature that explains wage dispersion in a search framework is based on the notion that the number of new hires of establishment depends on the wage paid by the establishment (and vice versa).¹⁸ In [Burdett and Mortensen \(1998\)](#), workers search for jobs both while they are unemployed and while on the job and workers who are employed have higher reservation wages than unemployed workers. Firms that offer higher wages will therefore

¹⁷Standard errors are bootstrapped using the method suggested by [Murphy and Topel \(2002\)](#) to take into account that the right hand side variable is a predicted regressor.

¹⁸Earlier papers that show how wage dispersion can arise as an equilibrium in a search model are [Butters \(1977\)](#) and [Burdett and Judd \(1983\)](#), which focused on one period models.

hire workers at a faster rate because they can draw more workers from the pool of employed workers. In [Acemoglu and Shimer \(2000\)](#) hiring rates also increase with wage offers but the mechanism is different. In their model there is no search by employed workers. Instead unemployed workers can sample one or more job offers at increasing costs. Some workers sample two jobs while the rest sample one job. The workers who sample two jobs have a higher reservation wage.¹⁹ When establishments are allowed to pick different levels of capital (technology), they show that an equilibrium emerges in which establishments with more capital pay higher wages. [Shimer \(2005\)](#) develops a model of coordination frictions in which firms with higher productivity offer higher wages in order to generate a longer queue for their vacancies and thus decrease the probability that a vacancy remains unfilled, or presumably in a dynamic context the time until the vacancy is filled. All three models have in common that establishments face an upward sloping labor supply curve: they can increase their hiring rate by offering higher wages.

There are two reasons why this may result in higher wages for new establishments: differences in demand and supply. If investments are lumpy, an establishment may start with a large upfront investment. In this case there is a high incentive to quickly hire new workers to utilize the capital. Also if there is an ideal size for an establishment, then a new establishment has to grow to reach its ideal size and hire workers for this, while an establishment in steady state is already at its ideal size and just has to replace workers that leave. The other mechanism is that new establishments may be less well known to workers, receive fewer applications, and thus face a steeper labor supply curve. This effect may be strengthened by a very thin labor market in the industry and region where the establishment is located. The Burdett and Mortensen model would imply higher wages in new establishments because they hire a larger fraction of their workers from the pool of on the job searchers. Furthermore it should be the case that what drives the wage differentials are differences in growth rates between establishments.

To test the search frictions theory, I estimate equation (3.1) but include various measures of employment growth in the wage regression.²⁰ If every establishment faces the same labor supply curve, the relevant statistic for capturing the upward sloping supply effect would be the absolute value of total employment growth. However, it is also possible that young (and relatively unknown) establishments have a steeper supply curve since fewer workers sample

¹⁹Although Acemoglu and Shimer do not mention this explicitly, their model implies that in the cross section wage and establishment age are negatively correlated. This is due to the fact that establishments that pay higher wages will find workers faster so they will on average be younger (once they actually have a worker and a wage is observed) than establishments that pay lower wages.

²⁰I only report these regressions for the IEBS data. Using the LIAB data for this is problematic because many establishments are observed for only a few surveys (3.2 on average).

their job offers. In this case the effect might be better captured by a relative measure of employment growth, such as the percentage change, or a measure such as the change in employment between two periods divided by the mean employment in these two periods.

I measure for employment growth using the employment change index used by [Davis et al. \(1996\)](#) - DHS index - is included. This is defined as: $2\frac{L_t - L_{t-1}}{L_t + L_{t-1}}$, where L_t is employment in the period where wages are measured for all workers who entered between t and $t - 1$. This index has the advantage over the more common “percentage change” index: $\frac{L_t - L_{t-1}}{L_t}$, that it is defined even if $L_t = 0$ and is symmetric for growth and decline. It varies between -2 and 2 Where -2 is a drop to 0 (a 100 percent change), and 2 is an increase from 0 (an arbitrarily large increase). Note that for moderate employment changes (e.g. employment growing or shrinking by around 20 percent), this index is fairly close to the percentage change index or simply log employment. Figure 5 (a) shows a histogram of the DHS index by establishment age. Young establishments have much higher employment growth than older establishments and growth rates are skewed to the right (in part because establishments that go out of business are not included mechanically). Figure 5 (b) shows the DHS index by establishment age and shows that very young establishments have much higher growth rates than older establishments.

Table 4 shows the main regression controlling for employment growth. Panel A Column (3) controls for net change in absolute employment: $L_t - L_{t-1}$, shows that controlling for employment growth in the level does have a significant positive effect on wages: fast growing establishments pay higher wages. Controlling for employment growth in levels reduces the age gradient quite a bit. Column (4) shows that this is pattern is even stronger when the DHS index is used: The age gradient is much smaller and statistically insignificant and the growth index has a clear positive effect. The DHS index provides a better fit then the absolute growth measure which indicates some heterogeneity in the labor supply curves.

The DHS index implies that firms that grow by 10 percent pay about 0.2 percent higher wages to new workers. I show a non-parametric version of this in Figure 5 (c) and (d), by including dummies for bins of the DHS index (-2 to -1.95; -1.95 to -1.9 and so on) in main regression specification and plotting the coefficients. The pattern shows very clearly that faster growing establishments pay higher wages and this holds both for new and mature establishments. While the tails of this plot are very noisy (not surprising given the low number of observations in the tails, the pattern seems very consistent in the -.7 to .7 range. Moreover, there seems to be a kink at 0, so that growing establishments pay higher wages the faster they grow, while shrinking establishments do not necessarily pay less.

There are different reasons why workers could have different reservation wages. One of them being that there is on-the-job search and that for employed workers reservation

wages depend on the wage on the current job. If this is the mechanism behind higher wages in new establishments, we should observe that in new establishments a larger fraction of newly hired workers come directly from another job and a smaller fraction comes from the pool of unemployed workers. In my data, in new establishments nearly 70 percent of newly hired workers come directly from previous employment, while in older establishments this fraction declines to 50 percent, so that nearly half of the new workers in old establishment were previously unemployed. In Figure 6 shows how wages develop before and after moving between two establishments conditional on whether or not there was an unemployment spell in between and conditional on whether the establishments were old or new. The figure clearly shows that workers who experience an unemployment spell have a large drop in wages at the new job. On the other hand job-to-job transitions are associated with a roughly 5 percent increase in wages for all transitions except from new to old establishments. Thus the fact that new hires in new establishments are more likely job-to-job transitions clearly explains some of the wage differential. This fits the models of [Burdett and Mortensen \(1998\)](#) and [Shimer \(2005\)](#) very well. However it is not just a composition effect, since job-to-job transitions from old to new establishments are associated with slightly higher wages increases than for old-old transitions, consistent with there being some heterogeneity in reservation wages among on-the-job searchers. Taken together these results point to the importance of search frictions in explaining the wage - establishment age gradient.

My result that fast growing firms pay higher wages may also explain the finding by [Davis et al. \(2009\)](#) that fast growing firms have a higher vacancy yield, i.e. hire more workers per vacancy in a given time period. Davis et al. do not have data on wages, but my findings suggest, that the higher vacancy yield may be caused by fast growing firms paying higher wages thus inducing more workers to apply (or to accept offers). Which would be exactly the [Shimer \(2005\)](#) prediction.

5.3 The Elasticity of Labor Supply to the Firm

Note that interpreting the coefficient on the growth rate in Table 4 Column (4) as the slope of the labor supply curve is problematic due to the classic endogeneity bias of estimating supply-demand systems with OLS. Firms may grow faster when they can do so more cheaply and thus changes in the growth rate on wages captures both movements along the demand and the supply curve. Thus the coefficient on employment growth is likely biased downwards. If however the reason that new establishments pay higher wages is only a reflection of their higher growth and establishment age does not affect wages (conditional on the controls) through other channels, then establishment age is a valid instrument for establishment growth and can be used to get consistent estimates for the slope of the labor supply curve. Table 4

Column (5) shows the OLS estimate of the slope of the labor supply curve, i.e. without controlling for establishment age, which is very similar to Column (4). Column (5) reports the IV estimate, where I instrument the DHS index with the establishment age splines. The estimated coefficient is nearly three times as big. This relies on the strong assumption that the labor supply curve (measured as starting wages relative to growth rates) does not vary with establishment age, so that these IV estimates should be viewed with caution and probably as upper bounds. The slope of the labor supply curve implies economically significant wage differentials at very high growth rates. For example an establishment that grows by 100 percent would be predicted to pay about 3 percent higher wages.

While the search frictions described above are a convenient explanation of the observed patterns, there are alternative explanations. Before, I argued that new establishments have high demand for labor, as shown by the high growth rate. Because labor supply is upward sloping they hire more workers if they offer a higher wage. One consistent explanation for the upward sloping labor supply being on the job search. However there may be other reasons why new establishments hire more on the job searchers and thus pay higher wages.

While this paper provides evidence on a variety of plausible channels, there are other possible explanations that are difficult to test for such as the role of efficiency wages. For example, in the shirking model of [Shapiro and Stiglitz \(1984\)](#), wage differentials arise because of heterogeneity in monitoring costs between employers. It is possible that older establishments have better monitoring technologies (that could range from controlling procedures to experienced managers) and thus can extract more effort from their workers for a wage. Similarly a link between establishment age and wages could arise because of fairness perceptions ([Akerlof and Yellen, 1990](#)). Such perceived fairness might depend on the profit situation of the employer. Similar implications arise from standard search models with wage bargaining, such as in [Pissarides \(2000\)](#). If younger establishments have higher profitability, then there are more rents to bargain over and they may pay higher wages. However, it is questionable whether new establishments have higher profits (E.g. [Pakes and Ericson \(1998\)](#) suggest otherwise).

6 Concluding Remarks

This paper offers two main contributions. First it shows that there is a strong negative relationship between establishment age and wages that is robust to the inclusion of very detailed controls and not driven by selection of establishments or workers. The magnitude of this wage differential is large: a worker who starts a job at a new establishment earns wages that are 9 percent higher than if the same worker would start at the same

establishment around 20 years later (taking into account the time effect). The empirical evidence strongly favors the interpretation that the wage differences reflect true differences in labor costs that new establishments face. While the data is on the establishment level, the relationship only holds in single establishment firms, and not in establishments that are part of larger corporations.

The second contribution is the investigation of various possible channels that may cause the differences in wages. *A priori*, it seems plausible that new establishments (or firms) compensate workers for the higher risk of job loss, but this is not supported by a closer investigation of the data. Even in industries where the risk of job loss remains essentially constant as an establishment becomes older, starting wages show a strong decline. This is interesting in its own right given the long standing literature on compensating differentials. While previous papers have also found it difficult to show compensating differentials empirically, this has often been blamed on measurement problems and insufficient data. In the context of new establishments, there is clear variation in employment risk which may be more exogenous than the inter-industry or inter-region variation used in other papers. Nevertheless, I find no indication for a risk premium in high risk firms, which suggests that such premiums are not important in practice (at least in Germany).

On the other hand, the paper provides suggestive evidence that search frictions are a plausible explanation for the wage differentials. In particular, fast growing establishments pay higher wages, presumably to attract enough workers. This is partly because they hire more workers from the pool of job-to-job movers and less from the unemployed, which fits quite well with search models that exhibit features of monopsony power in the labor market. This type of search frictions has potentially important implications for the economy in general since it may prevent new firms from quickly taking up a sizable work force and thus make adjustments over the business cycle more difficult.

Overall, the findings in this paper emphasize the importance of wage premia and wage dispersion, consistent with the results from the recent literature showing that employer based wage premia make up for an important part of the wage structure.

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Tables

Table 1: Means and Standard Deviations of Main Variables

	All	IEBS Data Age <10 Years	Age ≥10 Years	All	LIAB Data Age <10 Years	Age ≥10 Years
Panel A: Establishment Level Variables						
Establishment Age				18.00 [14.86]	5.410 [2.426]	27.14 [13.35]
Establishment Size: Tot Number Workers	169 [761]	61 [192]	204 [910]	279 [915]	117 [389]	397 [1140]
Employment growth rate	0.041 [0.17]	0.14 [0.25]	0.017 [0.12]	0.0089 [0.23]	0.038 [0.28]	-0.0070 [0.19]
Revenue in Million Euro				92.23 [2629.6]	30.03 [428.8]	137.3 [3433.6]
Investments in Million Euro				3.489 [46.90]	1.375 [17.83]	5.051 [59.87]
Value added in Million Euro				19.37 [91.45]	7.699 [49.58]	28.06 [112.2]
Revenue per Worker in Thousand Euro				209 [1694]	170 [1000]	237 [2054]
Investment per Worker in Thousand Euro				8.74 [50.8]	9.50 [70.0]	8.18 [29.4]
Export share in percent				11.09 [24.38]	7.595 [21.52]	13.79 [26.06]
Employment growth				-6.127 [126.9]	-0.902 [85.82]	-9.026 [144.7]
Unfilled vacancies during last 6 months				0.085 [0.28]	0.11 [0.31]	0.071 [0.26]
Overtime Yes / No				0.66 [0.47]	0.57 [0.50]	0.72 [0.46]
Hours per week for fulltime workers				38.6 [2.43]	39.2 [2.21]	38.2 [2.50]
Number of Establishments	1.3 million	0.4 million	0.9 million	32138	13517	18621
Panel B: Worker Level Variables						
Age in Years	33.1 [10.1]	36.1 [10.1]	33.1 [9.8]	34.6 [10.4]	36.8 [11.0]	33.4 [9.81]
Female	0.55 [0.50]	0.41 [0.49]	0.57 [0.49]	0.30 [0.46]	0.35 [0.48]	0.28 [0.45]
Foreign	0.11 [0.31]	0.14 [0.35]	0.10 [0.30]	0.11 [0.31]	0.082 [0.27]	0.13 [0.33]
Real Wage	65.4 [83.6]	63.9 [32.8]	65.8 [91.5]	72.5 [33.1]	61.6 [31.9]	78.5 [32.1]
Education: no vocational training	0.17 [0.38]	0.17 [0.37]	0.18 [0.38]	0.16 [0.37]	0.13 [0.34]	0.17 [0.38]
Education: vocational / apprenticeship	0.59 [0.49]	0.53 [0.51]	0.61 [0.49]	0.56 [0.50]	0.58 [0.49]	0.54 [0.50]
Education: college or university	0.11 [0.31]	0.071 [0.260]	0.12 [0.32]	0.18 [0.39]	0.14 [0.35]	0.21 [0.40]
Number of Workers	17.1 million	2.3 million	14.8 million	563900	200287	363613

Notes: Mean of main variables, standard deviations in brackets. The first three columns correspond to the IEBS Data. The last three to the LIAB data.

Table 2: The Decline of Starting Wages as New Establishments Grow Older - IEBS Data

	(1) No Controls	(2) Industry FE	(3) Industry FE & Estab. Size	(4) Estab. FE	(5) Estab. and Worker FE	(6) Estab. FE, Worker FE, Occ.	(7) Balanced Sample (Survive 10 y.)
Marg. Effect of Establishment Age	0.0211**	0.0110**	-0.00118**	-0.00732**	-0.00621**	-0.00601**	-0.00631**
0<=Age<10	(0.00091)	(0.00085)	(0.000648)	(0.00135)	(0.00110)	(0.00108)	(0.00123)
Marg. Effect of Establishment Age	0.00211	0.00131	0.00549	-0.00161	-0.00170	-0.00156	-0.00161
10<=Age<20	(0.00164)	(0.00279)	(0.0098)	(0.00164)	(0.00120)	(0.00112)	(0.00223)
Establishment Size: Tot Number Workers			0.00600**	-0.000356*	0.000736**	0.000843**	0.000841**
			(0.000198)	(0.000149)	(0.000175)	(0.000172)	(0.000176)
Est Size Spline:			-0.00663**	0.000295	-0.000527**	-0.000731**	-0.000723**
(Size - 30)*1(Size≥30)			(0.000280)	(0.000162)	(0.000191)	(0.000221)	(0.000221)
Est Size Spline:			0.00236**	0.000220*	-0.00000419	-0.0000034	-0.0000031
(Size - 100)*1(Size≥100)			(0.000276)	(0.0000908)	(0.0000925)	(0.0000851)	(0.0000847)
Est Size Spline:			-0.00167**	-0.000127*	-0.000129*	-0.000142*	-0.000148*
(Size - 300)*1(Size≥300)			(0.000194)	(0.0000632)	(0.0000588)	(0.000062)	(0.000061)
Establishment FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Worker FE	No	No	No	No	Yes	Yes	Yes
Industry FE (3 digit)	No	Yes	Yes	No	No	No	No
Occupation FE (3 digit)	No	No	No	No	No	Yes	Yes
Number of Observations in First Estimation Step:							
Number of Individuals	32.8 million	32.8 million	32.8 million	32.8 million	32.8 million	32.8 million	32.8 million
Number of Establishments	2.1 million	2.1 million	2.1 million	2.1 million	2.1 million	2.1 million	2.1 million
Number of Estab/Year Cells	7.9 million	7.9 million	7.9 million	7.9 million	7.9 million	7.9 million	7.9 million
Number of Observations in Second Estimation Step (Estab. age non-missing):							
Number of Individuals	17.1 million	17.1 million	17.1 million	17.1 million	17.1 million	17.1 million	11 million
Number of Establishments	1.3 million	1.3 million	1.3 million	1.3 million	1.3 million	1.3 million	0.9 million
Number of Estab/Year Cells	4.3 million	4.3 million	4.3 million	4.3 million	4.3 million	4.3 million	3.5 million

Notes: Standard errors clustered on establishment level, * P-value ≤ 0.05 , ** P-value ≤ 0.01 . Dependent variable is log of daily wage for fulltime workers with less than 1 year of tenure. All regressions control for year effects. The first step of the estimation uses all fulltime workers in the largest connected set. The second step (where the reported coefficients are based on) is then restricted to establishments where the establishment age is known and that came into existence as a new establishment. See text for details. Column (7) restricts the sample to establishments that survived at least 10 years. Data: IEBS (1993-2009).

Table 3: The Decline of Starting Wages as New Establishments Grow Older - LIAB Data

	(1) Full Sample Baseline Controls	(2) Full Sample Add. Controls	(3) Single Establ. Firms	(4) Multi Establ. Firms
Marg. Effect of Establishment Age 0<=Age<10	-0.0090** (0.0022)	-0.0095** (0.0024)	-0.0105** (0.0027)	-0.0027 (0.0042)
Marg. Effect of Establishment Age 10<=Age<20	-0.0047* (0.0024)	-0.0048* (0.0021)	-0.0052 (0.0035)	-0.0032 (0.0054)
Marg. Effect of Establishment Age 20<=Age<30	0.0024 (0.0039)	0.0026 (0.0041)	0.0039 (0.0051)	-0.000021 (0.0056)
Establishment Size: Tot Number Workers	0.00016 (0.0013)	0.00019 (0.0012)	0.0013 (0.0011)	-0.0048 (0.0028)
Est Size Spline: (Size - 30)*1(Size≥30)	0.000082 (0.0011)	0.000102 (0.0016)	-0.00097 (0.0013)	0.0049 (0.0031)
Est Size Spline: (Size - 100)*1(Size≥100)	-0.00016 (0.00041)	-0.00019 (0.00038)	-0.00017 (0.00039)	-0.00041 (0.00049)
Est Size Spline: (Size - 300)*1(Size≥300)	0.000012 (0.00016)	0.000014 (0.00014)	-0.00011 (0.00018)	0.00032 (0.00023)
Hours per week		0.0019 (0.0013)	0.0017 (0.0016)	0.00086 (0.0024)
Overtime Hours Paid 1st 6 month		0.00032* (0.00013)	0.00024 (0.00014)	0.00043 (0.00027)
Worked Overtime		-0.011 (0.0068)	-0.012 (0.0079)	-0.00044 (0.011)
Work Council		0.0091** (0.0042)	0.0092 (0.0051)	0.0068 (0.040)
Log(Value Added per Worker)		0.049 (0.026)	0.061 (0.035)	0.041 (0.031)
Company provided child care		0.0003 (0.0065)	0.0013 (0.0082)	-0.032 (0.080)
Establishment FE	Yes	Yes	Yes	Yes
Worker FE	Yes	Yes	Yes	Yes
Occupation FE (3 digit)	Yes	Yes	Yes	Yes
Number of Observations in First Estimation Step:				
Number of Individuals	1.5 million	1.5 million	1.5 million	1.5 million
Number of Establishments	14211	14211	14211	14211
Number of Estab/Year Cells	42377	42377	42377	42377
Number of Observations in Second Estimation Step (Estab. age non-missing):				
Number of Individuals	0.5 million	0.5 million	0.3 million	0.2 million
Number of Establishments	10071	10071	8165	2398
Number of Estab/Year Cells	32077	32077	24223	7854

Notes: Standard errors clustered on establishment level, * P-value ≤ 0.05 , ** P-value ≤ 0.01 . Dependent variable is log of daily wage for fulltime workers with less than 1 year of tenure. All regressions control for year effects. The first step of the estimation uses all fulltime workers in the largest connected set. The second step (where the reported coefficients are based on) is then restricted to establishments where the establishment age is known and that came into existence as a new establishment. See text for details. In Columns (2) to (4) Establishments with missing hours and overtime were included together with a dummy for whether the information was missing (not reported). Columns (4) restricts the sample to establishments that survived at least 10 years. Data: LIAB (1993-2005).

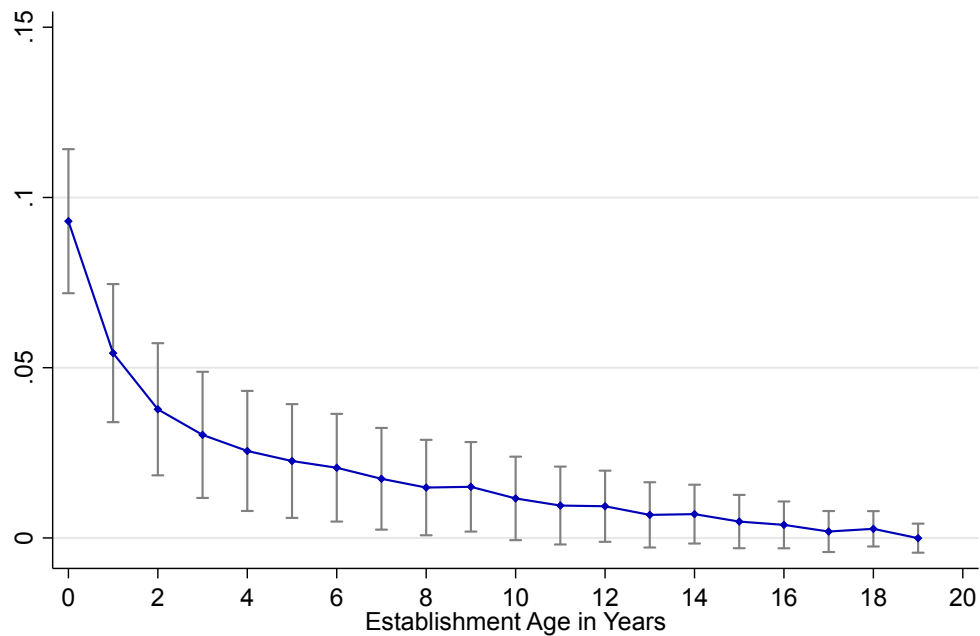
Table 4: The Effect of Employment Growth on Wages of Newly Hired Workers

	(1) OLS Worker and Estab. FE	(2) OLS Worker and Estab. FE	(3) OLS Worker and Estab. FE	(4) OLS Worker and Estab. FE	(5) OLS Worker and Estab. FE	(6) IV Instrument: Estab. Age	(7) OLS Restricted Estab. older 20 years
Panel A: IEBS Data							
Marg. Effect of Estab Age 0<=Age<10	-0.0062** (0.0012)	-0.0063** (0.0012)	-0.0032** (0.0012)	-0.0023 (0.0014)			
Marg. Effect of Estab Age 10<=Age<20	-0.0017 (0.0012)	-0.0016 (0.0012)	-0.0009 (0.0011)	-0.0009 (0.0011)			
Predicted Estab. Death Risk		0.0031 (0.0044)					
Net change in absolute employment $L_t - L_{t-1}$			0.000069** (0.000012)				
DHS Index for emp. growth $2(L_t - L_{t-1})/(L_t + L_{t-1})$				0.017** (0.0011)	0.019** (0.0011)	0.051** (0.009)	0.019** (0.0015)
F-Stat Excl Instruments First Stage						94.12	
Observations in Second Step:							
Number of Individuals	17.1 million	17.1 million	17.1 million	17.1 million	17.1 million	17.1 million	11.1 million
Number of Establishments	1.3 million	1.3 million	1.3 million	1.3 million	1.3 million	1.3 million	0.6 million
Number of Estab/Year Cells	4.3 million	4.3 million	4.3 million	4.3 million	4.3 million	4.3 million	3.3 million
Panel B: LIAB Data - Single Establishment Firms							
Marg. Effect of Estab Age 0<=Age<10	-0.0105** (0.0027)	-0.0104** (0.0028)	-0.066** (0.0031)	-0.045** (0.0031)			
Marg. Effect of Estab Age 10<=Age<20	-0.0052 (0.0035)	-0.0053 (0.0035)	-0.0028 (0.0035)	-0.0025 (0.0045)			
Marg. Effect of Estab Age 20<=Age<30	0.0039 (0.0051)	0.0038 (0.0052)	0.0029 (0.0051)	0.0018 (0.0051)			
Predicted Estab. Death Risk		0.0051 (0.024)					
Net change in absolute employment $L_t - L_{t-1}$			0.00012* (0.00007)				
DHS Index for emp. growth $2(L_t - L_{t-1})/(L_t + L_{t-1})$				0.021** (0.0041)	0.022** (0.0040)	0.057** (0.02)	0.023** (0.0054)
F-Stat Excl Instruments First Stage						31.3	
Observations in Second Step:							
Number of Individuals	0.3 million	0.3 million	0.3 million	0.3 million	0.3 million	0.3 million	
Number of Establishments	8165	8165	8165	8165	8165	8165	
Number of Estab/Year Cells	24223	24223	24223	24223	24223	24223	
Panel C: LIAB Data - Multi Establishment Firms							
Marg. Effect of Estab Age 0<=Age<10	-0.0027 (0.0042)	-0.0028 (0.0041)	-0.0023 (0.0045)	-0.0022 (0.0046)			
Marg. Effect of Estab Age 10<=Age<20	-0.0032 (0.0054)	-0.0031 (0.0053)	-0.0021 (0.0056)	-0.0017 (0.0059)			
Marg. Effect of Estab Age 20<=Age<30	-0.000021 (0.0056)	-0.000020 (0.0056)	-0.000011 (0.0058)	-0.000010 (0.0060)			
Predicted Estab. Death Risk		0.0046 (0.034)					
Net change in absolute employment $L_t - L_{t-1}$			0.00018* (0.00008)				
DHS Index for emp. growth $2(L_t - L_{t-1})/(L_t + L_{t-1})$				0.022** (0.009)	0.022** (0.009)	0.037 (0.03)	0.024** (0.008)
F-Stat Excl Instruments First Stage						12.12	
Observations in Second Step:							
Number of Individuals	0.2 million	0.2 million	0.2 million	0.2 million	0.2 million	0.2 million	
Number of Establishments	2398	2398	2398	2398	2398	2398	
Number of Estab/Year Cells	7854	7854	7854	7854	7854	7854	

Notes: Standard errors clustered on establishment level, * P-value ≤ 0.05 , ** P-value ≤ 0.01 . Dependent variable is log of daily wage. Regressions estimate the marginal effect of establishment age on wages of newly hired workers. Negative coefficients on the age variables indicate that starting wages are declining as establishments get older. The instruments in Column (6) is the spline function of age that is used in Columns (1)-(4). Column (7) is the same as Column (5) but restricts the sample to establishments older than 20 years. Controls are the same as in Table 2 Column (3).

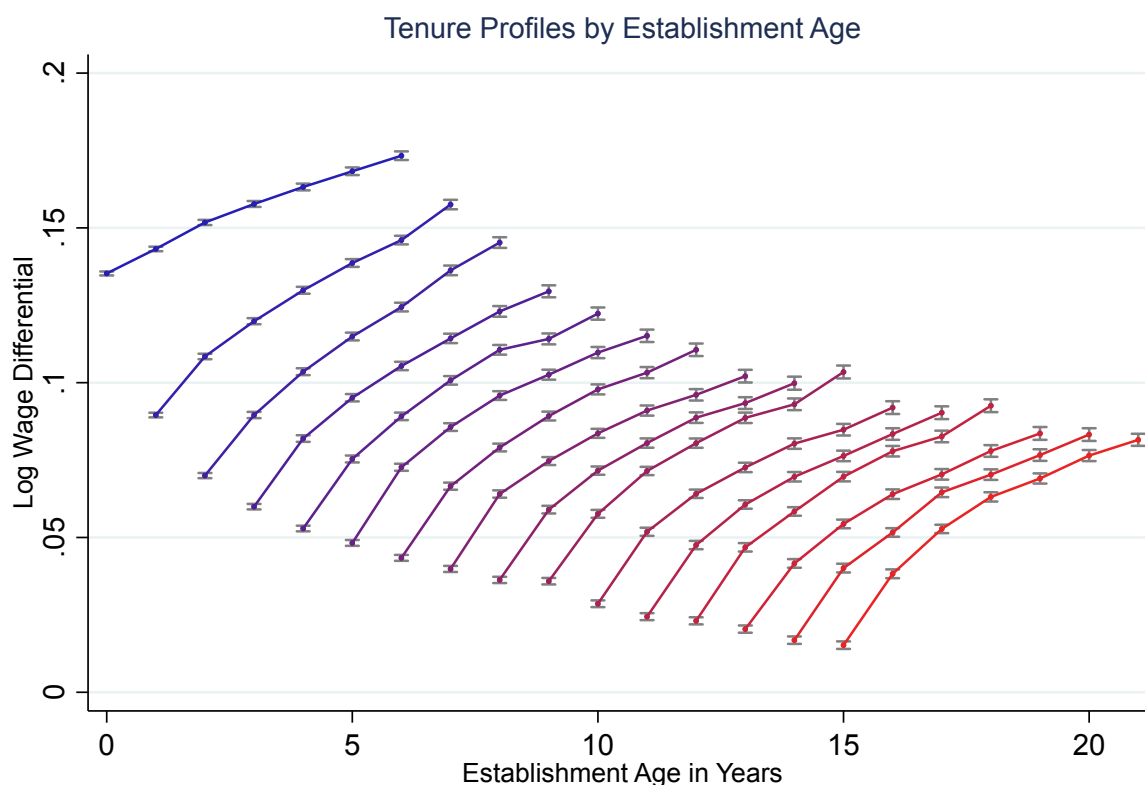
Figures

Figure 1: The Wage - Establishment Age Profile for Newly Hired Workers IEB data



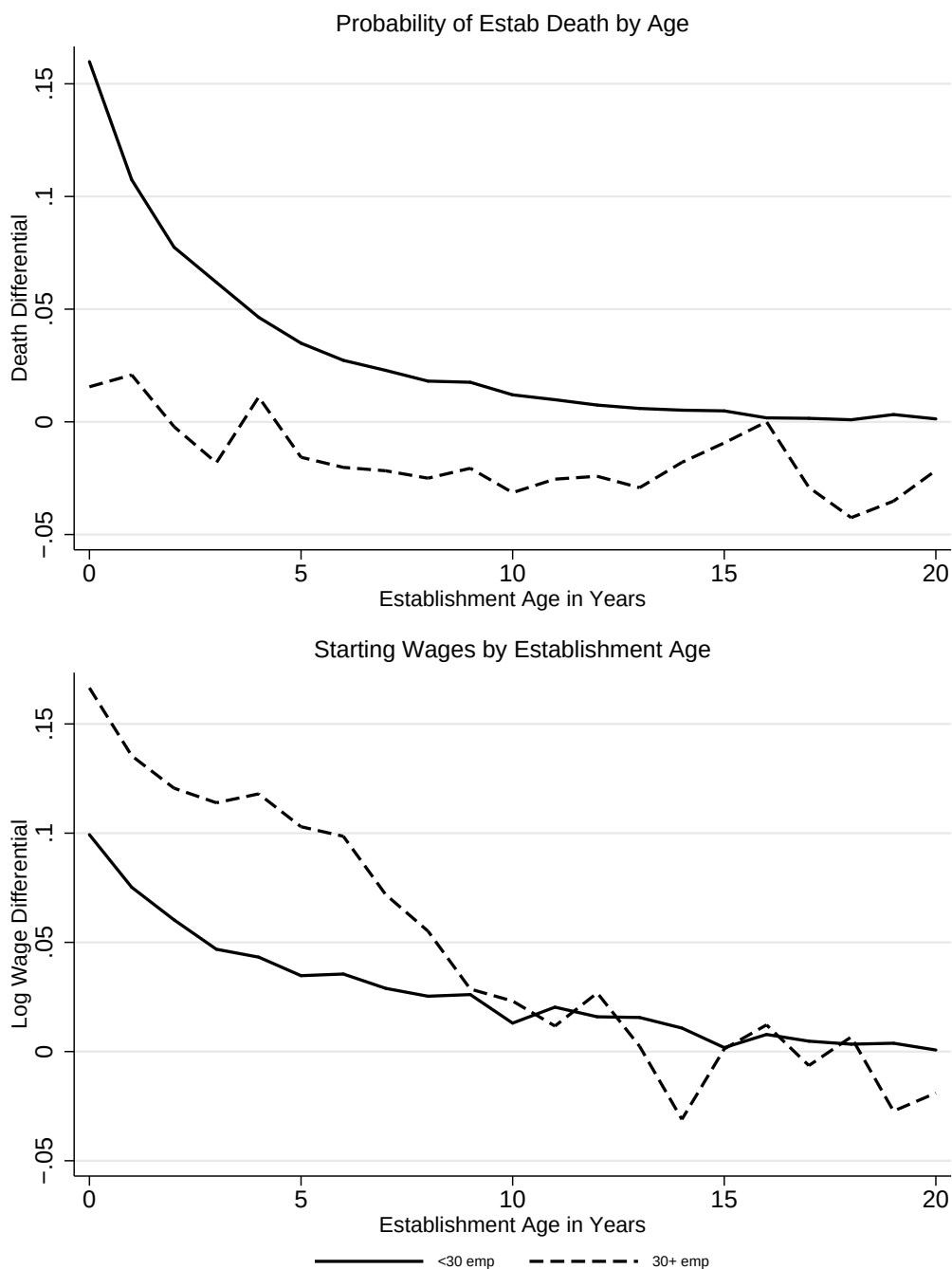
Notes: The figure shows how log real wages of newly hired workers vary by establishment age after controlling for establishment effects, worker fixed effects, worker experience by education profiles and establishment size.

Figure 2: The Variation of Wage-Tenure-Profiles by Establishment Age - Regression Estimates Controlling for Establishment Fixed Effects



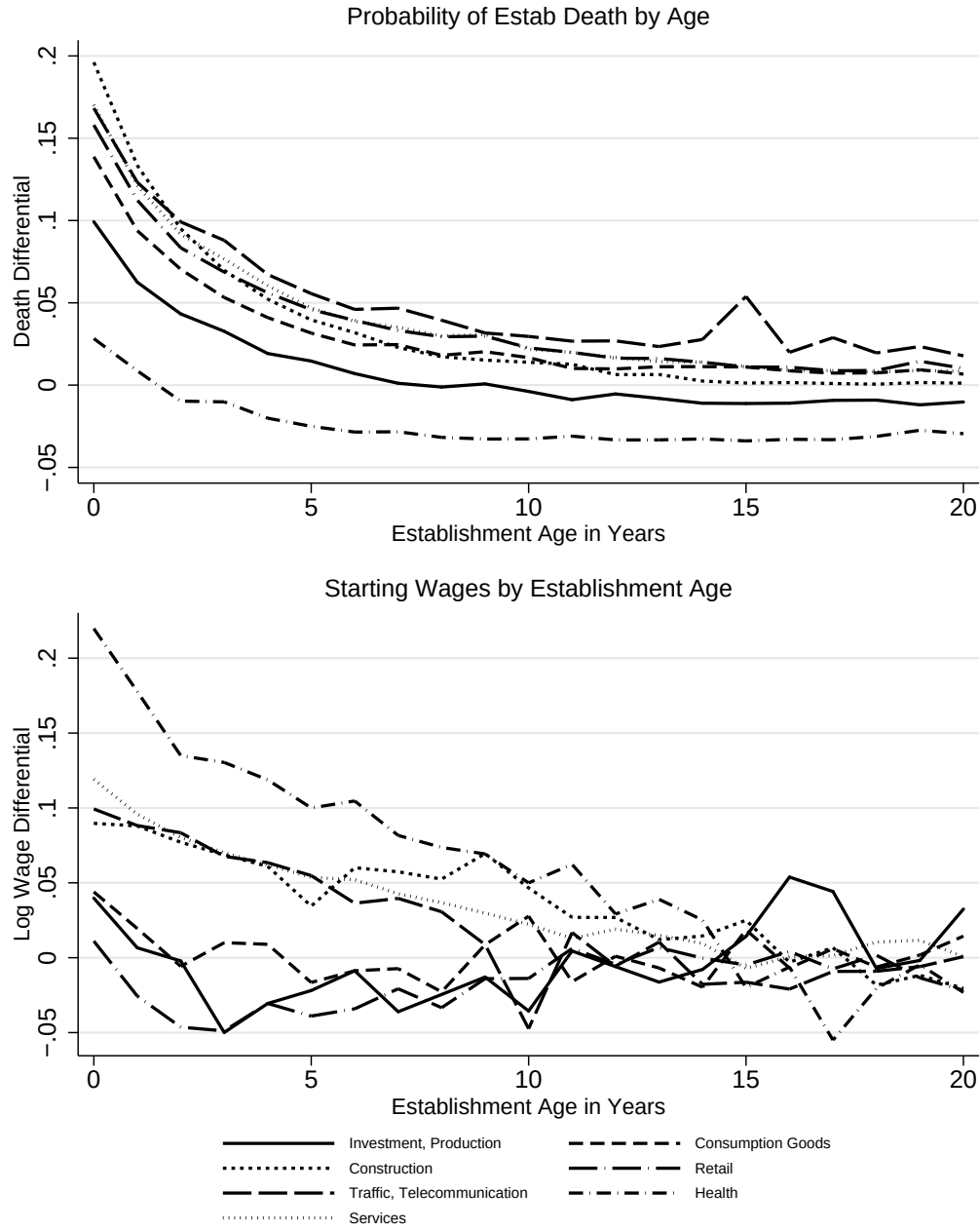
Notes: Each line represents the tenure profile of a cohort of workers starting at a specific establishment age. The points are connected so that each line represents the tenure profile of one cohort. For example, the first line to the left shows the tenure profile of the cohort of workers that start working at an establishment when it is newly created. The next line the cohort that starts one year later, and so on. The figure is created by regressing wages on a complete set of tenure - establishment age interactions and connecting the estimated coefficients to tenure profiles. The regression controls for worker and establishment fixed effects as well as experience by education profiles. The omitted category for the interactions are new workers in establishments age >15 years.

Figure 3: Comparing Risk and Wage-Establishment Age Profiles by Initial Employment to Assess Compensating Differentials Hypothesis



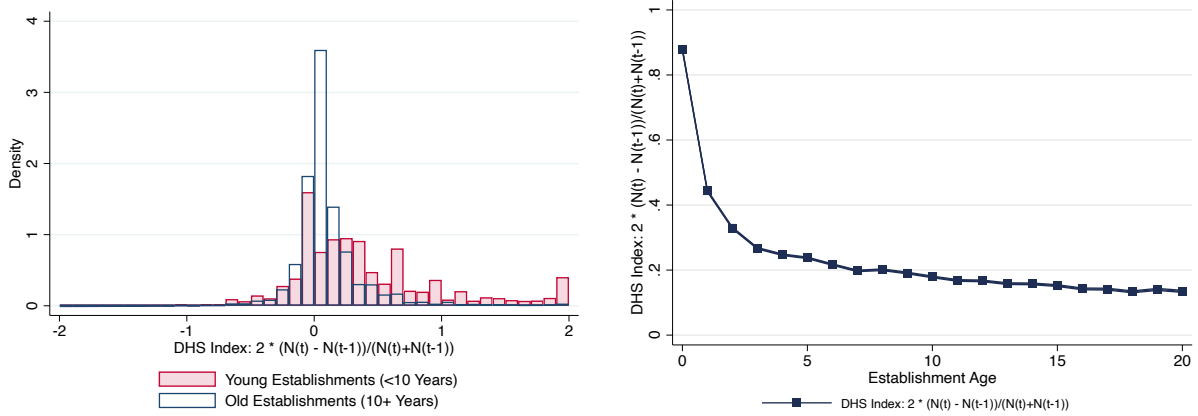
Notes: The top figure shows how the risk of going out of business declines with establishment age for establishments with different initial size. The bottom figure shows the same for starting wages. The lines are created from regressions with a complete set of establishment age dummies for each group. The regressions control for establishment fixed effects and the individual controls in Table 2 Column (6). The differentials are relative to establishments age 20 or above.

Figure 4: Comparing Risk and Wage-Establishment Age Profiles by Industry to Assess Compensating Differentials Hypothesis

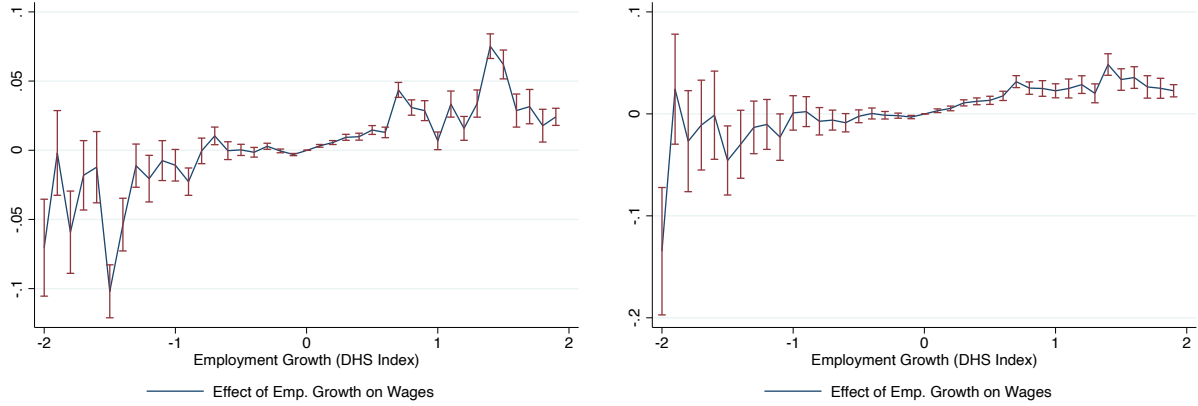


Notes: The top figure shows how the risk of going out of business declines with establishment age for establishments in different industries. The bottom figure shows the same for starting wages. The lines are created from regressions with a complete set of establishment age dummies for each group. The regressions control for establishment fixed effects and the individual controls in Table 2 Column (6). The differentials are relative to establishments age 20 or above.

Figure 5: The Relationship between Starting Wages and Establishment Growth



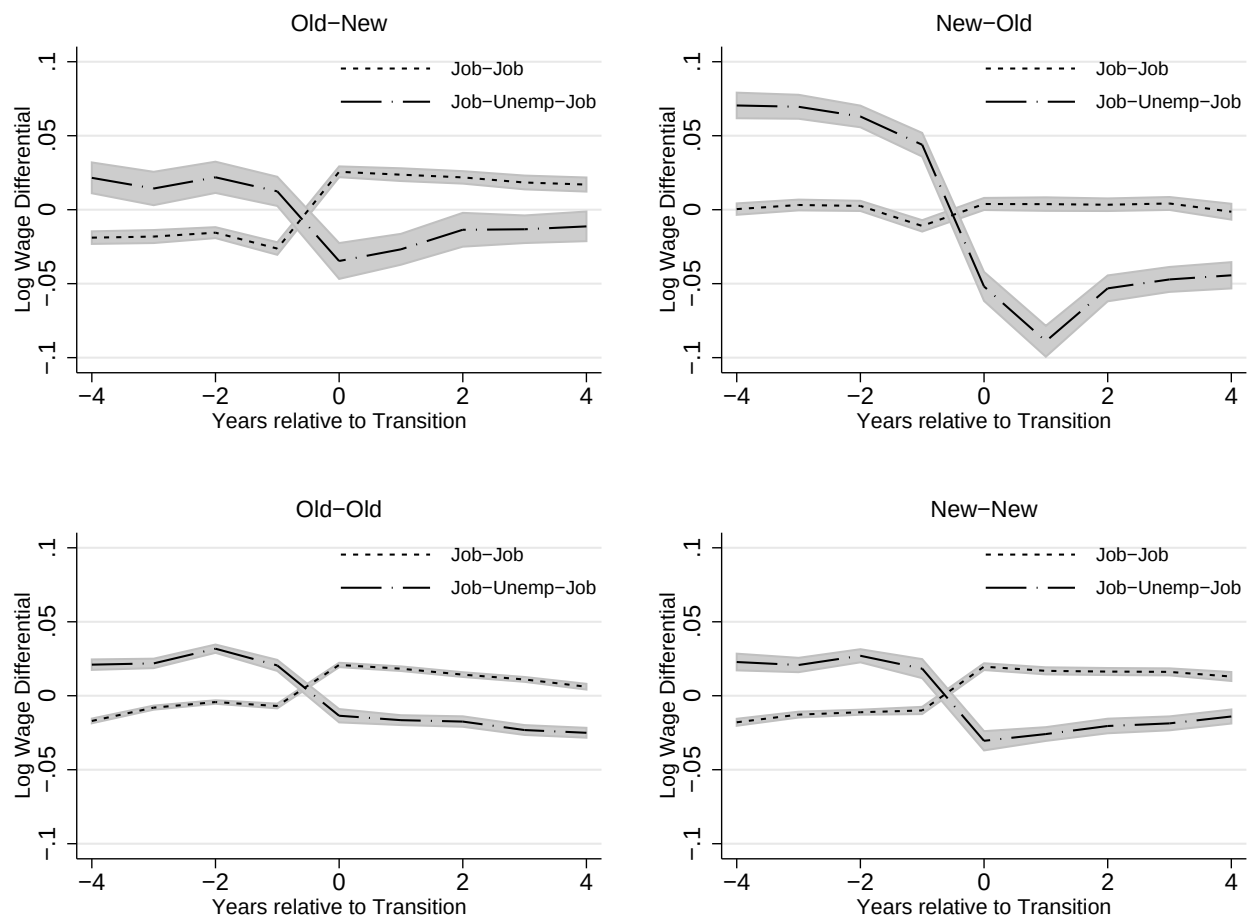
(a) Histogram of Employment Growth (DHS Index) (b) Average Employment Growth (DHS Index) by Estab. Age



(c) Effect of Emp. Growth on Starting Wages - Young Estab (Age≤10) (d) Effect of Emp. Growth on Starting Wages - Mature Estab (Age≥20)

Notes: The figures plots coefficients from regressing log wages of new workers on a vector of dummies for establishment growth bins (measured as the DHS Index: $2(L_t - L_{t-1}) / (L_t + L_{t-1})$). The regression also controls for establishment size, establishment fixed effects, worker fixed effects, experience by education polynomials and occupation. Vertical bars represent 95 percent confidence intervals.

Figure 6: Wage Trajectories of Job Movers before and after Transitions between Establishments



Notes: The figures plot average residual wages (i.e. after controlling for age, experience, year effects and worker fixed effects) before and after transitions between establishments conditional on whether the transition was a job-job transition or a job-unemployment/nonemployment-job transition. Year 0 is the year in which a worker starts working at the new establishment. New establishments are establishments age 0 to 8, old establishments all other establishments.

A Web Appendix - For Online Publication Only

A.1 Data appendix

The Linked Employer-Employee Data: LIAB

The LIAB is a dataset generated by the Federal Employment Agency of Germany (BA). The core of the LIAB is an establishment level panel dataset based on extensive interviews with the managers. This panel data is then linked with individual level administrative data from the German social security system.

The surveys are extensive and include questions on workforce composition and development, revenues, development of profits (whether got better or worse), investments, innovations, public subsidies, training programs, apprenticeship training, methods of employee recruitment, new positions, vacancies, overall wages, average time worked, overtime worked, trade relations, etc. Apart from these regular questions that are asked in every year, there is a special questionnaire each year with shifting focus.

Due to confidentiality reasons the dataset can only be accessed through special work stations at the Research Data Center of the German Federal Employment Agency at the Institute for Employment Research (IAB) in Nuremberg. However after using the dataset on site, one can access the data remotely by submitting code which is run on the local server and the log files are returned. Usage of the dataset is free to academic researchers.

The sample design is a random sample stratified by establishment size, so that sampling probability is approximately proportional to number of employees. In 1996, establishments in East Germany were added for the first time. Furthermore in every year establishments were added to the sample to make up for attrition, to account for newly founded establishments and to make the data more informative. This causes the aggregate time series to be quite inconsistent (e.g. establishment age is declining with time). The initial response rates to the surveys were about 70 percent, roughly constant across establishment size. Establishments that were re-interviewed had a response rate of 80 percent or more. On the establishment side, there are between about 4,000 and 15,000 observations per year. The large variations are caused by sample attrition and expansion of the sample in later years.

The link to worker level data is done in the following way: for every establishment year observation (one interview) the information for all workers at this establishment on June 30th of that year is provided. So, for example, if establishment X has 100 employees in year 1993, then in 1993 there are 100 records for this establishment, one for each worker. These worker level records have information on education, age, sex, nationality, wage, occupation, tenure, and experience. In year 1994 I would have all workers at that establishment again

and since the personal identifier remains the same across years, I can see who stayed at the establishment and who did not't. This allows me to follow workers while they are in establishments in the sample, but I don't know anything about their previous or past work history (apart from tenure and experience). In this version there are about 27 million worker observations.

Measuring Establishment Age

The establishment survey asks a variety of questions relating to when the establishment was created and under what circumstances (e.g. whether it was truly a new establishment creation or rather a change of ownership). During the 12 periods of the version of the LIAB I am using, the question format changed a number of times. In the early waves the respondents were asked whether the establishment was created before or after 1960 and only in the latter case the exact year of foundation was inquired. In the latter waves (after 1997), it was asked whether foundation happened before or after 1990 and only for the establishments after 1990 the exact year of birth was recorded. Furthermore there is a high non-response rate for this question, so that only for a subset of establishments I observe exact establishment age, for another subset I observe establishment age censored at 1960 or 1990 and for the remaining establishments I don't observe it at all. In my analysis I use only the establishment for which I know the exact age plus those that have age censored in 1960. I throw out all establishments that indicated that the given birth year was not really the creation of the establishment. I also only keep establishments that are independent companies or branches of larger companies, this excludes company headquarters and midlevel management units. Furthermore I only keep private businesses, throwing out public services and NGOs.

One possible concern is the quality of the establishment age variable. One advantage of having access to survey as well as administrative data on the establishment level is that it is in fact possible to do some cross checks on the reliability of this variable. I received permission to link the survey data to the establishment data and compare how the birth year derived from the interview question matches with the birth year derived from the first time an employer employs a social security liable worker. As mentioned in the data section a problem in this data is that spurious establishment ID changes occur. Using data on worker flows I managed to eliminate many of these spurious ID changes and was left with a set of establishments for which the first appearance of the ID seemed to reflect a new employer. Figure 9 shows a scatter plot of the birth years derived from the survey and the administrative data for all firms that could be matched up. I added some random noise to the birth-year variables so it is possible to see where the mass of observations is. Note that the administrative data starts in 1975 and for a subset of establishments the survey question

was left censored at 1990, thus the rectangular appearance. While there are a considerable number of firms where the administrative data and the survey data give different birth years, the vast majority of establishments is pretty close to the 45 degree line. It is not surprising that there are a significant number of establishments that have an older survey data birth year than administrative birth year, since this may reflect that an establishment can be started without immediately hiring workers which are covered by social security. Overall the graph supports the notion that the establishment age measured in either datasets does capture something real, though somewhat noisy. As a further robustness check I ran the main specifications of this paper again using a) only the administrative data birth year and b) only establishments for which the administrative data and the survey data gave birth years less than 2 years apart. Though the sample size is reduced, the main results are all robust to this and available on request.

A.2 Appendix Tables

Table A-1: Size Transition Matrix for Establishments Entering in 1990

Size 1990	Establishment Size in 1995							Death	Total
	1-3	4-10	11-20	21-30	31-50	51-100	101+		
1-3	37688	10536	1320	264	154	77	64	51168	101271
4-10	726	1712	567	147	69	32	/	2234	5487
11-20	35	93	182	85	48	41	/	416	900
21-30	/	/	28	42	44	/	/	91	205
31-50	/	/	/	/	28	34	/	51	113
51-100	/	/	/	/	/	31	/	/	31
101+	/	/	/	/	/	/	/	/	0
Total	38449	12341	2097	538	343	215	64	53960	108007

Data: BHP, West Germany. The “/” indicates that there are less than 20 establishments in the cell. For data confidentiality reasons exact counts for these cells are not reported.

Table A-2: Size Transition Matrix for All Establishments in 1990

Size 1990	Establishment Size in 1995							Death	Total
	1-3	4-10	11-20	21-30	31-50	51-100	101+		
1-3	427389	81644	3868	675	365	167	113	290537	804758
4-10	66180	230399	33833	2550	827	279	95	68170	402333
11-20	3069	22331	61429	13695	3052	621	69	17286	121552
21-30	805	1443	9132	17369	8247	1031	101	5407	43535
31-50	606	665	1681	5693	17915	6276	364	4159	37359
51-100	453	326	422	658	4246	17991	3319	2734	30149
101+	407	229	166	148	308	2924	23689	1702	29573
Total	498909	337037	110531	40788	34960	29289	27750	389995	1469259

Data: BHP, West Germany.

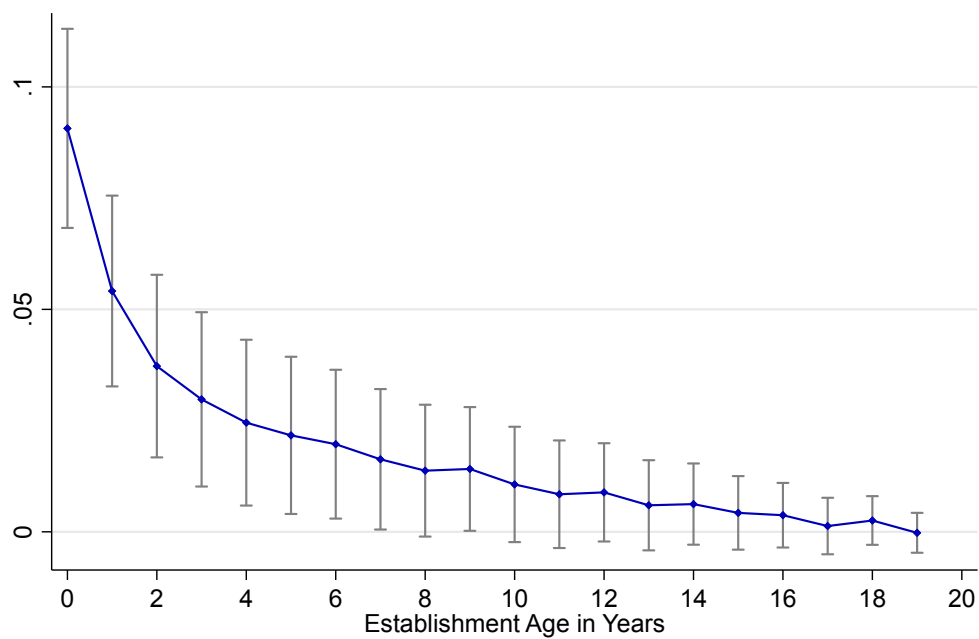
Table A-3: The Decline of Starting Wages as New Establishments Grow Older - IEBS Data - Single Step Estimation

	(1) No Controls	(2) Industry FE	(3) Industry FE & Estab. Size	(4) Estab. FE	(5) Estab. and Worker FE	(6) Estab. FE, Worker FE, Occ.	(7) Balanced Sample (Survive 10 y.)
Marg. Effect of Establishment Age	0.0182**	0.0090**	-0.00091	-0.00841**	-0.00755**	-0.00738**	-0.00721**
0<=Age<10	(0.00161)	(0.00182)	(0.00093)	(0.00249)	(0.00219)	(0.00201)	(0.00260)
Marg. Effect of Establishment Age	0.00245	0.00031	0.00223	-0.00224	-0.00210	-0.00212	-0.00288
10<=Age<20	(0.00344)	(0.00191)	(0.0030)	(0.00194)	(0.00130)	(0.00112)	(0.00245)
Establishment FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Worker FE	No	No	No	No	Yes	Yes	Yes
Industry FE (3 digit)	No	Yes	Yes	No	No	No	No
Occupation FE (3 digit)	No	No	No	No	No	Yes	Yes
Number of Observations:							
Number of Individuals	17.1 million	17.1 million	17.1 million	17.1 million	17.1 million	17.1 million	11 million
Number of Establishments	1.3 million	1.3 million	1.3 million	1.3 million	1.3 million	1.3 million	0.9 million
Number of Estab/Year Cells	4.3 million	4.3 million	4.3 million	4.3 million	4.3 million	4.3 million	3.5 million

Notes: Standard errors clustered on establishment level, * P-value ≤ 0.05 , ** P-value ≤ 0.01 . Dependent variable is log of daily wage for fulltime workers with less than 1 year of tenure. All regressions control for year effects. The first step of the estimation uses all fulltime workers in the largest connected set. The second step (where the reported coefficients are based on) is then restricted to establishments where the establishment age is known and that came into existence as a new establishment. See text for details. Column (7) restricts the sample to establishments that survived at least 10 years. Data: IEBS (1993-2009).

A.3 Appendix Figures

Figure 7: The Wage - Establishment Age Profile for Newly Hired Workers - 1 Step estimates - IEBS data



Notes: The figure shows how log real wages of newly hired workers vary by establishment age after controlling for establishment effects, worker fixed effects, worker experience by education profiles and establishment size.

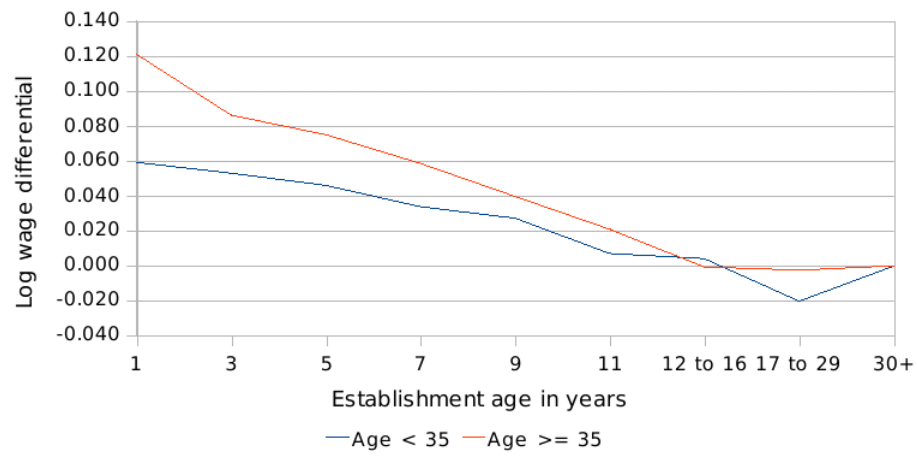


Figure 8: Establishment age and wages - Differences by Worker Age

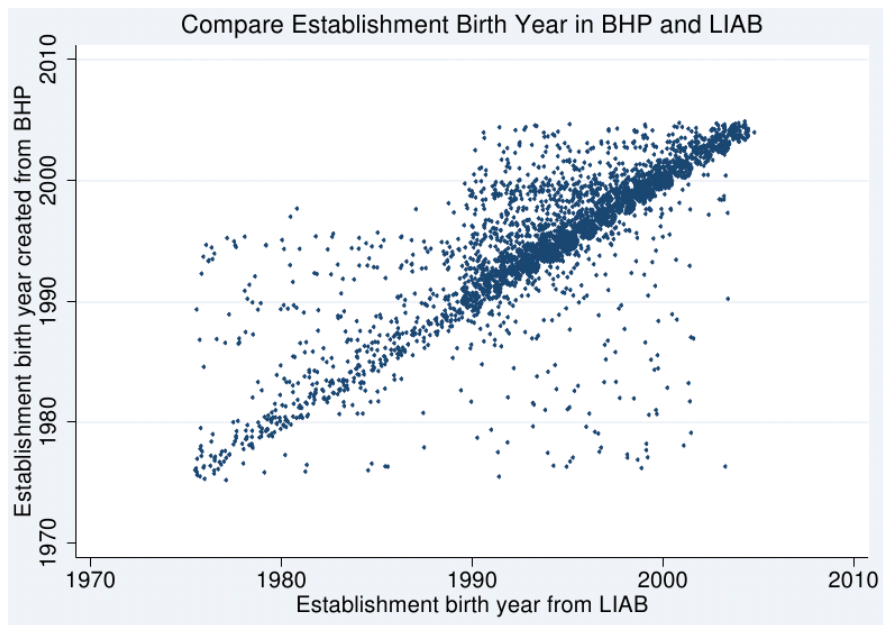


Figure 9: Comparing establishment birth year: Survey and Administrative Definition