# Off the Labor Supply Curve: The Zero Employer Size Wage Effect Within Large Firms

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**Abstract**

We revisit the employer size wage effect (ESWE)—arguably the most basic and influential departure from the law of one price for labor. Our main result is that this canonical fact *disappears completely* across establishments within the same firm, even though they operate in different local labor markets. We uncover and dissect this fact by including a *firm fixed effect* in otherwise standard cross-sectional regressions of wages on establishment size. We implement this demanding specification in population-wide triple-linked firm-establishment-employee data in Germany. This result is new to the ESWE literature (for which our paper also provides the first systematic meta-analysis). This wage-size decoupling is hard to square with the view that employment is determined *along* a finitely elastic employer-specific labor supply curve—i.e., employers pay exactly the minimum needed for the quantity of labor, *but no more*—the foundation of the monopsony view. By contrast, large multi-establishment firms (MEF) appear to hire *off* their labor supply curves (or those curves are very elastic), pay wage premia above the monopsonistic minimum, and leave excess labor supply. We find some evidence for a reemergence of the ESWE within low-premium MEFs. Overall, at least for the 25% of German employment in large firms for which the ESWE disappears, wage setting and employment determination may be better accounted for by alternative models, namely accommodating above-market-clearing wage premia and rationing of labor supply, such as efficiency wage theories.

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# 1 Introduction

The perhaps most robust, universal, and influential departure from the law of one price for labor is the employer size wage effect (ESWE): larger employers tend to pay higher wages, and this relationship holds across time periods, countries, and types of employers, and is robust to composition adjustment.[1] As we show in the first meta-analysis of the ESWE, the estimated elasticities of wages to employment range between 0.020 at the 25th percentile and 0.057 at the 75th percentile, thereby implying large wage differentials given the wide dispersion in firm size. Besides rent sharing or compensating differentials, the leading contemporary explanation is employer monopsony (see, e.g., Green, Machin, and Manning, 1996; Bachmann, Bayer, Stüber, and Wellschmied, 2025). According to monopsony, firms select the employment level along a finitely elastic firm-specific labor supply curve, where higher employment requires higher wages. Hence, large employers pay *exactly* the wage premium required to deliver their desired employment level—and no more. Figure 1 illustrates this logic in action.

In this paper, we show that this canonical regularity *disappears completely* across establishments within the same firm. These establishments operate in different local labor markets. To do so, we draw on *new triple-linked firm-establishment-employee data* covering the (near-)universe of German social security records (Diegmann, Doherr, Hälbig, and Wolter, 2025).[2]

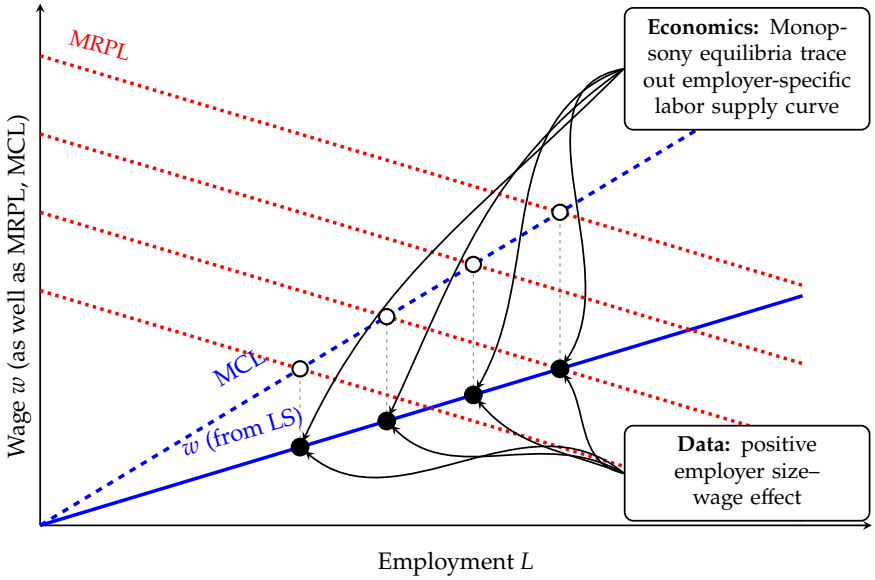
In our main specification, we simply rerun the conventional cross-sectional ESWE specification but include a *firm fixed effect* while we continue to include establishment size as the employer size variable—then naturally relying on establishment variation within multi-establishment firms (MEFs). About 25% of German private sector employment is in such firms, and establishments are spread across different local labor markets. Our main specification is at the establishment level, with average log wages as well as composition-adjusted firm wage differences (as given by firm fixed effects identified by movers Abowd, Kramarz, and Margolis, 1999; Card, Heining, and Kline, 2013), and we additionally consider worker-level and firm-weighted specifications.

The irrelevance of establishment size for wages within firms holds for both raw wages and AKM establishment effects that adjust for worker quality. Our regression estimates of the coefficients on log employment are precise zeros, with point estimates of just $-0.0038$ to $0.0027$ and tight standard errors of around $0.001$. That is, while firms pay different wages across their establishments, these wages have no relationship with establishment employment whatsoever. The disappearance of the ESWE is robust to controlling for industry-location fixed effects (as a proxy for the local labor market), to splitting the sample into firms subject or not subject to a collective bargaining

[1] See, e.g., Moore (1911); Brown and Medoff (1989); Abowd, Kramarz, and Margolis (1999); Oi and Idson (1999); Bloom, Guvenen, Smith, Song, and von Wachter (2018).

[2] Our meta-analysis also confirms that the handful of existing studies that include firm *and* establishment employment concepts simultaneously as continuous regressors do not replicate our specification because they do not (or for data reasons would not be able to) include firm-fixed effects (e.g., Brown and Medoff, 1989; Bayard and Troske, 1999; Troske, 1999) or mix within- and between-establishment employment variation (Barth, Davis, and Freeman, 2018).

**Figure 1:** Baseline model: monopsony and the employer size wage effect




agreement, works councils, or centralized human resources departments. It is also robust to weighting firms equally (irrespective of establishment count), to restricting the sample to firms with many or few establishments, and to aggregating establishments by location. It also holds in worker-level specifications. For comparison, we recover the conventional ESWE in standard specifications: (i) among single-establishment firms (0.073, SE <0.001), (ii) among establishments of multi-establishment firms omitting the firm FE (0.035, SE 0.001), and (iii) when considering firm-level total employment (0.048, SE 0.001). The ESWE for AKM establishment effects is about half the magnitude, due to raw wage effects partially capturing worker sorting. Within-firm effects are precisely estimated, allowing us to rule out even small cross-sectional effects of employment on wages across establishments within the firm, of about a tenth of the baseline point estimates.

The decoupling of wages from employment is puzzling if viewed through the monopsony lens. After all, an appealing interpretation of the ESWE is that it is the other (more precisely: inverse) side of the firm-specific labor supply curve that is at the heart of monopsony:[3] to grow and be large, firms must pay higher wages, and they pay exactly the lowest wage required for the given employment.[4]

Extensions of the basic monopsony model, e.g., to recruitment margins and search frictions, do

[3]We will discuss the many caveats to this interpretation, assumptions required, and departures from it. See Manning (2006) and the discussion on page 18 in Bassier and Manning (2025).

[4]Microfoundations of the finitely elastic firm-specific labor supply curves that generate monopsony (Robinson, 1969; Manning, 2003; Azar and Marinescu, 2024; Kline, 2025) include "tastes" for employers or heterogeneous amenity valuations (Card, Cardoso, Heining, and Kline, 2018; Berger, Herkenhoff, and Mongey, 2022) or commuting costs, or appeal to search and matching models with wage posting and employer competition or otherwise heterogeneous reservation wages (Burdett and Mortensen, 1998).

not immediately resolve the puzzle. In those models (Manning, 2003, 2006; Burdett and Mortensen, 1998; Bloesch, Larsen, and Yding, 2024), firms can also expend resources on non-wage recruitment margins, such as investing in recruitment. We find no offsetting boost in other recruitment margins; if anything, within MEFs, we find zero, or even slightly opposite-signed, effects of establishment size on vacancy duration, hours and expenses spent on recruiting, or the number of applicants, compared to the specification across single-establishment firms (SEFs). We find similar patterns for turnover rates. We also cannot detect clear evidence for larger worker quality trade-offs (as measured by worker AKM effects).

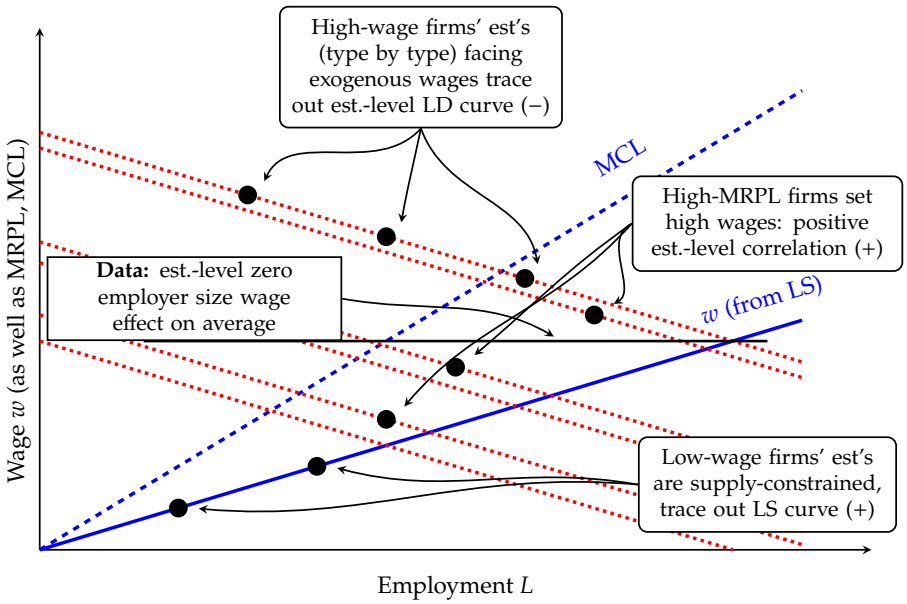
Another, at least theoretically intriguing, possibility is that MEFs essentially face one nation-wide labor supply curve—with individual establishments within the firm essentially being perfect substitutes for the workers upon choosing a MEF, and perfect interregional mobility. This view would substantially depart from the canonical local labor market notion, contradict evidence on the relative immobility of workers across regions, and be at odds with the prevailing nesting implicit in models of location-specific establishment labor supply (Berger, Herkenhoff, and Mongey, 2022; Kleinman, 2025; Carry, Kleinman, and Nimier-David, 2025). However, consistent with Hazell et al. (forthcoming), we find substantial wage variation across locations even within MEFs. We also do not find any evidence for positive ESWEs in MEFs for which such a national labor supply curve is particularly unrealistic: coarsening local labor markets, or selecting MEFs with operations spread out geographically and in terms of local wage levels, without centralized human resources, and those with no internal labor markets between establishments.

Which view of the labor market and wage setting can rationalize our findings? We argue that rather than a market-clearing perspective, a coherent account emerges by invoking a *disequilibrium view, with rationed labor supply*. MEFs are not just high-wage employers—they pay true premia strictly above what labor supply requires at their establishments' employment. This wage premium entails rationed labor supply, detaching actual employment from the employer-specific labor supply curve. In turn, this rationed labor supply generates a buffer that lets establishments be large or small without needing to adjust wages—a scenario hard to square with a "market-clearing" view whereby employers pay exactly the minimum wage required to attract the current workforce, as in monopsony.[5]

This logic is depicted in Figure 2, where MEF wages are set at (exogenously) high levels so that labor supply exceeds labor demand and actual employment, with high productivity firms paying high wages, with employment detached from the upward-sloping labor supply curve, and with the data points tracing out a zero ESWE. Moreover, for a small set of low-wage MEFs, the ESWE

[5]This "disequilibrium" view echoes themes in the efficiency wage literature as well as the literature on minimum wages or wage floors in the context of monopsony models (see, e.g. Bassier and Budlender, 2025; Bhuller, Delgado-Prieto, Hermo, and Lorentzen, 2026; Faia, Lochner, and Schoefer, 2026). However, by focusing on an *employer-specific setting*, the disequilibrium notion differs from the traditional market-level notion, with unemployment as a gap between aggregate labor demand and aggregate labor supply (e.g., Michaillat, 2012; Breza, Kaur, and Shamdasani, 2021). In our setting, rationed and queuing workers need not be unemployed but presumably are working at less-preferred firms.

**Figure 2:** Alternative model for establishment-level wage-employment determination at the large firms we focus on: exogenous wages imposed on heterogeneous establishments




should reemerge whether wages are monopsonistic or exogenous (e.g., due to firm-wide wage policies)—as long as employment remains determined along the labor supply curve.

We support this view of the labor market by attempting to construct its empirical analog. First, we assign each MEF establishment the labor-supply-curve-implied minimum wage needed to hire the current quantity of labor. We proxy for this concept by constructing a flexible reduced-form "wage function"—fitting a lasso model among SEFs (assumed to be on their labor supply curve) of the log wage (or AKM effect) on establishment characteristics and local labor market—and importantly establishment size. While imperfect, this proxy is, to our knowledge, the first attempt to directly measure employer-specific wage premia above the labor-supply-required wage. Second, for each MEF establishment, the premium is then simply its actual wage minus its thus-predicted one. To recap: economically, the wage function proxies for the labor supply curve in Figures 1 and 2, and the premium corresponds to the vertical gap between the actual and minimum wage at the given employment level.

With this flexible empirical analog of Figures 1 and 2 in hand, we show that the narrative described above provides a coherent account of the data. First, we document substantial wage premia paid—constructed as above and hence distinct from size-independent AKM effects also sometimes referred to as "premia"—in MEF establishments conditional on size and market shares. Even the largest and highest-paying MEF establishments pay premia. These premia therefore let MEFs grow or shrink establishments without requiring wage adjustments—hence rationalizing the zero ESWE in those firms.

Second, when we study the sample of low-premium and low-wage MEFs, we find that the ESWE reemerges even within firms. This check confirms the role of pay premia in our results, and also suggests that a finitely elastic employer-specific labor supply curve exists, but is just irrelevant to firms operating off it.

In conclusion, while pointing away from at least simple monopsony models, the wage-size decoupling we document points towards alternative models that are able to rationalize non-market-clearing wage premia and richer pay setting motivations. Instead, one is reminded of and drawn to the literature on efficiency wage theories (see, e.g. Akerlof and Yellen, 1986; Katz, 1986; Krueger and Summers, 1988). If read as a test of a core feature of monopsony models, our paper also adds to a small literature with this goal (see, e.g., Faia, Lochner, and Schoefer, 2026). We reiterate that our diagnosis is restricted to multi-establishment variation with firm fixed effects, but these employers command 25% of German employment, and specifically in the high wage sector.

Our paper appears to be the first to document that the wage-size gradient breaks down within firms and relate this new finding to labor market models such as monopsony. By considering within-firm variation across establishments, we connect to an emerging literature on the role of firm-level wage setting that has emphasized *wage compression*, such as from internal pay equity constraints (Bewley, 1999; Saez, Schoefer, and Seim, 2019; Amior and San, 2025), although we note evidence that the ESWE emerges in a skill-group-specific way within firms (Barth and Dale-Olsen, 2011). In the literature on firm wage policies, we highlight two particularly related studies documenting evidence that lower-level business units' wages may be subject to firm-wide wage policies (despite which ESWEs should still prevail). Recent work by Hjort, Li, and Sarsons (2026) studies multi-national corporations and find that firms extend headquarter wage premia across countries, and that wages comove across countries in the same firm, consistent with firm-level rent sharing. Hazell, Patterson, Sarsons, and Taska (forthcoming) show evidence that a significant minority of U.S. employers set wages nationally rather than locally. Importantly, we emphasize that these papers show moderate *attenuation* in how MEFs adjust pay to local wage conditions, with a relatively small share of truly national wage setters. Indeed, while we document that there *is* tremendous heterogeneity in wages across establishments within MEFs that would leave room for substantial ESWE—*our striking and separate finding is that it is uncorrelated with establishment size.* Other studies studying MEFs' wage policies entertain or empirically document flexible, establishment-by-establishment and location-specific wage setting (Kleinman, 2025; Carry, Kleinman, and Nimier-David, 2025). Hence, quantitatively, this important existing complementary literature would not offer an immediate explanation for the precisely *zero* wage-size relationship we document.

We close by reiterating that the puzzle our paper points out and dissects is not wage compression within MEFs, but the *decoupling of wages from employment*. The existing literature does not

study the wage-employment relationship, and the otherwise standard monopsony frameworks these papers use would decidedly predict a positive ESWE reflecting the establishment-specific labor supply curve. For instance, across their instructive suite of model variants dissected in Hazell, Patterson, Sarsons, and Taska (forthcoming), even for MEFs that set perfectly fixed national wages, their local employment and wage variation will *still* trace out the firm-specific labor supply curve that would yield a positive ESWE *within firms*. This is because in this scenario, local establishments simply hire from the upward-sloping establishment-specific labor supply curve taking the fixed firm wage as given, and without rationing labor supply.

The paper is organized as follows. Section 2 contains our meta-analysis of the ESWE. In Section 3, we present the data, our research design, and our sample. In Section 4, we present our main empirical result on the breakdown of the ESWE within firms. Section 5 dissects these results through extended interpretations of the monopsony model. Section 6 investigates the idea that MEFs simply do not operate along their labor supply curves, but ration employment, naturally accommodating our main findings despite a latent labor supply curve. Section 7 concludes.

## 2 Meta-analysis of existing empirical estimates

We provide a comprehensive meta-analysis of existing empirical estimates of the ESWE. Figure 3 and Table 1 present this meta-analysis, with additional information in Appendix Table A.1. To our knowledge, this is the first such meta-analysis.[6]

Broadly, we report the regression coefficient of interest $\gamma$ in specifications of the following kind:

$$\ln w_{it} = \alpha + \beta X_{it} + \gamma \ln n_{j(it),t} + \varepsilon_{it}, \tag{1}$$

where $X_{it}$ may include Mincer controls or worker fixed effects, and the employment measure is, depending on the study, the establishment or firm. The specifications may be purely cross-sectional or include panel dimensions. Moreover, some regressions are at the establishment level rather than the worker level. To quantify the effect $\gamma$ as an elasticity, we must exclude categorical studies that report ESWE by binning employer size into broad groups (e.g., Bloom, Guvenen, Smith, Song, and von Wachter, 2018), but note that this class also has not featured our within-firm ESWE analysis.

We identify 64 preferred estimates from 26 studies, spanning a variety of specifications, countries, data sources, and time periods. We group estimates into four categories based on the degree to which worker heterogeneity is controlled for.[7] Studies with preferred estimates belonging to

[6] To be included, studies must (1) be published or (conditionally) accepted in a refereed journal at the time of the meta-analysis (August 2025); (2) report the ESWE as a continuous elasticity (as opposed to wage–size regressions based on size classes); (3) use data from developed countries; and (4) have a focus on estimating the ESWE, rather than merely reporting a size coefficient in an otherwise unrelated wage analysis.

[7] We recognize that studies cannot all be forced into a single template, but our selection of preferred estimates within studies generally followed these guidelines: we prioritized establishment over firm size (as most studies and our main

multiple categories appear in multiple categories. Within categories, we average preferred estimates across time periods and/or countries within studies, if applicable, and report one preferred estimate per study per category.[8] This yields 40 estimates from 26 studies. We list those estimates in Figure 3 and Table 1, which we complement with additional information in Appendix Table A.1.

Overall, we find consistently positive ESWE estimates. Based on the 40 preferred estimates reported in Table 1, the mean elasticity of wages with respect to employer size is 0.040, indicating that a doubling of employer size is associated with a 4 percent increase in wages. The median estimate (0.037) is very close to the mean, the 25th percentile is 0.020, and the 75th percentile is 0.057, resulting in an interquartile range of 0.037.[9]

Turning to different empirical contexts, Table 1 shows that ESWE estimates are lowest in the Scandinavian countries (0.014). They are similar in continental Europe excluding Scandinavia (0.053) and the rest of the world (0.046; Brazil, Canada, the United Kingdom, and the United States). We observe substantial differences across the four categories defined by the extent to which worker heterogeneity is controlled for. The average ESWE is relatively high (0.062) among studies that do not control for worker heterogeneity. Among studies that control for observable worker characteristics, the average drops to 0.036, and it declines further to 0.018 in studies that control for unobserved worker heterogeneity using worker fixed effects, consistent with high-wage workers sorting into large firms or with short-run effects of firm-level size fluctuations yielding smaller wage effects.

AKM-based studies of the ESWE place the estimated employer fixed effect on the left-hand side of the regression, thereby explicitly accounting for worker heterogeneity. The estimates vary widely in this group (lower panel of Table 1). Alvarez, Benguria, Engbom, and Moser (2018) report an elasticity of 0.072 for Brazilian firms, declining from 0.106 in the late 1990s to 0.047 around 2010. The estimates in Lochner, Seth, and Wolter (2020) for establishment size in Germany are close to the continental European mean (0.050) and show less variation over time. Kline, Saggio, and Sølvsten (2020) report an ESWE of 0.028 for Northern Italy, which is similar to the results of other studies using Italian data reported in Panels B and C of Table 1.

We also summarize those patterns in a regression analysis based on the 40 preferred estimates,

analysis focus on establishments), worker-level over employer-level regressions, pooled samples over subgroups (or the largest subgroup if only subgroup results were available), and estimates based on the largest dataset when multiple sources were used.

[8] We anticipate that coefficients across separate regressions within the same study may be positively correlated and report two bounds for the standard error of the average coefficient. The first number is for zero correlation $SE(\bar{\beta}) = K^{-1} * \sqrt{\sum_{k=1}^{K} SE_k^2}$, the second for perfect correlation, which is the mean of the standard errors.

[9] Accounting for the precision of the estimates via inverse-variance weighting is not feasible, as some studies do not report standard errors. Moreover, extremely small standard errors in a few studies would result in nearly all the weight being placed on them. For instance, Pehkonen, Pehkonen, Strifler, and Maliranta (2017) report standard errors of 0.0001 whereas the seminal work by Brown and Medoff (1989) reports standard errors around 0.002 implying that Pehkonen, Pehkonen, Strifler, and Maliranta (2017) would get 400 times the weight of Brown and Medoff (1989). We leave this step to the reader as we will make the underlying data available as part of the replication package.

reported in Appendix Table A.2: (i) ESWE is lowest in Scandinavian countries, (ii) it is similar between continental Europe (excluding Scandinavia) and the rest of the world, and (iii) estimates are lowest when worker fixed effects are included,[10] somewhat higher when observable worker characteristics are controlled for as well as in employer-level regressions with AKM employer effects as the dependent variable (though imprecisely estimated) and highest in worker-level regressions without controls for worker heterogeneity. We do not find any systematic differences regarding the time period analyzed in these studies.

Using AKM employer effects derived from the same German matched employer–employee social security data as we do, Lochner, Seth, and Wolter (2020) is the study most comparable to ours. The key innovation of our research design is to draw on novel data that permits us to compare establishments belonging to the same multi-establishment firm due to firm IDs (see below in Section 3.2).[11]

Importantly, while some studies also include firm-level employment (on its own or in a horse race with establishment employment, e.g., Brown and Medoff, 1989; Bayard and Troske, 1999; Troske, 1999), they do not include firm fixed effects, and would not be able to, given data constraints. Ours appears to be the first cross-sectional specification to include firm fixed effects in population-wide, triple-linked firm–establishment–employee data. In one specification, the rich analysis by Barth, Davis, and Freeman (2018) comes closest to our design, specifically in a panel regression of wages on various employer characteristics including size and a firm fixed effect. Rather than comparing larger and smaller establishments within a firm, the regression predominantly uses establishment-level changes over time, but we argue that the coefficients appear consistent with our main result (see also Footnote 2).[12] Hence, we are not aware of studies that replicate our main specification; in the conclusion in Section 7, we therefore note that it would be interesting to assess whether our results extend to other contexts.

[10] But we also note that the specifications that contain worker fixed effects identify the EWSE of panel variation and hence largely employment-size changes among stayers (short-run variation that may be lower).

[11] Other studies set in the German context include Gerlach and Schmidt (1990) and Gerlach and Hübler (1998) (both based on the German Socio-Economic Panel), Schmidt and Zimmermann (1991) (based on data from the Zentralarchiv für Empirische Wirtschaftsforschung in Cologne), Gibson and Stillman (2009) (based on the International Adult Literacy Survey), and Fackler, Schank, and Schnabel (2015) using the LIAB data set. These studies are conducted at the worker level and control for observable worker characteristics. They meet all inclusion criteria for this meta-analysis except for reporting the ESWE as a continuous elasticity. Roughly approximating the ESWE by assigning midpoints to the reported firm size categories yields elasticities around 0.015 in the first two studies, 0.023 in Schmidt and Zimmermann (1991), 0.05 in Gibson and Stillman (2009), and approximately 0.044 in Fackler, Schank, and Schnabel (2015).

[12] Specifically, Barth, Davis, and Freeman (2018) examine the broader role of employer characteristics, including size, in earnings determination and inequality, rather than the ESWE, monopsony, or MEF wage setting. The stability of their establishment-size coefficient (Table 3, Column (5)) after including establishment FEs suggests that much of the identifying variation used in their Table 3, Column (4) (with firm FEs) reflects wage changes associated with establishment growth, rather than stable wage differences between larger and smaller establishments within the same firm. With this interpretation, the indirect evidence from Barth, Davis, and Freeman (2018)—to our knowledge, the only study that partly speaks to our question—is consistent with a small latent cross-sectional within-firm ESWE in US manufacturing as well, thereby complementing our main result.

# 3 Research design, data, and sample

We present our research design and then describe our data and sample. We often refer to single-establishment firms as SEFs and multi-establishment firms as MEFs.

## 3.1 Research design

We provide a combination of formal regression models that impose a linear relationship between log wages and log employment, and nonparametric binned scatter plots. We also provide individual case studies of large firms. Throughout, our focus is on the elasticity of wages to employer size as the statistic corresponding to the ESWE.

**Regression specification.** We run versions of Equation (1) in our data, which is triple-linked firm-establishment-employee data from Germany, which we detail below in Section 3.2:

$$\ln w_j = \alpha + \nu_{m(j)} \underbrace{+\theta_{f(j)}}_{\substack{\text{Included in} \\ \text{within-firm spec.}}} + \gamma \ln n_j + \varepsilon_j. \tag{2}$$

Index $j$ denotes establishments, as our main specification is an establishment-level variant; $f$ denotes the firm (which may consist of multiple establishments). We also replicate our results while firm-weighting (inversely weighting establishments by their firm's establishment count). We also show robustness to instead running a worker-level specification (which effectively weights by establishment size). Our regressions are cross-sectional, so that the fixed effect specification isolates within-firm size differences rather than mixing in changes over time.

Our wage outcome variables are the log mean of the establishment wage and AKM establishment fixed effects, which adjust for composition. We detail those variables below in Section 3.2. By considering AKM establishment effects as a *dependent* variable, our point estimates circumvent the debate on the precision in estimated AKM effects (Bonhomme, Lamadon, and Manresa, 2019; Kline, Saggio, and Sølvsten, 2020). Our standard errors are robust (and we have found very similarly small SEs when experimenting with clustering, e.g., at the labor market region-industry level).

Our coefficient of interest is $\gamma$—capturing the employer size wage effect as an elasticity of wages to employment (after controls).

As controls, our preferred specification includes fixed effects $\nu_{m(j)}$ for the establishment's labor market $m$, proxied for by industry and local labor market region (see below), or their interaction. By studying relative size within the market, the specifications with local labor market fixed effects moreover would capture relative employment shares, the relevant concept for most monopsony models.

In our key specification, we then include firm fixed effects $\theta_{f(j)}$ for the firm $f$ that establishment $j$ belongs to. This specification identifies $\gamma$ off variation of differently sized establishments all belonging to multi-establishment firms and compares how relative size—compared to the firm's other establishments (mostly based in other labor markets, see below)—correlate with that establishment's wage. Here, the versions that additionally include labor market fixed effects employ a double comparison with other MEFs' establishments.

We also consider versions where we additionally or solely consider firm-level employment (the sum of the firm's establishments' employment) or run a horse race between firm and establishment employment (while noting that our firm FE is qualitatively different from such a parametric control for firm level employment).

**Nonparametric scatter plots.** In addition to the parametric regressions above, we show the ESWE and its disappearance in binned scatter plots of wages against employment. We will do so in subsets of SEFs and MEFs (and other sample splits). Importantly, we calculate the quantile cutoffs separately by sample (pooled, MEF, SEF), for the plots to also illustrate dispersion in employment size (x-axis). We also present case studies for particularly large individual firms.

### 3.2 Main data and analysis sample

Our data is triple-linked matched firm-establishment-employee data from Germany. Our cross-sectional analysis focuses on 2019. Our main specifications are in establishment-level data, but we also draw on worker-level data to replicate the results in that specification in the literature.

**Main datasets.** Broadly, our data draw on three components: firm-level, establishment-level, and worker-level information.

Our baseline dataset is the *Establishment History Panel* (BHP) provided by the Institute for Employment Research (IAB). Employers in Germany are obliged to file for all employees who are subject to social security contributions. Thus, the data cover the universe of establishments with at least one employee subject to social security contributions. Civil servants and the self-employed are exempt from such notifications and hence not covered. Establishment information is then observed on June 30th on a yearly basis (see Ganzer et al., 2023 for a detailed description).

Besides employment, the BHP contains mean average wages, and we supplement our data with the IAB-estimated AKM fixed effects following Lochner, Seth, and Wolter (2020). For some specifications, we draw on additional establishment surveys. We detail our key variables below.

To obtain firm identifiers in the IAB data, we make use of a recently established data merge between the BHP and comprehensive firm level data (MUP).[13] The record linkage between the

[13]The firm-level data is the *Mannheim Enterprise Panel* (MUP), the most comprehensive micro panel data of companies in Germany. Besides the official Business Register of the Federal Statistical Office, the MUP has close to full coverage

two datasets is based on name and address information between MUP and BHP and is generated following an algorithm developed in Doherr (2023). Diegmann, Doherr, Hälbig, and Wolter (2025) provide a final dataset with clean links between establishments and firms and show match rate statistics. For the year 2019, which is the main focus of our analysis, 81.9% of all observed establishments have firm links, and more than 90% of employment—with even higher match rates in the sectors we focus on. For MUP firms, match rates are around 80%.

Finally, for our worker-level specification, we also draw on administrative worker-level data from the *Integrated Employment Biographies* (IEB), containing complete information on earnings and days worked in each employment spell and worker characteristics for the universe of private-sector (social-security-covered) employment. We restrict the sample to regular workers subject to social security contributions, thereby excluding apprentices and marginal employees. We further restrict the sample on available AKM worker effects calculated by Lochner, Seth, and Wolter (2023) over the years between 2014 to 2021. To align the worker data with the (BHP) establishment data, we retain all employment spells that contain June 30, 2019. In case of parallel employment spells, we choose episodes with highest daily wages. We follow Dustmann, Ludsteck, and Schönberg (2009) and Card, Heining, and Kline (2013) and impute wages above the social security contribution limit. All specifications draw on the same analysis sample, and we have checked that the sample restrictions, while reducing our sample size, features a nearly identical share of MEF employment.[14]

**Firm vs. establishment definitions.** In the IAB data, an *establishment* is a regionally (at the municipality (*Gemeinde*) level) and economically (5-digit industry) delimited unit in which employees work (see Ganzer, Schmucker, Stegmaier, Jens, and Wolter, 2023). It may consist of one or more branch offices or workplaces belonging to one enterprise. The Federal Employment Agency issues an eight-digit establishment identifier. It identifies a unit uniquely and is issued if an establishment is obliged to submit social security notifications. The assignment of an establishment identifier depends on the economic purpose of the establishment and its main economic activity within municipalities. Larger production units could hold multiple identifiers if the site hosts more than one economic purpose, e.g., research and development, production, and catering. An establishment may or may not be economically independent. Hence, it reports employees to the Federal Employment Agency but, for instance, no information to the tax authorities. Until the emergence

of all firms starting around 2000. Bersch, Gottschalk, Müller, and Niefert (2014) provide detailed information on data collection, processing, and variable definitions. We largely draw on this dataset to obtain a firm identifier but do not currently use the underlying firm-level financial variables in MUP.

[14]Our initial 2019 population (observed on June 30) features nearly 30 million workers; applying the sector restrictions leaves about 23 million workers (still including part-time workers). Restricting the sample to establishments with valid AKM firm effects and having at least two employees reduces the sample by about 0.5 million workers. Dropping workers with either very low daily wages below 10 Euro or very high (imputed) daily wages above the 99th percentile leaves 21.7 million workers. Upon merging on the AKM effects (estimated within 2014 to 2021 among full-time workers moving across establishments in the largest connected set), the sample drops to about 18 million workers, providing our final analysis sample, of whom about 5.1 million are in MEFs.

of the novel firm IDs our study draws on, this establishment notion has been the standard and only IAB establishment definition that all existing studies using the IAB data have at their disposal (sometimes *inaccurately* referred to as "firm").

For robustness of the definition of establishments, we also consider two alternative definitions. We aggregate employment at the local labor market region (LMR) level, summing establishment employment across both industries and municipalities to that level of aggregation, so there is at most one observation per firm at the new level of aggregation. There are 10,462 municipalities with establishment observations in our sample (out of 10,994 potential ones), 400 districts (*Kreis*, which we do not use), and 257 local labor market regions.[15]

A *firm* in the MUP data is defined in terms of legal units as in the statistical business register. A legal unit may be a natural person engaged in economic activity, a legal person, or an association of persons. Economic activity includes not only the operation of businesses but also the exercise of certain self-employed professions (e.g., law) and the holding of shares or participation in other legal entities. Examples of legal units include joint stock companies, limited liability companies, general partnerships, and sole proprietorships. A legal unit is the smallest entity required to prepare financial statements or comparable records for commercial and/or tax purposes. Importantly, a legal unit may comprise several establishments; however, not every legal unit (e.g., a holding) corresponds to an establishment in the sense of a production unit (Diegmann, Doherr, Hälbig, and Wolter, 2025).

**Variables.** Our main variables are employment and wages. The main employment measure is based on all employees observed for each identifier (i.e., here without restrictions on full-time status or apprenticeship status, which would not affect our main results). We use this measure at the establishment level (and aggregate it to the firm level in an alternative specification). As a robustness check, we also provide results based on full-time employment only.

We have two wage variables. First, we use the IAB-provided mean wage at the establishment level (from the BHP establishment panel), which we log. This variable is calculated for full-time employees only.[16]

Second, we consider composition-adjusted wages, specifically the IAB-provided AKM (Abowd, Kramarz, and Margolis, 1999) fixed effects based on Card, Heining, and Kline (2013) and Lochner, Seth, and Wolter (2023), using the 2014-2021 vintage for all of Germany (East and West). These fixed effects are estimated for full-time employees in a panel regression of worker-level log wages

[15] We use the most recent regional boundaries of 2021 with 400 districts and 10,994 municipalities. In the 2019 cross-section of the BHP, we observe establishments in 10,462 municipalities. According to the local labor market region, we follow the definition of the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR), which defines 257 distinct local Labor markets regions.

[16] Nominal wages, and all other nominal ones, are deflated to 2015 euro levels using the CPI deflator, which is of course inconsequential for our analysis. The BHP-based wages also are also imputed above the contribution limit, as described above in the underlying IEB worker-level data.

on worker-level controls (including year dummies as well as quadratic and cubic terms in age fully interacted with educational attainment), worker fixed effects, and establishment fixed effects.[17] To reiterate, AKM effects are to be understood as decomposing *log* wages additively into worker and establishment effects, plus a residual and limited Mincerian controls, so that the AKM establishment effect is a percent (log) wage difference accounted for by the employer. Moreover, as mentioned above in Section 3.1, by considering AKM effects as a *dependent* variable, we circumvent the debate on precision in those estimated variables (Bonhomme, Lamadon, and Manresa, 2019; Kline, Saggio, and Sølvsten, 2020).

**Sample.** We conduct our cross-sectional analysis in 2019. The main reason for 2019 is to avoid the Covid pandemic, while noting the relatively tight labor market conditions in Germany at that point. Our main analysis sample covers the core private sector establishments based on the sector classification of the German Statistical Office (WZ08). Thus, we drop observations from public administration and defense, education, health care and social work activities, and arts, entertainment and recreation. Moreover, we drop observations with only one employee (and include robustness checks with higher cutoffs). (This restriction is inconsequential as our nonparametric binscatter plots will reveal relatively linear log-log relationships and checks confirmed robustness to larger firm size cutoffs.) We also restrict our sample to establishments with an estimated AKM fixed effect (even when considering raw wages as an outcome). Some robustness checks merge on smaller establishment surveys (described at the end of the section) and hence consider subsamples of this main analysis sample. (Our worker-level regressions inherit these establishment level restrictions through their employers, as we draw the workers employed at those establishments.)

**Defining single-establishment firms (SEFs) and multi-establishment firms (MEFs).** In our research design, we separate establishments and firms into single-establishment firms (SEFs) and multi-establishment firms (MEFs), based on whether they have exactly one (pre-sample restrictions) or more than one (post-sample restrictions) establishment in the MUP-BHP merged data. We note that any unassigned establishments would misclassify some SEFs that are actually MEFs.

**Summary statistics.** Multi-establishment firms make up about 25% of German private sector employment, whereas about 12% of establishments belong to MEFs. Among *establishments* with at least 10, 50 and 100 employees, these statistics are 27% and 17%, 32% and 26%, and 34% and 30%, respectively. Similarly, 3.8% of *firms* are MEFs. Among *firms* with at least 10, 50 and 100 employees, the shares of MEF employees and establishments is 27% and 7.9%, 36% and 21%, and 41% and 29%, respectively. Appendix Figure A.1 reports these numbers by sector, and shows that

[17] In one (worker-level) specification, we also draw on the associated IAB-estimated worker fixed effects as a simple variable to control for worker quality.

MEFs make up a larger fraction (or, equivalently, are overrepresented in) the following industries: finance and insurance, mining, electricity, ICT, and wholesale and retail.

Table 2 reports summary statistics for our analysis sample, for the pooled sample, and MEFs and SEFs separately. Columns (1)-(3) are establishment-weighted and Columns (4)-(6) are weighting establishments by their employment. We consider the wage (based on establishment log mean wage), the establishment AKM effect, employment, industry (sector code), an establishment-level indicator of being located in East or West Germany, establishment age in years, fraction female, fraction of helper (*Hilfsarbeiter*) activities, professionals, specialists and experts, and proxies for turnover (hiring rate, separation rate, and turnover rate).

### 3.3 Additional surveys for supplementary checks

For some additional investigations, we merge on establishment surveys, yielding smaller samples for those additional analyses.

**Additional dataset: IAB Establishment Survey.** We merge on the annual IAB Establishment Survey to conduct heterogeneity checks, splitting up the sample by collective bargaining coverage (defined as by either sectoral collective agreements or inhouse/company agreements—not counting voluntary "orientation") or works council coverage—and classifying the entire *firm* whenever any covered establishment may have these industrial relations features. We boost sample size by filling in missing 2019 survey observations from other years in which our 2019 establishment analysis sample may have been surveyed.[18] Appendix Table A.3 provides summary statistics for the merged *analysis* sample.

**Additional dataset: IAB Vacancy Survey.** To understand potential offsetting mechanisms whereby MEF establishments can grow large without drawing on the wage margin but by, e.g., recruiting more intensely, we merge on the 2019 wave of the IAB Vacancy Survey (see Börschlein, Diegmann, Gürtzgen, Kubis, Pirralha, Pohlan, Popp, and Vetter, 2024). For establishments not in the 2019 survey, we backfill information from the 2015 to 2018 waves (but, unlike in the survey above, we do not extrapolate to the entire MEF because these variables are used as establishment-level outcomes, and do not backfill due to COVID's effect on hiring). The survey is a representative repeated annual cross section of about 14,000 establishments. Appendix Table A.4 provides summary statistics for

[18] Works council presence and collective bargaining coverage vary very little over time within establishments (see, e.g., Mueller, 2012). Since the 2019 sample (our analysis period) is small, we expand coverage for establishments not surveyed in 2019 with survey information from their closest survey year before or after 2019 (prioritizing the pre-2019 year in case of ties). The representative annual survey started in 1993 in West Germany and 1996 in East Germany and currently covers about 16,000 establishments per year. Appendix Figure A.2 reports the survey years for establishments observed in the BHP in 2019, our focal year. With this filling approach, we can merge on survey information for 30,815 establishments in our 2019 BHP analysis sample. When multiple establishments of the same MEF are covered and give conflicting answers (which is very rare), we prioritize the indicator for the presence of the institution.

the survey merged to our 2019 sample distinguishing between single-establishment and multi-establishment firms. Of particular relevance are information on the vacancy duration, recruitment effort (hours and expenditure) to fill the vacant position, number of suitable applicants, and the number of applicants, all for the most recent hire.

# 4 Main result: the breakdown of the employer size wage effect within firms

We now present our results dissecting the employer size wage effect within and across firms. We start by documenting substantial variation in wage and size among SEF and MEF establishments, and also across establishments within a given MEF. Moreover, even though MEF establishments are larger and pay more than SEFs, their distributions have considerable overlap.

We then move to the analysis of the ESWE. We estimate this effect for the pooled sample and then separately for SEFs and MEFs. For MEF establishments, we conduct between and within firm analyses, in specifications with and without firm fixed effects. Lastly, we show robustness checks and heterogeneity analyses.

## 4.1 Univariate analysis: distributions of wages and employment by firm type

We start by plotting the distributions of log employment and wages (raw and AKM FEs) for SEF and MEF establishments in Figure 4. We present both raw levels (to emphasize between-group overlap) and "normalized" versions that demean (to compare within-group dispersion). Specifically, for the latter, normalized versions, we demean by labor market region times industry fixed effects for SEFs, and additionally by firm fixed effects for MEFs, and then plot the resulting residuals. We also report summary statistics (mean, median, SD) in the histograms.

Starting with the raw level comparison (before normalizing each group as described above), we confirm that while MEF establishments pay more and are larger on average than SEFs, there is substantial overlap in those distributions. Focusing on the residual variation, we find that dispersion is not dramatically dissimilar between MEFs and SEFs. Log wages have standard deviations of 0.17 for MEFs and 0.35 in SEFs, respectively, indicating some wage compression within MEFs but maintaining considerable wage dispersion. Moreover, the employment standard deviations are 0.85 and 1.04, respectively. For AKM effect dispersion, the residual standard deviations are 0.10 and 0.20, respectively, indicating the role of worker quality in between-establishment wage dispersion and wage compression of about 50% when moving from SEFs to MEFs. However, this compression partially also reflects the fact that the firm fixed effects we can include for MEF establishments are much richer than the coarse location-sector fixed effects for SEFs. Moreover, in Section 5 and Appendix Figure A.3, we will also show that MEFs place their establishments in local labor markets that appear heterogeneous in terms of prevailing external wage levels.

Overall, this univariate perspective already makes clear that MEF establishments exhibit tremendous heterogeneity in employment and wages even within firms, in a way that is not dissimilar to the large dispersion seen between SEF establishments. We will study the joint distribution of those variables next, when we study the "effect" of establishment employment on wages, across and within firms. Towards this goal, the univariate perspective of this stepping stone analysis here implies that there remains substantial room for wage differentiation between establishments even within MEFs, and hence considerable room for a strong ESWE. Intuitively, any dramatic attenuation of the regression coefficient of wages on employment would need to predominantly reflect a dramatic reduction in the correlation rather than the ratio of standard deviations of wages and employment.

### 4.2 The standard ESWE in our data

We now report our main results: the relationship between wages and employment across establishments. We start by replicating the ESWE facts across establishments. That is, we estimate the specification in Equation (2) *without* the inclusion of firm fixed effects and in the pooled sample that does not yet separately estimate the effect within SEF and MEF establishments.

**Establishment-level specification.** We start with our main specification conducted at the establishment level. We report the formal regression estimate following Equation (2) in Table 3 Columns (1)-(3), and complement this estimate with a nonparametric binned scatter plot to visualize the underlying variation in Figure 5. We always report results separately for the log wage and the establishment AKM effect as dependent variables (Panel A and B, respectively), where the latter nets out worker quality differences. (Generally, we find that the ESWE is larger for the former, indicating the usual sorting of high-quality workers into large and high-wage firms.) Our coefficient of interest is $\gamma$, which captures the ESWE, i.e., the elasticity of wages to employer size.

Across German establishments, the coefficients of the establishment-level wage regression on log employment are 0.073-0.079 for raw log wages. We then turn to the specification with the establishment AKM effect as the dependent variable, a rich worker-quality adjusted wage effect for each establishment (reflecting the log wage change for the same worker switching across employers). Here, the estimated effect is about half as large, at 0.038. This attenuation implies that high-wage workers systematically sort into large firms that pay higher wages, so that the raw wage effect overstates the true wage premium effect of employer size. While the main specification in Column (1) and depicted in the scatter plot does not include controls for industry or location, we report results with fixed effects for industry (2-digit industry) and location (local labor market region) in Column (2), and their interaction in Column (3). Results are similar across these specifications. Across estimates, standard errors are consistently below 0.001. Overall, our pooled baseline results are therefore consistent with the analogous specifications in Lochner, Seth, and

Wolter (2020) (see also our meta-analysis and discussion of existing estimates in the German context in Section 2).

**Worker-level specification.** While our main analysis will remain at the establishment level, we also report a worker-level specification rather than one at the establishment level, for comparability with a strand in the literature that has focused on worker-level versions that are essentially Mincer regressions with employer size (see our meta-analysis in Section 2). Table 4 Columns (1) and (2) present these results. See also Footnote 14 for our note on the worker sample size.

We find similar ESWE coefficients of about 0.058 with standard errors below 0.001 for raw wages. We account for worker quality by including Mincer controls (female indicator, indicator for part-time employment, four education groups, tenure (linear and squared), and age (linear and squared). The coefficient drops to 0.036 in Column (2) when we additionally include as a control the continuous value of the estimated AKM worker fixed effect (as generated in Lochner, Seth, and Wolter, 2023). We reiterate that this specification relies on the IEB dataset, i.e., on the universe of the IAB worker-level data.

**Zooming into local labor markets through fixed effects.** We note that the population-wide effects (as well as all effects by SEF vs MEF status below) are robust to including proxies for local labor markets: industry and location fixed effects, and even their interaction. This means that the log employment variable can then also be interpreted as *relative local employment or shares of local employment* (the employment concept relevant for many monopsony models). While these proxies are basic and imperfect, the stability of the estimates suggests that further attempts to draw on more sophisticated and precise labor market definitions are unlikely to change this picture.

**Establishment definition.** We also reiterate (see Section 3 above) that the IAB establishment definition differentiates units of production by industry and location—so that by virtue of the data structure, the administrative definition already limits the concern that the establishment concept might be too fine-grained (e.g., a coffee shop chain operating different stores within the same location—which our data would pool into *one* establishment already). We will investigate further aggregations below and discuss related aspects of this consideration.

**Preview: the monopsony lens.** Intuitively, the ESWE is consistent with a firm-specific labor supply curve, as explained in the introduction and as illustrated in Figure 1. Employers are heterogeneous in productivity and locate at different points along their respective employer-specific labor supply curve. While the cross-sectional observational ESWE does not cleanly trace out this (inverse) labor supply curve as such due to interference from variation in other parameters (amenities, the intercept of the curve, slopes,...), the idea that within a local labor market larger

employers must pay more to be large, is the essence of labor market monopsony. We return to a more theory-driven interpretation and additional research designs below.

### 4.3 Recovering the standard ESWE: omitting firm fixed effects

As a stepping stone towards our eventual within-firm between-establishment specification, we now report ESWE estimates separately for SEFs and MEFs establishments. We do so in Table 3 Columns (4)-(11) as well as in Figures 6 (raw levels) and 7 (residualized after fixed effects ranging from simple intercepts to firm fixed effects, the latter described next).

**Single-establishment firms.** As a stepping stone, we separately estimate $\gamma$ for two samples: single-establishment firms (SEFs) and establishments belonging to multi-establishment firms (MEFs). For the SEFs, Table 3 Columns (4)-(6) report essentially identical estimates as for the pooled analogs in Columns (1)-(3), perhaps unsurprisingly in light of the sample being dominated by SEFs and the establishment-level regressions not being weighted by employment (see also Section 3.2 above). Estimates for $\gamma$ are around 0.073-0.074 for raw wages and 0.036-0.037 for establishment AKM effects and are extremely precisely estimated (SEs below 0.001).

**Multi-establishment firms: omitting the firm FE.** We then turn to the sample of establishments that are part of multi-establishment firms. In Columns (7)-(9) of Table 3, we start by replicating the specifications analogous to Columns (1)-(3) and (4)-(6) from the pooled and SEF samples in terms of controls—but do not yet include the firm fixed effect. We find a moderate attenuation of the ESWE. For raw wages, the coefficient estimates are now in the range of 0.035-0.046. For AKM effects, we estimate ESWEs of 0.020-0.022. That is, we document up to a halving of the ESWE when moving to MEFs. This reduction in the ESWE might reflect the kind of wage compression that we had already documented in Section 4.1 above. However, the remaining within-firm ESWE remains sizable and indeed on the order of many existing baseline estimates between employers as documented in our meta-analysis in Section 2.

**Firm-wide rather than establishment employment in MEFs.** This moderate reduction in the ESWE motivates a check on other employment concepts for MEFs, so that we include firm-wide employment in the same specification as an independent variable (which we construct by summing employment across establishments). These results are reported in Columns (10) and (11) of Table 3. We find a large "independent" effect of firm size on wages of about 0.045-0.048, which survives the inclusion of establishment employment (which, in turn, drops to 0.013 in the horse race specification). We overall find a sizable firm-size-based ESWE for MEF establishments no matter

the specification, and view it as a stepping stone towards our analysis with firm fixed effects.[19]

Complementing the regression, Figure 8 plots establishment and firm wages (for raw wages and AKM effects) against *firm* total employment, for SEFs and MEFs (where SEF outcomes are naturally identical but repeated as references)—without normalization or demeaning and hence comparable to Figure 6 above.

While consistent with firm-level labor supply (rather than at the establishment), this wage effect of firm-wide employment may reflect rent sharing through, e.g., bargaining, and firm-wage policies—with individual establishments facing local labor supply. We return to this important question when rationalizing our full set of results in Section 6 at the end of the paper, where the idea that MEFs may be high-wage employers across all establishments, paying premia above what the monopsony labor supply curve traced out by the SEF ESWE requires, will detach MEFs' establishment employment from labor supply rather than calling its existence into question.

### 4.4 The decoupling of employment and wages in multi-establishment firms: adding firm FEs

We now turn to our main innovation: to estimate the within-firm across-establishment variant of the specification in Equation (2)—which amounts to including a *firm fixed effect*. That is, we compare how wages and establishment employment comove across establishments *within the same firm*. This cross-sectional specification is then naturally only estimated in the sample of MEFs (as SEFs of course leave no variation after the inclusion of firm FEs). Again, we report the results in the remaining columns of Table 3 (i.e., Columns (12)-(14)) as well as in Figure 7.

**Main finding.** The main finding is a striking zero estimate for $\gamma$, the coefficient of interest that captures the ESWE. For raw wages, the estimated coefficients range between -0.0038 and 0.0023, with tight standard errors that let us rule out effects above 0.004—just a tenth the size of the point estimate for the baseline estimates for MEFs without firm fixed effects. For AKM effects, the effects are similarly tightly estimated around zero, with point estimates of -0.0001 to 0.0027 and permitting us to rule out even small positive effects an order of magnitude below the baseline ESWE coefficients.

**Basic robustness checks.** Again, the effects are robust to including basic proxies for local labor markets (industry, location, their interaction) and hence the decoupling of wages from employment also applies to relative firm size in, or an employer's share of, a granular local labor market. They

[19] Our meta-analysis in Section 2 did not reveal a persistent pattern when it comes to firm-level vs. establishment employment concepts. Among the studies in our meta-analysis, such horse-race specifications have only been conducted in Brown and Medoff (1989); Bayard and Troske (1999); Troske (1999); Barth and Dale-Olsen (2011)—none of which included firm fixed effects.

also hold at the worker level (Table 4 Columns (7)-(8)). The rest of this section will provide additional robustness checks.

**Monopsony interpretation.** Hence, despite the tremendous variation in wages and employment even within firms, establishments can evidently be larger or smaller without any systematic relationship with wages whatsoever. In other words, the ESWE breaks down across establishments in the same firm—even though its establishments operate in vastly different local labor markets and evidently have different sizes and shares of the local employment pool.

This decoupling of wages and employment is not just an exception to the reduced-form regularity of the ESWE (see our meta-analysis in Section 2). Instead, the complete decoupling of wages from employment also presents a puzzle to the prominent monopsony view of the ESWE specifically and perhaps the labor market more generally. Looking at Figure 1, firms paying *exactly* the minimum wage required to hire the current employment level is the cost-minimizing choice monopsony models predict. If firms face on average upward-sloping labor supply curves, then absent perfectly offsetting shifts in other monopsony equilibrium determinants (e.g., as captured by slopes or intercepts in the graph), this pattern appears hard to reconcile with the environment in which economists embed the monopsonistic firm—specifically, its labor demand operating along the labor supply curve. We interpret and further dissect the data from that perspective in Section 6, while first deepening this set of findings below.

### 4.5 Case studies of individual firms

We complement our large-sample analysis of all MEFs with case studies of individual MEFs large enough to estimate firm-specific ESWEs. We focus on AKM effects to strip out compositional effects in Figure 9, and Appendix Figure A.4 repeats the analysis for raw wages. The figure zooms into the largest firms and traces out their wage-employment gradients (again in binned scatter plots).

Figure 9 Panel (a) studies the three largest MEFs in three senses: (i) with the most establishments, (ii) with the highest total employment, and (iii) with the largest single establishment (in turn among those with at least 10 establishments; this third MEF ends up having 12). As a benchmark, we include the SEF gradient. Panel (b) plots the wage-size relationship for the ten largest firms, based on the number of establishments. Panel (c) groups firms by extreme size: the top 10 firms in terms of the number of establishments, and, as a reference, the bottom firms pooling all MEFs with exactly two establishments. Panel (d) reports on the 51 MEFs with at least 100 establishments and presents within-firm ESWE estimates for each of those firms, ranking firms by the point estimate and plotting confidence intervals.

Across these case studies, we confirm that MEFs exhibit no relationship whatsoever between size and wage. The case studies also highlight the fact there is no "mix" of establishments some of

which follow the SEF gradient and others that do not, a constellation that might have been masked in the average effects estimated so far. This becomes particularly clear in Panel (d), where we plot 52 separate firm-level estimates, which turn out to be centered around zero with little variation, and, if anything, the point estimates that are positive being matched with negative counterparts, pointing to statistical flukes.

We also note that the analyses reiterate that MEFs pay wages above the SEF gradient, even for the smallest MEF establishments (in terms of employment as well as number of establishments in the MEF). We pick up this important insight again in Section 6 below when trying to understand the implications of the high wage level of MEFs. To preview, this situation raises the possibility that MEFs operate off their labor supply curve rather than, as predicted by monopsony, exactly on it.

### 4.6 Additional robustness checks

We now report on additional robustness checks. We do so in Figures 10 for AKM effects as outcome variables, with Appendix Figure A.5 doing so for unadjusted log wages. Besides reporting on the baseline specifications for the pooled, SEF, and MEF sample without firm FEs as benchmarks, the figure then reports the most demanding specification with firm fixed effects and location-industry fixed effects for the different robustness checks. For many checks, fuller sets of results are reported in dedicated regression tables in the Appendix, with references below. The bottom line across is that we do not find sizable or significantly positive ESWE within MEFs in any robustness checks.

**Weighting and size cutoffs.** Supplementing the worker-level specification, which already evokes a weighting by employment count, in Appendix Table A.5, we revisit the MEF specifications with respect to weighting and overall firm size. We find overall robust results for both raw wages and AKM effects. We focus on the specifications with firm FEs and also the local labor market FEs (industry times region).

First, in Columns (1) and (2) of Appendix Table A.5, we separately consider MEF establishments with more than or at most 5 employees. Appendix Table A.6 additionally considers higher establishment size cutoffs of 10 and 20 employees and at least 10 full-time employees. Second, in Column (3) of Appendix Table A.5, we adjust establishment weights inversely to the firm's establishment count, so that the weighting is firm-level. Third, in Columns (4) to (7), we split up MEFs by their establishment count (exactly 2, 3 to 9, 10 to 99, and 100 and up), and find similar results in the form of no economically sizable positive ESWE.

**Full-time employees only.** In Appendix Table A.7, we replicate the main results in Table 3 but measure establishment and firm size by full-time employees only, finding similar results.

**Median vs. mean wage, and censoring.** In Appendix Table A.8 and Appendix Figures A.6 and A.7, we replicate the results for log median rather than log mean wages. We also show that the social security earnings cap (above which earnings are censored in the worker-level IAB data) cannot drive our results, because (i) even among MEFs, the censoring cutoff is low (see means) and (2) within MEFs, there is an, if anything, negative effect of firm size on the share of workers with censored earnings.

**Heterogeneity: industry.** We also estimate the employer size wage effect regression coefficients by broad industry, reporting results in Appendix Figure A.8. While the SEF ESWEs varies a bit, the MEF ESWEs disappear once we control for firm effects for any industry.

# 5 Rationalization attempts within the monopsony framework

We now dissect the key result, that the employer size wage effect completely disappears across establishments within a firm even if operating in different labor markets, through an extended monopsony lens. We again report on those results in Figures 10 and Appendix Figure A.5, for AKM effects and log wages, respectively.

## 5.1 Broadening the employer definition

At which level does the labor supply curve—and hence the ESWE it generates—operate: the local establishment, the national firm, somewhere in between? What is the definition of the employer, and the associated labor market a share of which it commands? Different microfoundations for monopsony may suggest slightly different constructions of employer definitions. In taste-based monopsony models, the answer is substitutability of employers and workplaces from the perspective of non-wage attributes. Moving or travel costs would point to geography as the relevant clustering variable. Search models may segment markets by workers' search clusters. This question is particularly relevant within MEFs, since SEFs are already defined at the unique level (unless one were to define monopsony by skill group within the firm, as in Barth and Dale-Olsen, 2011).

Intuitively, a theoretical possibility that could rationalize our results is one extreme case: that MEFs face one nation-wide labor supply curve—with individual establishments within the firm essentially being perfect substitutes for the workers upon choosing a MEF.[20] This scenario plausibly describes the extreme case of small MEFs with two establishments right across opposite sides of a border. Below, we show that we do not find evidence for this idea: we find zero effects even for MEFs that cannot be viewed through this lens—those whose establishments are clearly

[20] As we note in the introduction, this view would substantially depart from the canonical local labor market notion and the nesting implicit in models of location-specific establishment labor supply (Berger, Herkenhoff, and Mongey, 2022; Kleinman, 2025; Carry, Kleinman, and Nimier-David, 2025). However, consistent with Hazell et al. (forthcoming), we find substantial between-location wage level even within MEFs.

segmented by geography or wage levels, and those without detectable internal labor markets between establishments.

**The baseline IAB definition.** So far, we have relied on the *administrative definition of establishments in the German IAB data*, whereby an establishment for social security tax purposes is defined as a 5-digit industry code in a given municipality (see Section 3). As we noted, this is the sole establishment definition the literature using the IAB data has been able to rely on (and, up until recently, also to define employers for lack of firm IDs)—including the existing research on the employer size wage effect in Germany (see Section 2) as well as studies estimating firm-specific labor supply elasticities and diagnosing monopsony in Germany.

**Changing the establishment definition: aggregation.** To gauge robustness, we additionally define establishments more coarsely by aggregating employment across industries within a location as well as aggregate municipalities to the district level on top of across industries (see Section 3 for details on these definitions).[21] We report those results in Appendix Table A.9. We find nearly identical results for this definition: the within-firm effect estimated with fixed effects among MEF establishments remains economically zero (with if anything very small negative effects). This is despite this aggregation reducing both establishment and MEF counts (we still require at least two (now-aggregated) subunits for the MEF to be included in these regressions, and note the remaining MEF counts in the table). We conclude that geographic clustering of establishments did not underlie the result.

**Geographic distance between MEF establishments.** We also more directly address the question of geographic clustering by splitting our baseline sample by the distance of establishments (focusing on the centroid of their municipality) within a MEF. We do so in Appendix Table A.10.

We start by partitioning the sample into MEFs with zero (e.g., where we only have industry differentiation but all establishments are in the same municipality) vs. positive geographic distance in Columns (1) and (2), and find similar zero effects for both subsamples. In Column (3), we then increase the threshold for average geographic distance to 160 km (which gives us about half the sample), and again find similar results. Finally, we consider the MEFs with far-away establishments. We do so by first calculating, within each MEF, the *minimum* distance of all establishments from one another, across all potential establishment pairs within the MEF. We then consider the MEFs whose minimum is above increasingly strict cutoffs: 50 km, 100 km, and 200 km—reporting results in Columns (4)-(6). Results yield precisely estimated zero point estimates (which turn, if anything,

[21] Employment is the sum of employment across establishments (and then logged); AKM effects are the employment weighted average of the establishment AKM effects; raw wages are the employment-weighted average of average wages (in EUR levels) across establishment, and we then log that average. The industry assigned to the resulting aggregated unit is the industry of the largest constituent establishment.

even negative for raw wages). We conclude that even MEFs with highly geographically dispersed establishments—where establishments plausibly make up the relevant employer concept and are weaker substitutes within a firm—the main result remains robust.

**"Wage distance" between MEF establishments.** To complement this perspective, we additionally split up MEFs by a notion of "wage distance." We classify municipalities by the average AKM effect (or log wage when considering wages as the outcome), and compute, within each MEF, the mean and minimum difference between all its establishment pairs. Appendix Figure A.3 plots the distribution and summary statistics of this distance measure, showing that MEFs frequently place their operations in very different locations in terms of wage, even within the same MEF. This rules out the concern that MEFs place establishments only in narrowly homogeneous sets of local labor markets with respect to wage levels.

We then split the MEFs by this "wage distance" measure, compared to the distance mean, median, and 90th percentile. Appendix Table A.11 reports the regression results for the ESWE. We do not find any evidence for positive ESWE in any subgroup—not even in those where the firm already faces different local wage conditions across establishments.

**Internal labor markets: substitutability between establishments within the MEF.** We close our analysis with the perhaps most direct and simple "revealed preference" proxy for how the workers perceive their MEF establishment as substitutes: frequent *internal* job-to-job transitions between establishments of the same MEF. Appendix Table A.12 reports those results. We define job to job transitions as those between 2018 and 2019, and classify MEFs by whether it had some (or none), and then, whether some of those transitions were between establishments in the same MEF. Finally, we split up those establishments with positive within-firm between-establishment job to job transitions by the share of such transitions among all its job to job transitions, along the median of these positive shares. Across the board, we find the same zero ESWE once MEF fixed effects are included, even for the MEFs that do exhibit no such signs of internal labor markets between their establishments—so that their individual establishments very plausibly can be viewed as differentiated employers and hence should face the standard local labor supply curve. In conclusion, the idea of a national MEF-wide single labor supply curve with establishments being perfect substitutes appears unlikely to explain our results.

**A knife-edge case.** There are also economic reasons to expect the absence of a wage-size gradient within MEFs. For instance, if all establishments contribute to a common production function of a tradable good, firms should harmonize marginal revenue products across all production units—so that no relationship with firm size should emerge. An inspection of our aforementioned industry heterogeneity cuts in Appendix Figure A.8 does not suggest a role for this resolution as the ESWE remains flat in plausibly less tradable industries, too. Moreover, as we note below at the end of

Section 5.2, generally, if MEFs pay similar wages within the firm, these wages, being relative to local conditions and other local MEF employers, should still trace out a positive ESWE along local labor supply curves (after local labor market effects). Hence, this source of wage compression within the firm would not escape the prediction of an ESWE as long as firms operate along their labor supply curves.

## 5.2 A brief check on the role of firm-level wage setting and personnel policy constraints

We have found it hard to rationalize MEF establishment employment to be along the establishment-specific labor supply curve, and hence struggled to reconcile this facet of the ESWE with the monopsony framework. In the rest of the paper following this section, we will then transition to a setting where the 25% of employees that work in MEFs are not actually in equilibrium with labor demand. Instead, the wage setting by MEFs appears to generate strict pay premia—above what a monopsonist would need to pay for the labor it buys in a given labor market.

**Heterogeneity: collective bargaining agreement (CBA) coverage status and works councils.** A potential explanation of our findings might be that large firms are more likely to be in sectoral collective bargaining agreements that may impose similar wage floors—though these floors typically do not bind in large, productive covered firms (see, e.g. Hirsch and Mueller, 2020; Jäger, Noy, and Schoefer, 2022).

To check for this, we merge on information on collective bargaining coverage from the IAB Establishment Panel, an annual survey of establishments. As discussed in Section 3.3, we boost coverage from adjacent years and classify the entire MEF based on establishment survey information. Still, the analysis sample of MEFs with at least one surveyed establishment shrinks.

Appendix Table A.13 reports the results by splitting the sample into covered and non-covered firms. We find similar results across both groups—confirming that collective bargaining cannot explain our findings. As a complement, we also conduct an analogous check and split firms by the presence of works councils—a powerful worker representation body associated with wage premia (Hirsch and Mueller, 2020). We report these results in Appendix Table A.14. Again, the ESWE is zero once firm fixed effects are included in MEFs.

Inspecting the outcome means in the table, it becomes clear that CBA-covered firms are, if anything, high-wage firms (and moreover, the sample selection into our restriction of having at least two establishments covered in the survey is likely associated with being a particularly large firm). One may therefore not be surprised that the "case study" of large MEFs covered in the survey and selecting into CBA coverage may yield even smaller baseline ESWE in MEFs even before the inclusion of firm FEs—echoing our econometric case studies of large firms discussed in Section 4.5 and reported in Figure 9 (AKM) and Appendix Figure A.4 (raw wages).

**Centralized human resource (HR) departments.** Some firms may also self-impose wage policies (so that wages are compressed even in unregulated contexts, see Hazell, Patterson, Sarsons, and Taska, forthcoming) or conduct personnel policies centrally (leaving room for labor demand not being local). While we do not have a clear proxy for such policies, we suggestively present results that classifies MEFs by the presence of a firm-wide, centralized vs. decentralized HR department structure, in Appendix Table A.15. We consider MEFs with one or more than one such department, and those without any HR department as measured in our data. To proxy for HR department structure, we draw on the matched employer-employee microdata and use the occupational codes to identify HR occupations, where we apply narrow, medium, and broad occupational definitions (see table note for details). The table reports on specifications with industry-location FEs and firm FEs. The bottom line is that we find little evidence that HR departments being centralized or dispersed or not present appear to drive our results. Next, we reiterate that and why wage compression within MEFs should not affect the ESWE.

**A note on homogeneous-wage policies and the ESWE within monopsony** We reiterate a claim discussed in the introduction and depicted in Figure 2: even exogenous wages—such as from MEF-wide pay constraints, CBAs or internal pay policies—need not lead to a zero ESWE. The new fact our paper points out and dissects is not wage compression within MEFs, but the *decoupling of wages from employment*. For instance, even if wages were set nationally within a MEF (as in, e.g., Hazell, Patterson, Sarsons, and Taska, forthcoming), a monopsony perspective would still prescribe an ESWE in the data even in the presence of wage compression—provided establishment-level employment remains on the establishment-specific labor supply curves and given the implied relative wage differentials with other MEFs' establishments' wages from including local labor market FEs. And indeed, the standard monopsony models employed in studies of firm wage compression and multi-establishment firms' wage policies (e.g., Saez, Schoefer, and Seim, 2019; Hazell, Patterson, Sarsons, and Taska, forthcoming; Kleinman, 2025) make this assumption (and focus on wages, but do not study employment or firm size). The rest of the paper develops the flip side of this argument—as an appealing rationalization of the findings might be that MEFs—hence 25% of German employment, in particular high-wage employment—is determined off firms' labor supply curves and strictly exceeds labor supply.

### 5.3 Other labor demand margins and trade-offs: turnover, recruitment, and worker quality

To shed additional light on how employers evidently are larger or smaller without tantamount wage adjustment, we study alternative labor demand margins besides wages as outcomes for the specification in Equation (2): turnover, recruitment, and worker quality.

**Recruitment effort.** A potential offsetting effect of higher wages is more intensive or effective recruitment, as in dynamic monopsony or search models. To check for effects on this margin, we draw on the IAB Vacancy Survey (see Section 3) and study effects on vacancy duration (of the last hire), hours spent recruiting the last hire, the hiring cost in Euro, and the number of applicants. We add a salient caveat about the small MEF establishment sample size after firm fixed effects in this merged dataset, so our check remains tentative. Results are reported in Appendix Table A.16. If anything, MEF establishments face less of a trade-off between recruitment difficulty and establishment size despite not raising wages: while larger SEFs face higher vacancy durations than small SEFs and put in more recruitment hours and expenditure per hire, the effects among MEF establishments are zero or even negative, with a more mixed picture for applicants per vacancy. Hence, we find little evidence for the idea that by keeping wages stable in establishment size, MEF establishments face an obviously steeper trade-off at the hiring margin. In Appendix Table A.17, we also show results for the share of hires that come from nonemployment.

**Turnover.** In Appendix Table A.18, we study hiring and separation rates, relying on the administrative worker flow data from the BHP (see Section 3). We sum all hiring flows, separation flows, and their sum (turnover) in 2019 and divide by 2018 employment (so these ratios can be higher than one, so that control means seem high; we cap these ratios at 1), and relate those three outcome variables to establishment employment in 2019. We report results in Appendix Table A.18.

Across samples and specifications, we find that the turnover rate decreases in firm size for SEFs and MEF establishments, largely due to lower separation rates. Strikingly, for the separation margin, the coefficients are actually *larger* in magnitude (i.e., more negative) for MEF establishments already without firm FEs, and grow even somewhat larger in magnitude with firm FEs. That is, even though MEFs do not appear to boost wages in their larger establishments, we do not see evidence for higher separations as a trade-off. This result would point to some offsetting non-wage benefit effect if interpreted through a labor supply perspective to explain why workers are more likely to stay put. In Appendix Table A.17, we also study average worker tenure as an outcome.

**Worker quality.** Another trade-off from growing without raising wages may come from worker quality. Comparing the difference between the coefficient for raw wages and AKM effects in Table 3 already suggested that MEF establishments, once firm FEs are included, have a considerably lower sensitivity of worker quality to employment than SEFs do—perhaps because they do not pay wage premia for size. This suggests that within MEFs, there is less positive sorting by size than across SEFs (but MEFs still have much higher average worker quality, see group means in the regression table).

In Appendix Table A.17 Columns (1) and (4), we study worker quality directly. Specifically, we put as the dependent variable the AKM *worker* effect, and hence focus on quantitative point estimates here. Appendix Figure A.9 Panel (a) plots the associated binned scatterplots for SEFs

and MEFs with and without firm FEs. We find that indeed, MEF establishments' worker quality decreases somewhat in size. For SEFs, the effect of employment on the AKM worker effect is 0.018, while it is 0.004 for MEF establishments before the inclusion of firm FEs. Once firm FEs are included and we are comparing establishments within the same MEF, the effect turns negative to -0.006. (Standard errors are consistently below 0.001, but we note that the outcome variable is an estimated variable.)

# 6 Beyond monopsony: high wage firms operate *off* their labor supply curves

We now present and empirically support a coherent account of the patterns we have documented. The core of our account relies on MEFs' labor demand entailing rationed labor supply propped up by wage premia, rather than operating along their employer-specific labor supply curve as in monopsony models.

## 6.1 The simple economics of employer-specific (dis-)equilibria, monopsony, and rationing

**A minimal model.** To guide our final steps towards the labor market logic potentially underlying the zero ESWE we document, we consider *employer-specific equilibria and disequilibria*—returning to and extending the basic framework underlying the constellations depicted in Figures 1 and 2. Formally, denoting the employer by $j$ operating in labor market $m$ with catch-all demand/supply shifters $x$ (productivity, amenities,... all shifting around the curves), the minimal implication is that actual(ly traded) employment must lie weakly below (typically: exactly at one of) the minimum of labor demand $n^D$ and supply $n^S$ at the given wage $w_j$:[22]

$$\ln n_j \leq \min\{\ln n^S_{m(j)}(w_j, x^S(m(j), ...)), \ln n^D(w_j, x^D(m(j), ...))\}. \tag{3}$$

[22]We can sketch a simple model by specifying the following functions for labor supply and demand: $\ln n^D_j(w) = a^D_j - b^D_j \left(\ln w + x^D_j\right)$ and $\ln n^S_j(w) = a^S_j + b^S_j \left(\ln w + x^S_j\right)$, where $a$ capture shifters of the curve, $b$ capture the slopes (absolute elasticities), and $x$ capture "wedges" on the wage. An employer-specific equilibrium (i.e., an equality in Expression (3)) yields: $\ln w^* = \frac{a^D_j - a^S_j - \left(b^D_j x^D_j + b^S_j x^S_j\right)}{b^S_j + b^D_j}$, with $n^D_j(w^*) = n^S_j(w^*)$ at this point. Forces such as monopsony show up through a markdown and hence labor demand shifters or through a tax-like wedge raising the full labor cost above the wage. The monopsony interpretation of the cross-sectional ESWE amounts to an identification assumption of labor demand factors $a^D_j$ dominating, sufficiently orthogonally to the other sources of potential variation, hence tracing out an average labor supply elasticity. Variation in other parameters (specifically, labor supply shifters) can confound this relationship. We do note that our specifications are run with and without sector and location fixed effects including their interactions (so that we compare similar employers within local labor markets).

Our design analyzes such employer-level employment and wages pairs in cross-sectional observational data—depicted as black dots in Figures 1 and 2. Absent assumptions on market clearing, Expression 3 makes weak predictions for the constellation of these pairs.

**Benchmark: the ESWE as monopsony equilibria.** Under the assumption of monopsony, employers flexibly set wages to equilibrate supply and demand (subject to a markdown), similarly for the (employer-specific) "competitive" equilibrium (minus a markdown,). In either "market-clearing" case, the wage-employment data points would reflect rich combinations of labor demand and supply shifters. The standard picture painted by the ESWE is that (at least on average), wages and employment trace out the kind of upward-sloping relationship that we documented *across* SEF and MEF establishments and is a canonical empirical regularity (see our meta-analysis in Section 2). This positive ESWE is consistent with a scenario in which, on net, labor demand rather than supply shifters dominate the variation, and hence trace out average employer-specific labor supply curves. This monopsony-based interpretation is popular (see introduction). For a formal lever, see also Footnote 22.

**Reading the MEF data as disequilibria.** The ESWE breaks down across employers (establishments) within the same MEF across different labor markets. We close our interpretation by attempting a parsimonious rationalization *within* the monopsony-style framework above. The basis is that MEFs pay *above-market-clearing wage premia*, so that employment is labor demand-determined, with labor supply *rationed* without an active role. (We also note (with further references in Footnote 5) that this notion of disequilibrium and rationing is employer-specific and hence echoes the logic of queuing for "good jobs." Rather than unemployed, rationed workers are typically employed in other firms but would strictly prefer to work in a specific high-wage MEF establishment at that wage.) Figure 2 depicts this logic as MEF establishments' wages are (here: exogenously) high so that labor demand exceeds supply. If high productivity firms impose pay premia, then a zero ESWE can emerge. (Figure 2 also shows the counterfactual negative relationship that would emerge without the positive correlation between wages and productivity for premium-paying firms.) Importantly, for low-wage MEFs, the ESWE should reemerge, as employment is again determined along the labor supply curve for any given wage—whether monopsonistic or "exogenous."

### 6.2 Some evidence in support of the rationing perspective within MEFs

We close our empirical analysis by supporting this disequilibrium view of the labor market. First, we document true pay premia among MEFs—defined as wage levels above the level required to satisfy supply at the given employment. Second, we show the ESWE reemerges for MEFs that do not appear to pay a premium.

**A smoking gun: MEFs are high-wage employers.** We start by reiterating that MEFs are, on average, high wage firms. First, our descriptive analysis of the distributions of wages across MEFs and SEFs (Figure 4) already foreshadowed that MEF establishments are not only larger but also pay higher wages. Second, the scatter plots tracing out the ESWE by group (Figure 6) showed that the MEF wage and AKM effect levels are, on average, higher for any establishment size. Third and relatedly, the case studies of the largest MEFs already showed much higher levels compared to the SEF reference (Figure 9).

**Constructing the wage premium conditional on size.** We are not aware of any study that attempted, let alone delivered, a method to construct this notion of true, size-specific wage premia that entail rationed labor supply. We now attempt to construct such a proxy.

First, we assign each MEF establishment a predicted labor-supply-required wage: the minimum wage needed to buy the quantity of labor it currently hires. Economically, the wage function proxies for the inverse labor supply curve in Figures 1 and 2 (with employment to be read as a level/share). We proxy for this concept by constructing a flexible reduced-form "wage function" *conditional* on the establishment's employment/local labor market employment share. Specifically, we fit a flexible lasso regression model *among SEFs* (assumed to be on their labor supply curve) of the log wage (or AKM effect) on establishment covariates including local labor market—and importantly establishment employment.[23] The lasso model takes a 75% random sample among SEFs. The lasso-selected coefficients are then used to predict the outcome variable for SEF and MEF establishments. Appendix Figure A.10 Panel (a) shows actual and predicted values for the left-out 25% SEF sample along log establishment employment—even in the range of larger establishments that may be particularly relevant for the MEF sample explored below. Second, for each MEF establishment, the premium is then simply its actual wage minus its thus-predicted counterpart—corresponding to the vertical gap between the actual wage and the minimum (labor-supply-required) wage at the given employment in Figures 1 and 2.

**Pay premia by employer size.** We present results in Figure 11, for AKM establishment fixed effects, and find similar results for raw wages (Appendix Figure A.11). Panel (a) plots MEF establishments' actual AKM effects and the predicted counterparts (based on the SEF wage function) against employment. A striking result—one that rhymes with the raw wage level Figure 6—emerges: MEF establishments pay, on average, higher wages *no matter their size* and even flexibly controlling for characteristics of the establishment and labor market. Moreover, this gap is largest for smaller establishments. Panel (b) plots the pay premium: the establishment-level difference between actual and predicted wages, separately for MEF and SEF establishments, against employ-

[23] The covariates include 2-digit sector FE, labor market FE, log employment, log employment squared, interaction of log employment with broad sector FE, and interaction of log employment squared with broad sector FE. The penalty parameter $\lambda$ is selected by 10-fold cross-validation.

ment. Even large MEF establishments pay a premium. As a caveat, we note that prediction errors make it difficult to accurately diagnose negative premia, so that this check remains tentative and better understood in terms of employment gradients.[24]

Hence, our proxy for pay premia substantiates the idea that MEFs tend to pay wage premia above what is required to satisfy labor supply. The resulting *rationed firm-specific labor supply* implies a decoupling of employment from the labor supply curve and should permit the decoupling of wages and employment.

**The reemergence of the ESWE in low-premium MEFs.** Finally, we complete the circle by showing that the ESWE reemerges in low-premium MEFs—which should operate along labor supply. This consistency check establishes the role of the employer-specific labor supply curve that appears irrelevant for most MEFs due to premia. We split the MEF sample into 20 bins by the MEF's average establishment premium (AKM or wage), and estimate bin-specific ESWE regressions (with sector-local labor market region effects, and with or without MEF FEs). Indeed, the ESWE reemerges within MEFs in the lowest-premium MEFs—restoring the constraint of the finitely elastic employer-specific labor supply curve.

We conclude by acknowledging that this final exercise is not fully independent: MEFs classified as low-premium are, by construction, those whose wages track size more closely in the way SEFs do. The value of the exercise is to provide evidence that the zero ESWE is not uniform across MEFs, and that its presence correlates strongly with the premium proxy in the direction the rationing view predicts.

## 7 Conclusion

Our paper has revisited the employer size wage effect (ESWE)—perhaps the most influential departure from the law of one price for labor and skill. We started by presenting the first systematic meta-analysis of the ESWE. We then present a new result: the ESWE turns to zero within the same firm. Within multi-establishment firms (MEFs), establishments are large or small without any relationship to wages whatsoever. This wage-size decoupling poses a challenge to the employer-specific labor supply curve view of monopsony. Instead, our findings point towards rationed labor supply, wage bargaining and rent sharing, and firm-level personnel policies as important factors in wage setting and labor demand. That is, the fact that MEFs may pay premia above what is needed in terms of labor supply—implying rationed labor supply with demand-determined employment—is a parsimonious explanation for our findings.

[24]Indeed, Appendix Figure A.10 Panel (b) plots, separately for MEF and SEF establishments, the share of establishments in a given size bin with negative premia.This share is only 25% for the smallest MEF establishments, and tops out at 40% for the largest. (As expected, the gradient for SEFs is stable at about 50%.)

We close our paper with a discussion of limitations of our study and questions we leave open. First, we do not have direct evidence on firms' personnel policies and decision-making, and it would be interesting to supplement our econometric analysis on the basis of cross-sectional correlations with surveys of firms and their wage setting policies (as in Hazell, Patterson, Sarsons, and Taska, forthcoming). Second, we study correlational relationships, and it may be interesting to obtain exogenous labor demand shocks (as in Hjort, Li, and Sarsons, 2026, for multinational companies). Third, we have only scratched the surface of potential departures from labor demand optimality conditions among establishments; progress here would require high-coverage and reliable establishment productivity data. Fourth, while we have identified above-market-clearing wages in MEFs, which make up 25% of German employment, we have left open whether the associated rationing characterizes high-wage employers' equilibria more generally. Fifth, we leave open which wage setting models lead to such high wages, all in all pointing to patterns that leave considerable room for—and perhaps call for a reappreciation of—the efficiency wage logic.

Lastly, we advertise that our research design can in principle be replicated in any triple-linked firm-establishment-employee data, which this paper leaves for future work. While we have attempted to rule out that institutional factors related to the German industrial relations system drive our results (e.g., by separately studying the sample not covered by collective bargaining), it will be interesting to replicate our findings in other contexts.

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# Tables

**Table 1:** Meta-Analysis of Estimated Size-Wage Elasticities from the Literature

| Study | Country | Elasticity | SE |
|---|---|---|---|
| *Mean employer-size wage effect across all 40 preferred estimates: 0.040* | | | |
| *(1) Without any controls for worker heterogeneity (mean elasticity: 0.062)* | | | |
| Bernard, Jensen, and Lawrence (1995) | US | 0.037 | 0.0004 |
| Troske (1999) | US | 0.064 | 0.0060 |
| Arai (2003) | Sweden | 0.016 | 0.0060 |
| Manning (2003)† | UK, US | 0.097 | 0.0022-0.0030 |
| Barth and Dale-Olsen (2011) | Norway | 0.019 | 0.0007 |
| Sulis (2011) | Italy | 0.078 | 0.0043 |
| Scoppa (2014) | Italy | 0.074 | 0.0004 |
| Lochner, Seth, and Wolter (2020)* | Germany | 0.092 | n.a. |
| Arellano-Bover (2024) | Spain | 0.083 | 0.0004 |
| *(2) With controls for observable worker heterogeneity (mean elasticity: 0.036)* | | | |
| Brown and Medoff (1989) | US | 0.027 | 0.0020 |
| Reilly (1995) | Canada | 0.039 | 0.0092 |
| Green, Machin, and Manning (1996)* | UK | 0.041 | 0.0077-0.0110 |
| Doms, Dunne, and Troske (1997) | US | 0.036 | 0.0100 |
| Albaek et al. (1998)†* | Scandinavia | 0.023 | 0.0018-0.0033 |
| Troske (1999) | US | 0.047 | 0.0050 |
| Lane et al. (1999) | US | 0.050 | 0.0020 |
| Bayard and Troske (1999)‡ | US | 0.048 | 0.0017-0.0026 |
| Arai (2003) | Sweden | 0.010 | 0.0050 |
| Manning (2003)† | UK, US | 0.056 | 0.0018-0.0025 |
| Belfield and Wei (2004) | UK | 0.060 | 0.0044 |
| Lallemand, Plasman, and Rycx (2007)† | South & Central Europe | 0.037 | 0.0026-0.0045 |
| Winter-Ebmer (2001) | Austria | 0.028 | 0.0010 |
| Heyman (2007)* | Sweden | 0.012 | 0.0016-0.0027 |
| Barth and Dale-Olsen (2011) | Norway | 0.017 | 0.0007 |
| Sulis (2011) | Italy | 0.041 | 0.0034 |
| Scoppa (2014) | Italy | 0.043 | 0.0004 |
| Pehkonen et al. (2017) | Finland | 0.007 | 0.0001 |
| Barth, Davis, and Freeman (2018) | US | 0.026 | 0.0003 |
| Green, Heywood, and Theodoropoulos (2021) | UK | 0.031 | 0.0011 |
| Arellano-Bover (2024) | Spain | 0.059 | 0.0005 |
| Bachmann et al. (2025) | Germany | 0.061 | 0.0100 |
| *(3) With worker fixed effects (mean elasticity: 0.018)* | | | |
| Arai (2003) | Sweden | 0.020 | 0.0080 |
| Barth and Dale-Olsen (2011) | Norway | 0.015 | 0.0010 |
| Scoppa (2014) | Italy | 0.021 | 0.0005 |
| Pehkonen et al. (2017) | Finland | 0.003 | 0.0004 |
| Barth, Davis, and Freeman (2018) | US | 0.031 | 0.0002 |
| Green, Heywood, and Theodoropoulos (2021) | UK | 0.019 | 0.0007 |
| *(4) Estimates based on AKM employer effects (mean elasticity: 0.050)* | | | |
| Alvarez et al. (2018)* | Brazil | 0.072 | n.a. |
| Lochner, Seth, and Wolter (2020)* | Germany | 0.050 | n.a. |
| Kline, Saggio, and Sølvsten (2020) | Italy | 0.028 | 0.0007 |

*Note:* The table lists preferred estimates; see Appendix Table A.1 for details. Standard errors are bounded for averaged estimates (see Footnote 8). † denotes averages over estimates for different countries. Only non-Scandinavian estimates in Lallemand et al. (2007) reported. * denotes averages over estimates for different time periods. ‡ Bayard and Troske (1999) provide sector specific ESWE estimates based on joint inclusion of establishment- and firm size regressors, only. We report the sector-averaged establishment size coefficients. Firm size coefficients are small and sometimes insignificant (with sector-averaged mean of 0.007).

**Table 2:** Summary Statistics

| | Establishment-weighted | | | Employment-weighted | | |
|---|---|---|---|---|---|---|
| | Full | SEF | MEF | Full | SEF | MEF |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Employment | 26.504 | 22.704 | 51.809 | | | |
| | (165.651) | (156.955) | (213.026) | | | |
| Log Real Daily Wages | 4.506 | 4.482 | 4.669 | 4.727 | 4.677 | 4.873 |
| | (0.408) | (0.400) | (0.424) | (0.431) | (0.420) | (0.431) |
| AKM FE | -0.065 | -0.078 | 0.020 | 0.033 | 0.011 | 0.100 |
| | (0.225) | (0.225) | (0.204) | (0.199) | (0.201) | (0.175) |
| Establishment Age | 18.275 | 18.495 | 16.814 | 24.440 | 24.513 | 24.227 |
| | (13.453) | (13.476) | (13.207) | (14.737) | (14.702) | (14.837) |
| Fraction Female | 0.404 | 0.391 | 0.490 | 0.375 | 0.368 | 0.395 |
| | (0.295) | (0.289) | (0.323) | (0.251) | (0.250) | (0.254) |
| Fraction Helper Activities | 0.199 | 0.207 | 0.148 | 0.201 | 0.211 | 0.174 |
| | (0.253) | (0.254) | (0.240) | (0.263) | (0.263) | (0.261) |
| Fraction Professionals | 0.610 | 0.610 | 0.613 | 0.562 | 0.568 | 0.541 |
| | (0.301) | (0.299) | (0.314) | (0.281) | (0.278) | (0.289) |
| Fraction Specialists | 0.103 | 0.100 | 0.124 | 0.128 | 0.120 | 0.151 |
| | (0.177) | (0.172) | (0.208) | (0.158) | (0.150) | (0.175) |
| Fraction Experts | 0.088 | 0.083 | 0.115 | 0.109 | 0.100 | 0.133 |
| | (0.177) | (0.175) | (0.192) | (0.164) | (0.159) | (0.175) |
| Hiring Rate | 0.248 | 0.247 | 0.258 | 0.221 | 0.223 | 0.216 |
| | (0.239) | (0.241) | (0.224) | (0.175) | (0.178) | (0.163) |
| Separation Rate | 0.218 | 0.214 | 0.248 | 0.198 | 0.196 | 0.203 |
| | (0.201) | (0.199) | (0.207) | (0.153) | (0.151) | (0.157) |
| Turnover | 0.461 | 0.455 | 0.501 | 0.415 | 0.415 | 0.415 |
| | (0.351) | (0.350) | (0.354) | (0.281) | (0.282) | (0.280) |
| East Germany | 0.194 | 0.192 | 0.207 | 0.164 | 0.164 | 0.164 |
| Agriculture | 0.024 | 0.026 | 0.013 | 0.009 | 0.011 | 0.004 |
| Mining | 0.002 | 0.001 | 0.002 | 0.002 | 0.002 | 0.003 |
| Manufacturing | 0.132 | 0.140 | 0.081 | 0.279 | 0.287 | 0.256 |
| Energy, Electricity | 0.004 | 0.003 | 0.009 | 0.009 | 0.008 | 0.013 |
| Water | 0.007 | 0.007 | 0.008 | 0.010 | 0.011 | 0.007 |
| Construction | 0.166 | 0.185 | 0.035 | 0.076 | 0.094 | 0.023 |
| Wholesale & Retail Rrade | 0.229 | 0.204 | 0.399 | 0.176 | 0.162 | 0.219 |
| Transportation, Storage | 0.058 | 0.056 | 0.072 | 0.079 | 0.074 | 0.093 |
| Accommodation | 0.071 | 0.074 | 0.051 | 0.052 | 0.060 | 0.029 |
| ICT | 0.040 | 0.039 | 0.047 | 0.046 | 0.041 | 0.059 |
| Banking, Insurance | 0.023 | 0.020 | 0.046 | 0.033 | 0.027 | 0.051 |
| Real Estate | 0.020 | 0.021 | 0.018 | 0.010 | 0.011 | 0.006 |
| Technical Service | 0.111 | 0.112 | 0.100 | 0.088 | 0.085 | 0.097 |
| Business Service | 0.075 | 0.073 | 0.090 | 0.104 | 0.098 | 0.122 |
| Other Service | 0.038 | 0.039 | 0.029 | 0.027 | 0.030 | 0.018 |

*Note:* The table provides summary statistics for the year 2019 for the full sample, single-establishment firms (SEF) and multi-establishment firms (MEF). The first three columns are establishment-weighted average statistics. The last three columns are employment-weighted average statistics. Average daily wages are measured in 2015 euros. Standard errors in parentheses for continuous variables.

**Table 3:** Main Results: The Employer Size Wage Effect Across and Within Firms (Establishment Level)

| | Pooled | | | Single-Establishment Firms (SEF) | | | Multi-Establishment Firms (MEF) (*Unique firms: 30,507*) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | No firm FE | | | | | With firm FE | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) |
| Panel A: Log Mean Wages | | | | | | | | | | | | | | |
| Est. Empl. | .0785*** | .0743*** | .0729*** | .0772*** | .0740*** | .0730*** | .0460*** | .0362*** | .0347*** | .0128*** | | .0023** | -.0031*** | -.0038*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.001) | (0.001) | (0.001) | (0.001) | | (0.001) | (0.001) | (0.001) |
| Firm Empl. | | | | | | | | | | .0451*** | .0477*** | | | |
| | | | | | | | | | | (0.001) | (0.001) | | | |
| Obs. | 890,728 | 890,728 | 890,728 | 778,068 | 778,068 | 778,068 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 |
| $R^2$ | .047 | .360 | .388 | .043 | .358 | .388 | .020 | .406 | .465 | .498 | .496 | .808 | .828 | .848 |
| Mean of $Y$ | 4.506 | 4.506 | 4.506 | 4.482 | 4.482 | 4.482 | 4.668 | 4.668 | 4.668 | 4.668 | 4.668 | 4.668 | 4.668 | 4.668 |
| Panel B: AKM FE | | | | | | | | | | | | | | |
| Est. Empl. | .0383*** | .0370*** | .0365*** | .0373*** | .0364*** | .0360*** | .0223*** | .0200*** | .0197*** | .0070*** | | .0027*** | .0003 | -.0001 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | | (0.000) | (0.000) | (0.000) |
| Firm Empl. | | | | | | | | | | .0261*** | .0276*** | | | |
| | | | | | | | | | | (0.000) | (0.000) | | | |
| Obs. | 890,728 | 890,728 | 890,728 | 778,068 | 778,068 | 778,068 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 |
| $R^2$ | .037 | .223 | .250 | .032 | .223 | .251 | .020 | .257 | .319 | .366 | .365 | .723 | .735 | .757 |
| Mean of $Y$ | -.066 | -.066 | -.066 | -.078 | -.078 | -.078 | .020 | .020 | .020 | .020 | .020 | .020 | .020 | .020 |
| SIC | | Y | | | Y | | | Y | | | | | Y | |
| LMR | | Y | | | Y | | | Y | | | | | Y | |
| SIC × LMR | | | Y | | | Y | | | Y | Y | Y | | | Y |
| Firm | | | | | | | | | | | | Y | Y | Y |

*Notes:* The table shows regression results of log establishment wages (Panel A) and AKM establishment effects (Panel B) on establishment employment (Est. Empl.) and firm employment (Firm Empl.). Columns (1) to (3) provide the results for all establishments (pooling SEFs and MEFs). Columns (4) to (6) provide the results for single-establishment firms (SEF). Columns (7) to (14) provide the results for multi-establishment firms (MEF). Control variables refer to 2-digit sector (SIC) FE and labor market region (LMR) FE. Firm size in columns (10) and (11) refers to the sum of all establishments within the firm identifier. Columns (12)-(14) include firm FE to identify the effect of size variation on the outcome variable within the firm. Panel A shows the result for log establishment wages. Panel B shows the results for AKM establishment effects. Robust standard errors in parentheses. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

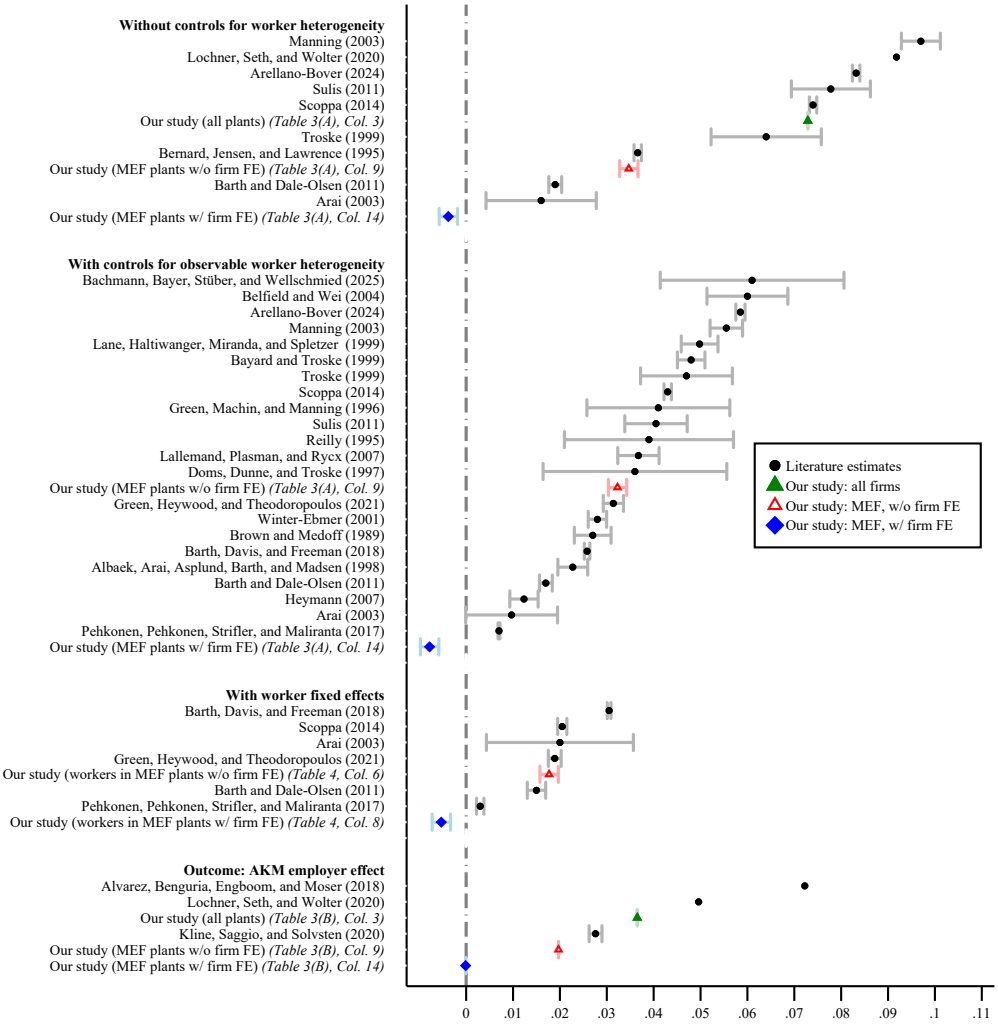
**Table 4:** Robustness Check: Worker-level Specifications

| | Pooled Sample | | SEF | | MEF | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Est. Empl. | 0.0583*** | 0.0356*** | 0.0605*** | 0.0385*** | 0.0323*** | 0.0177*** | -0.0078*** | -0.0053*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Obs. | 17,963,312 | 17,963,312 | 12,816,976 | 12,816,976 | 5,146,336 | 5,146,336 | 5,146,336 | 5,146,336 |
| $R^2$ | 0.590 | 0.760 | 0.584 | 0.752 | 0.618 | 0.782 | 0.684 | 0.811 |
| Mean of $Y$ | 4.576 | 4.576 | 4.53 | 4.53 | 4.688 | 4.688 | 4.688 | 4.688 |
| *Worker-level controls* | | | | | | | | |
| Mincer vars | Y | Y | Y | Y | Y | Y | Y | Y |
| W-AKM value | | Y | | Y | | Y | | Y |
| *Establishment-level controls* | | | | | | | | |
| SIC × LMR | Y | Y | Y | Y | Y | Y | Y | Y |
| Firm FE | | | | | | | Y | Y |

*Note:* The table shows regression results of log worker-level wages on establishment employment. Columns (1) to (2) provide the results for all workers (pooling workers in SEFs and MEFs). Columns (3) to (4) provide the results for workers in single-establishment firms (SEF). Columns (5) to (8) provide the results for workers in multi-establishment firms (MEF). Columns (7) to (8) include firm fixed effects to identify the effect of size variation on the outcome variable within the firm. Mincer control variables include age and age square, tenure and tenure square and indicator variables for female, part-time employment and 4 educational levels. W-AKM value refers to the separately estimated AKM *worker* effect as a continuous variable. SIC indicates 2-digit sector FE. LMR indicates labor market region FE. Robust standard errors in parentheses. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

# Figures

**Figure 3:** Meta-Analysis of Estimated Size-Wage Elasticities from the Literature

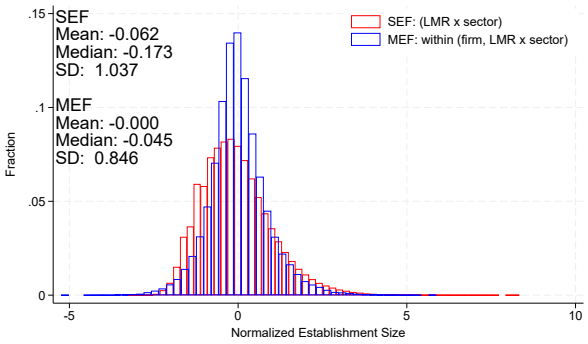



*Note:* The figure presents the results from Table 1 in black and our own main estimates (always with $SIC \times LMR$ fixed effects) from Table 3 (establishment level) and Table 4 (worker level). Studies are ordered by coefficient size within each of the four categories in Table 1. The first block includes studies that do not control for worker heterogeneity, followed by those controlling for observables, then those with worker fixed effects (or AKM worker effects in our worker-level estimates), and finally studies based on AKM employer effects as dependent variables. For estimates averaged over multiple point estimates within studies (see the notes to Table 1), we report the mean of the standard errors. Further details on the standard error calculation are provided in Footnote 8 in Section 2. For further details on the studies see Table A.1.

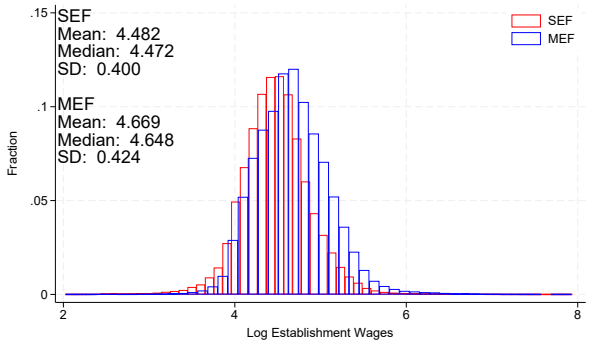
**Figure 4:** Size, Wage, and AKM Effect Distribution across Establishments For Single- and Multi-Establishment Firms

**(a)** Raw Log Size Distribution

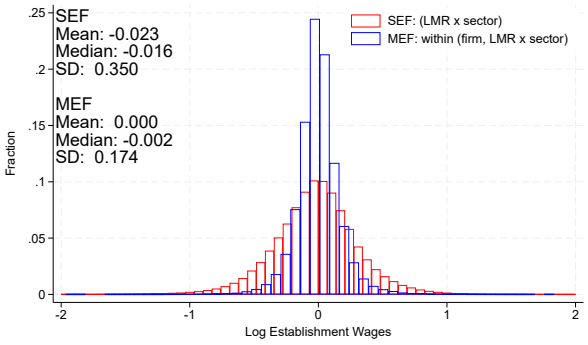

**(b)** Normalized Log Size Distribution



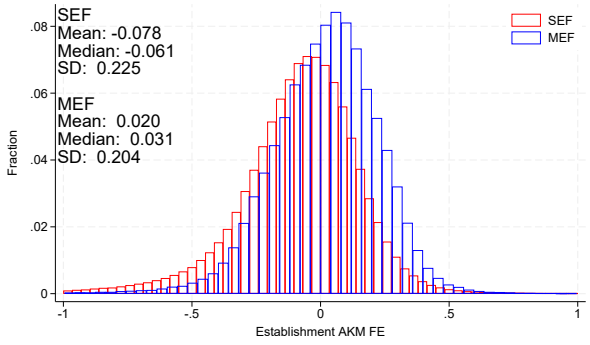

**(c)** Raw Wage Distribution



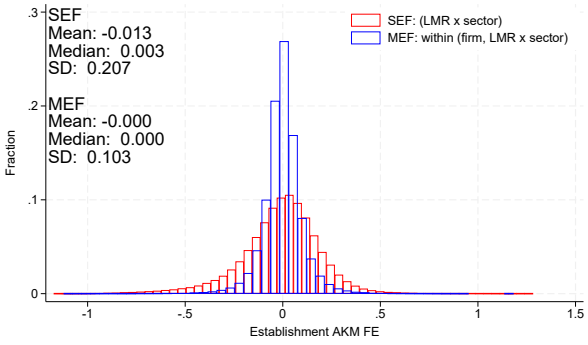

**(d)** Normalized Wage Distribution




**(e)** Raw AKM Distribution

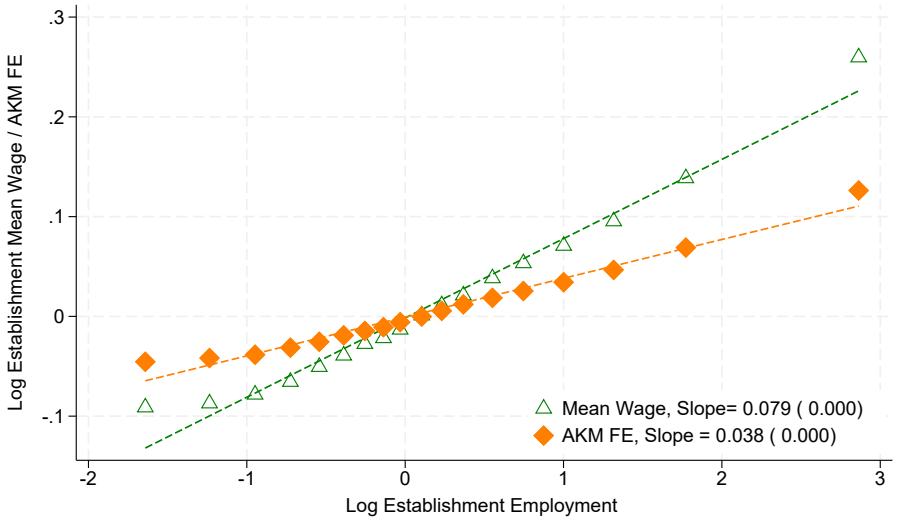



**(f)** Normalized AKM Distribution




*Note:* The figure reports the distribution of log establishment size (employment), log wages, and AKM establishment fixed effects for single-establishment firms (SEF) in gray and multi-establishment firms (MEF) in white. Panels (a), (c), and (d) plot the raw data. Panels (b), (d), and (f) shows normalized distributions. SEF units are normalized by local labor market (LMR) times sector fixed effects. MEF units are normalized by LMR times sector fixed effects and firm fixed effects.

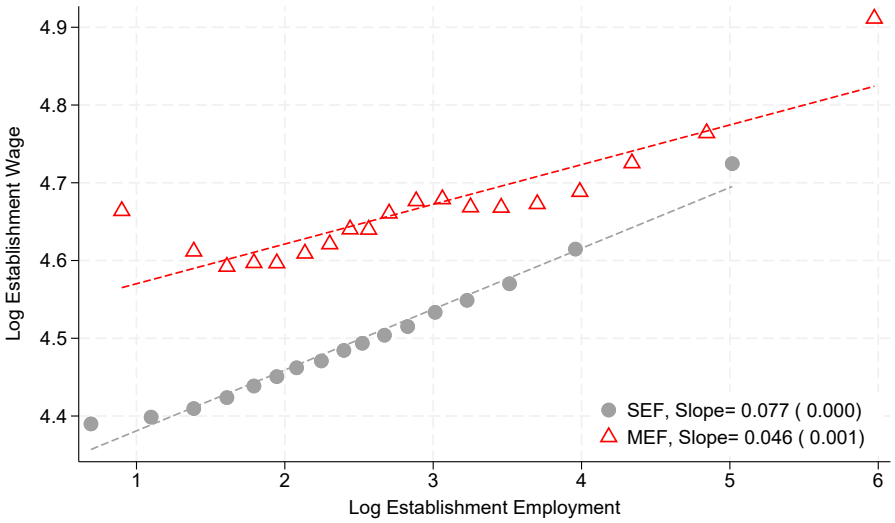
**Figure 5:** The Standard Employer Size Wage Effect in Germany: Across all Establishments



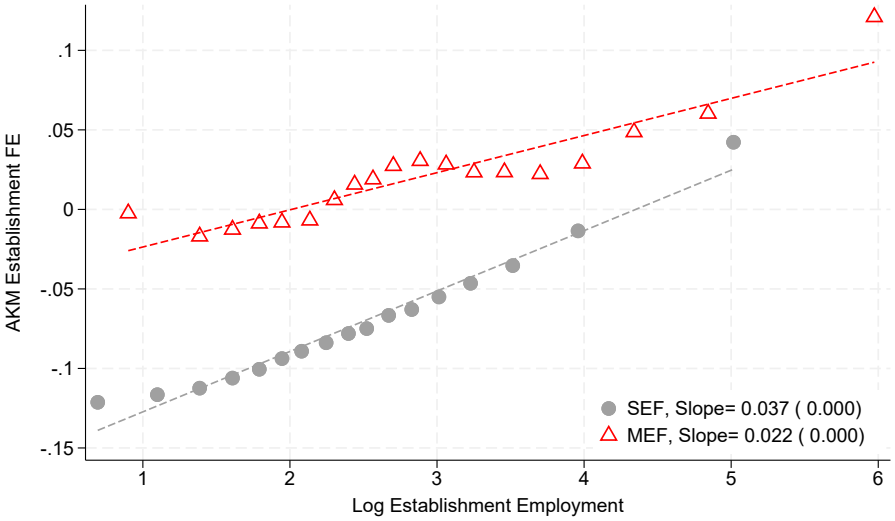

*Notes:* The figure shows binned scatter plots of log establishment size and log average wages (orange dots) and AKM FE (blue dots) for the year 2019. The dashed lines represent linear fits based on a univariate linear OLS model. Point estimates are shown in the top left corner with robust standard errors in parentheses. The sample covers 890,728 establishments. Each variable is normalized by a constant for ease of representation.

**Figure 6:** The Employer Size Wage Effect: Across Firms, by SEF vs. MEF Status

**(a)** Raw Wages



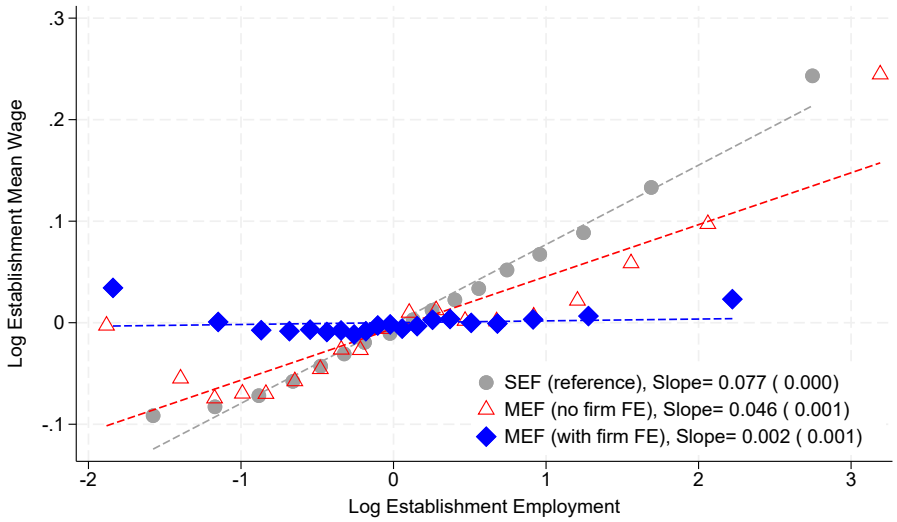

**(b)** AKM Establishment Effects



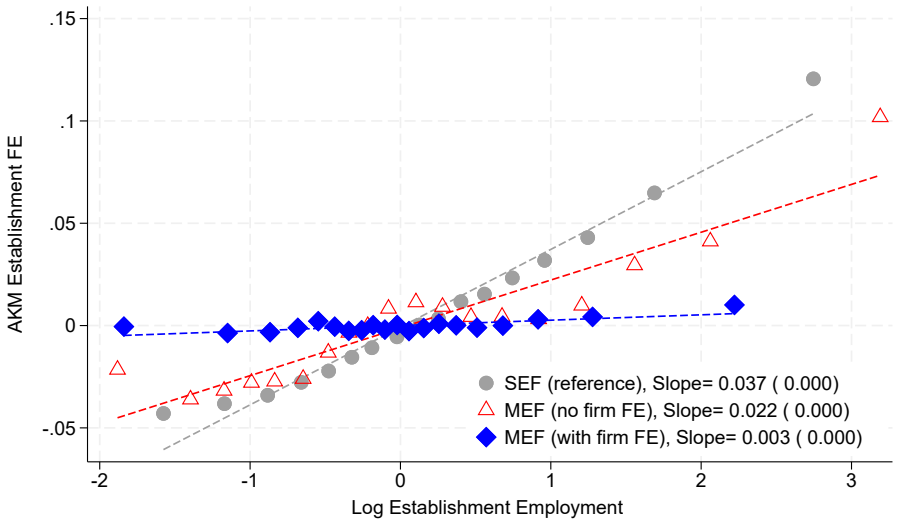

*Notes:* The figure shows binned scatter plots of log establishment size and log average wages (Panel (a)) and AKM establishment effects (Panel (b)) for the year 2019 differentiating by single-establishment firms (SEF) and multi-establishment firms (MEF) without firm fixed effects. The dashed lines represent linear fits based on a univariate linear OLS model. Point estimates are shown in the top left corner with robust standard errors in parentheses. The SEF sample covers 778,068 establishments. The MEF sample covers 112,660 establishments. Unlike the other binned scatter plots, this figure is not normalized by fixed effects or intercepts but plots raw levels, permitting one to compare relative level differences between groups.

**Figure 7:** The Employer Size Wage Effect: Within-Firm vs. Across Firms

**(a)** Raw Wages



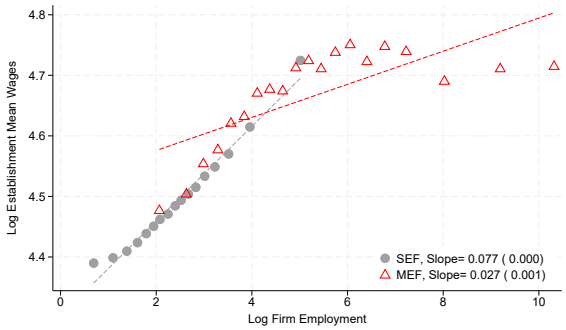

**(b)** AKM Establishment Effects



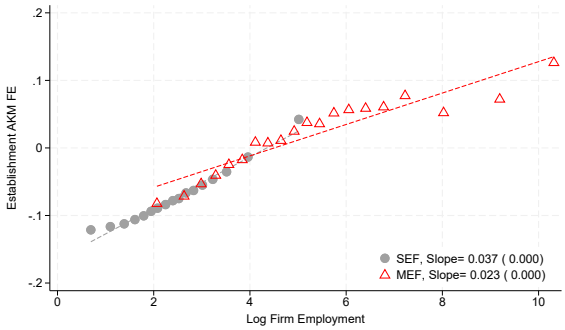

*Notes:* The figure shows binned scatter plots of log establishment size and log average wages (Panel (a)) and AKM establishment effects (Panel (b)) for the year 2019 differentiating by single-establishment firms (SEF) and multi-establishment firms (MEF) with and without firm fixed effects. The dashed lines represent linear fits based on a univariate linear OLS model. Point estimates are shown in the top left corner with robust standard errors in parentheses. The SEF sample covers 778,068 establishments. The MEF sample covers 112,660 establishments. In the cases without firm fixed effects, each variable is normalized by a constant.

**Figure 8:** The Employer Size Wage Effect: Firm-Wide Rather than Establishment Employment

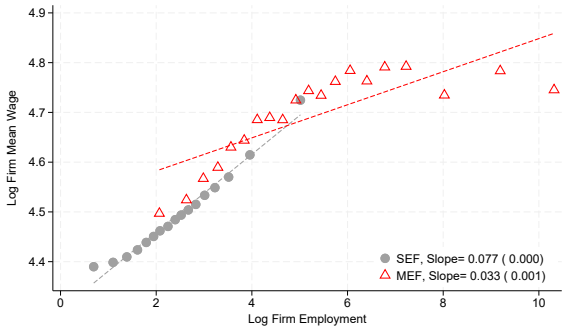
**(a)** Establishment Mean Wage, Est. Level



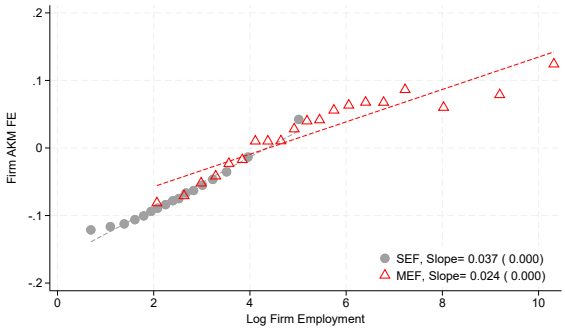

**(b)** Establishment AKM, Est. Level



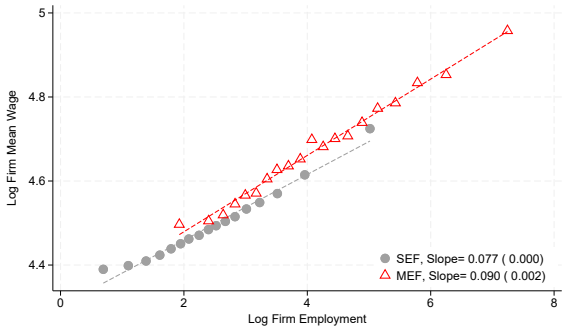

**(c)** Firm Mean Wage, Est. Level



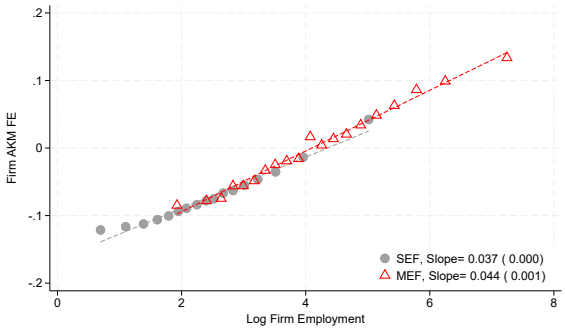

**(d)** Firm AKM, Est. Level




**(e)** Firm Mean Wage, Firm Level



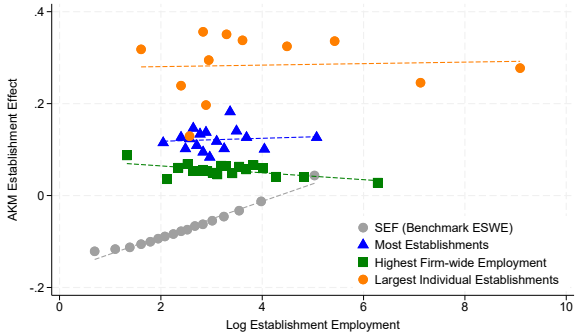

**(f)** Firm AKM, Firm Level



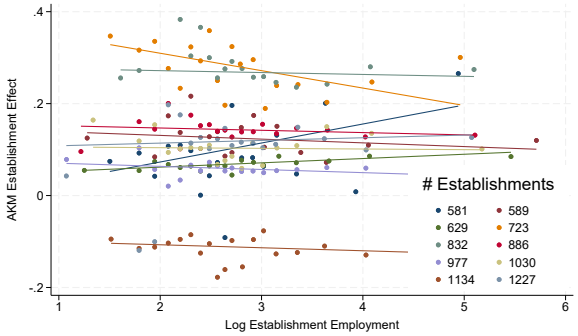

*Note:* The figure shows binned scatter plots of log firm size and wages and AKM establishment/firm effects for 2019. The dashed lines represent linear fits based on a univariate linear OLS model. Point estimates are shown in the lower right corner with robust standard errors in parentheses. Panels (a)-(d) are based on establishment-level observations and Panels (e) and (f) collapse the data onto the firm level. Panel (a) considers log establishment mean wages. Panel (b) considers establishment AKM FE. Panels (c) and (e) consider log firm mean wages. Panels (d) and (f) consider *firm* AKM FEs. Firm-level wages and AKM effects are calculated as employment-weighted averages of establishment wage and AKM information.

**Figure 9:** Firm-level Case Studies: ESWE (AKM) within Individual Multi-Establishment Firms

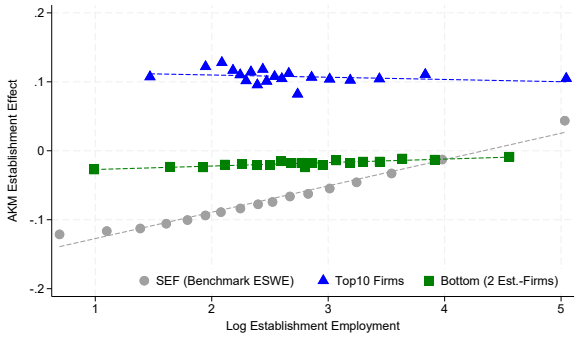
**(a)** Largest Firms



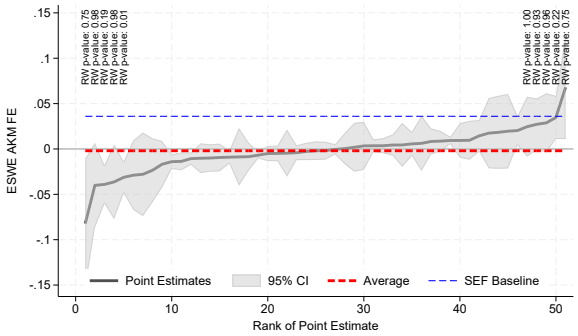

**(b)** Top10 Firms by # of Establishments




**(c)** Top 10 Firms (by Establishment Count) vs. Bottom (2-Establishment MEFs)

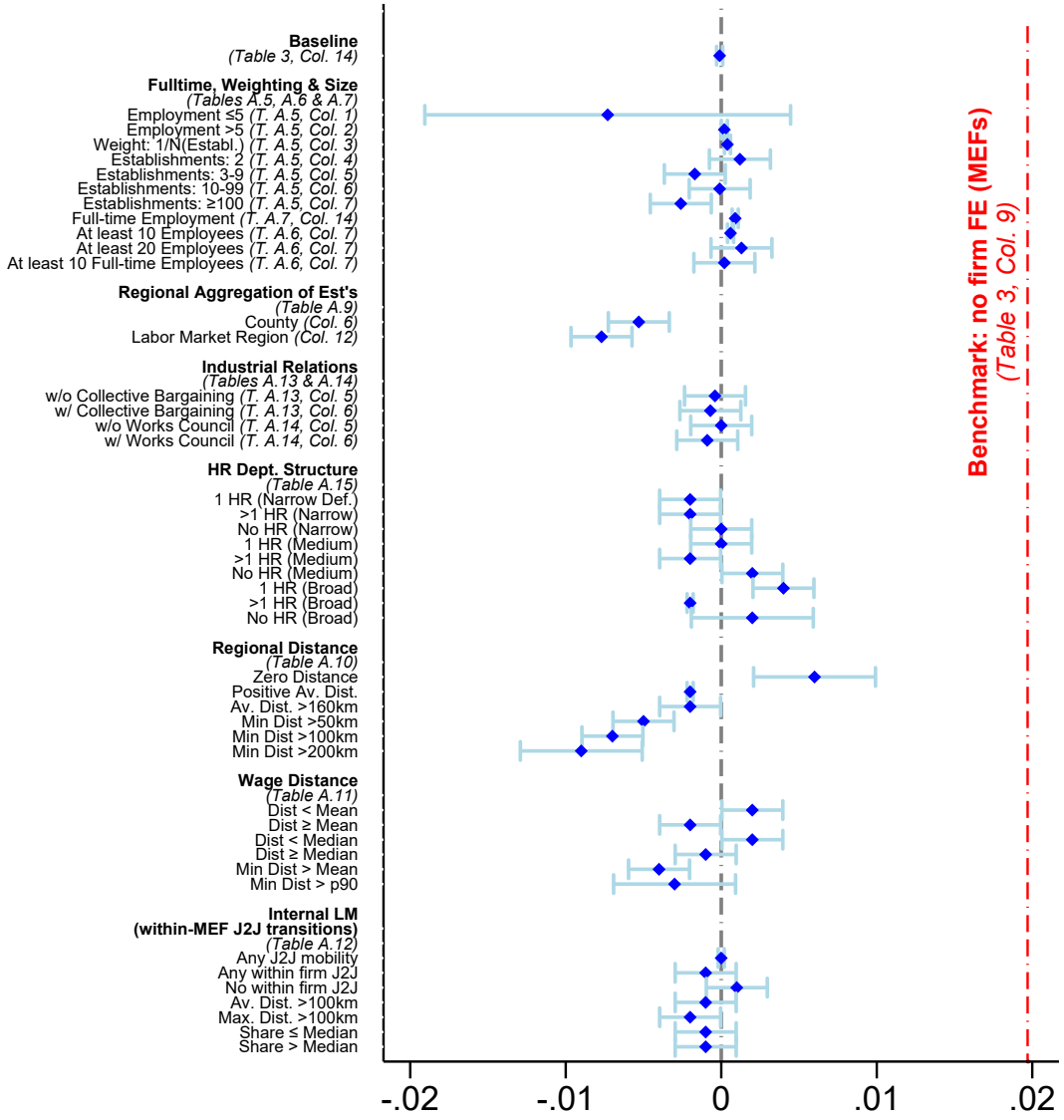



**(d)** ESWE Slope Estimates (AKM) in Firm with at least 100 Establishments, Ranked by Point Estimate




*Notes:* The figure shows binned scatter plots of log establishment size and AKM establishment effects for the year 2019 for selected large firms, i.e., blue, green and orange dots refer to establishments within one selected firm. Panel (a) defines the largest MEF by its number of establishments, total employment, or employment of its largest single establishment (conditional on having at least 10 establishments). For reference, single-establishment firms (SEF) are shown. Panel (b) shows the 10 largest firms based on the number of establishments. Panel (c) groups firms by size groups, the top 10 largest firms in terms of the number of establishments, and the bottom firms pooling all MEFs with exactly 2 establishments. For reference, single-establishment firms (SEF) are shown. (Only in Panel (c), variables are normalized within firms and the group-specific average AKM establishment effect is added for comparability of levels.) Panel (d) reports on the MEFs with at least 100 establishments (which are 51) and presents point estimates (separately estimated) and corresponding 95% CI for within firm regressions of AKM establishment effect on log establishment size for the year 2019. Point estimates are ordered by coefficient size. Thick black line shown the mean of all 51 point estimates. Romano-Wolf-corrected p-values with 1,000 bootstrap replications are shown for the lowest 5 and top 5 estimation results (Romano and Wolf, 2005). Appendix Figure A.4 replicates this figure for raw wages instead of establishment AKM fixed effects.

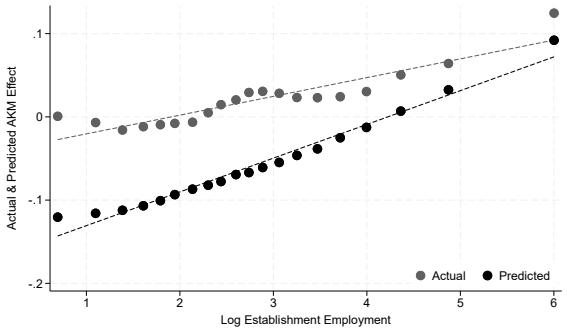
**Figure 10:** Summary of Robustness Checks: The ESWE Across Establishments Within Firms, i.e., Estimated With Firm FEs (Pay Variable: AKM Establishment Effect)



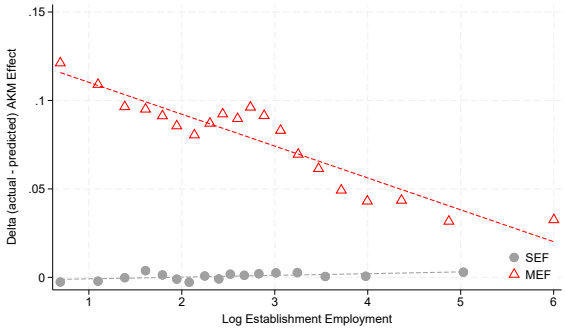

*Notes:* The figure shows coefficient estimates along with 95% CI from regressions of establishment AKM effects on log establishment employment. The red line shows the benchmark result without firm fixed effects for multi-establishment firms. The blue diamonds report results among multi-establishment firms with firm fixed effects. These include the baseline result and for subsamples along different dimensions or alternative variable definitions. The rows also list the respective table containing fuller regression results and details. The first panel provides results for full-time employment, differentiates by below/above 5 employees, weights by the inverse of the number of establishments, and applies different establishment size thresholds. The second panel aggregates establishment within counties and labor market regions. The third panel provides results by collective bargaining agreements and works councils. The fourth panel provides estimates concentration of human resources (HR) departments. The fifth panel provides estimates by different geographic distances between establishments within the firm. The sixth panel provides estimates by "distances" of local wages at the municipal level between establishments within firms. The final panel provides estimates with and without job-to-job (J2J) transitions between 2018 and 2019 within multi-establishment firms. Appendix Figure A.5 replicates this figure for mean log establishment wages rather than establishment AKM effects.

**Figure 11:** Pay Premia (Actual minus Lasso Predicted Pay) by Employment, and the Reemergence of the ESWE Among Low-Premium MEFs

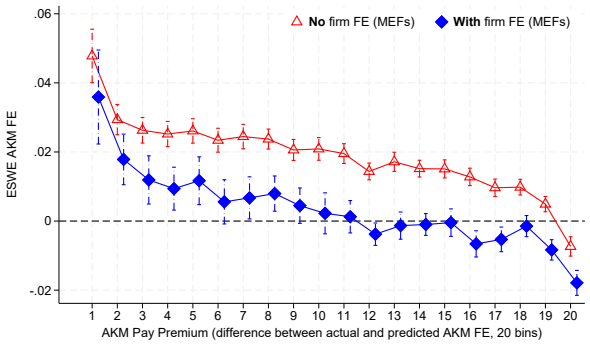
**(a)** Actual and Predicted Pay, MEFs (AKM-based)



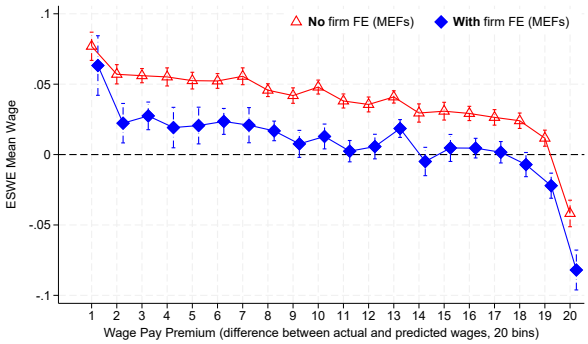

**(b)** Pay Premium (Actual − Predicted Pay) (AKM-based)




**(c)** AKM-based ESWE by AKM-based Premium




**(d)** Wage-based ESWE by Wage-based Premium




*Note:* The figure reports actual pay and pay predicted based on a lasso regression estimated among a random 75% sample of SEFs, of AKM establishment effects on the covariates (set 2-digit sector FE, labor market FE, log employment, log employment squared, interaction of log employment with broad sector FE, and interaction of log employment squared with broad sector FE). The penalty parameter $\lambda$ is selected by 10-fold cross-validation. Selected coefficients are then used to predict the outcome for SEF and MEF establishments. Panel (a) show actual and predicted values for the MEF sample along log establishment size. Panel (b) plots pay premia (the within-establishment difference between actual and predicted pay) against log employment for both SEFs and MEF establishments. Dashed lines represent linear fits. Panels (c) and (d) shows ESWE estimates by premium bin: regression coefficients (with 95% CI) of AKM establishment FE and log mean wages on establishment employment within 20 bins along the pay premium; Panel (c) is based on AKM FE as the pay measure and to estimate the ESWE; Panel (d) is based on the mean log wage for both. Classification into the 20 bins is based on average premium estimates at the MEF level, averaged across all its establishments. Each dot represents a single regression controlling for 2-digit industry times labor market region FEs. Blue dots in addition control for firm FE. Appendix Figure A.10 supplements this figure by showing the fit for the hold-out sample of SEFs and the share of negative premia, both by size. Appendix Figure A.11 replicates Panels (a) and (b) for raw wages rather than AKM establishment fixed effects.

# Online Appendix

**Off the Labor Supply Curve:**
**The Zero Employer Size Wage Effect Within Large Firms**
**André Diegmann, Steffen Müller, and Benjamin Schoefer**

## List of Tables



## List of Figures

## Additional tables

**Table A.1:** Additional Details on the Meta-Analysis of Estimated Size-Wage Elasticities

| Study | Design Features | Elasticity |
|---|---|---|
| *A: Without any controls for worker heterogeneity* | | |
| Bernard, Jensen, and Lawrence (1995) | Survey of US manufacturing establishments (ASM), 1981 cross section | 0.037 |
| Troske (1999) | US manufacturing workers (WECD) and establishments (LRD), 1990 cross section | 0.064 |
| Arai (2003) | Swedish survey and register data, 1991 cross section, firm size | 0.016 |
| Manning (2003) | US workers (CPS), 1993, establishment size<br>UK workers (BHPS), establishment size | 0.108<br>0.086 |
| Barth and Dale-Olsen (2011) | Norwegian workers, register data, 1991 - 1997 cross sections, establishment size | 0.019 |
| Sulis (2011) | Italian male workers, social security data, 1985 - 1996 cross sections, firm size | 0.078 |
| Scoppa (2014) | Italian full-time workers, social security data, 1985-2002 cross sections, firm size | 0.074 |
| Lochner, Seth, and Wolter (2020) | German full-time workers, social sec. data<br>1985-1992 cross sections<br>1993-1999 cross sections<br>1998-2004 cross sections<br>2003-2010 cross sections<br>2010-2017 cross sections | <br>0.070<br>0.081<br>0.095<br>0.109<br>0.104 |
| Arellano-Bover (2024) | Spanish, male, native workers, social sec. data, 2005-2015 cross sections, within-region firm size | 0.083 |
| *B: With controls for observable worker heterogeneity* | | |
| Brown and Medoff (1989) | US workers (CPS), 1979 cross section, establishment size | 0.027 |
| Green, Machin, and Manning (1996) | UK establishments (WIRS), full-time unskilled workers, N≥25, 1984 & 1990 | 0.041 |
| Reilly (1995) | Canadian workers, Maritimes provinces, survey data, 1979 cross section, establishment size | 0.039 |
| Doms, Dunne, and Troske (1997) | US manuf. workers (WECD) and establishments with N ≥ 20 (LRD), 1988 cross section | 0.036 |
| Albaek et al. (1998) | Danish workers, register data, 1991<br>Finnish manuf. workers, register data, 1985<br>Norwegian workers, survey data, 1989<br>Swedish workers, survey data, 1991 | 0.025<br>0.020<br>0.025<br>0.021 |
| Troske (1999) | US manufacturing workers (WECD) and establishments (LRD), 1990 cross section | 0.047 |

*(continued on next page)*

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| Study | Design Features | Elasticity |
|---|---|---|
| Lane et al. (1999) | State of Maryland, male workers (CPS),<br>1985-1996 cross sections, firm size | 0.050 |
| Bayard and Troske (1999)* | US male full-time in N ≥ 20 establishments, 1990, | |
| | manufacturing, establishment size | 0.047 |
| | manufacturing, firm size | 0.014 |
| | retail, establishment size | 0.050 |
| | retail, firm size | 0.000 |
| | services, establishment size | 0.047 |
| | services, firm size | 0.006 |
| Arai (2003) | Swedish survey and register data<br>1991 cross section, firm size | 0.010 |
| Manning (2003) | US workers (CPS), 1993, establishment size | 0.064 |
| | UK workers (BHPS), establishment size | 0.047 |
| Belfield and Wei (2004) | UK workers, survey data from establishments with<br>with N ≥ 10 (WERS), 1998, establishment size | 0.060 |
| Lallemand, Plasman, and Rycx (2007) | Workers, ESE survey, 1995, establishment size | |
| | Belgium | 0.030 |
| | Denmark | 0.006 |
| | Ireland | 0.039 |
| | Italy | 0.033 |
| | Spain | 0.045 |
| Winter-Ebmer (2001) | Austrian male workers, social security<br>data, 1991 cross section, establishment size | 0.028 |
| Heyman (2007) | Swedish survey and register data<br>1987, 1991, 1995, cross sections, firm size | 0.012 |
| Barth and Dale-Olsen (2011) | Norwegian workers, register data, 1991 -<br>1997 cross sections, establishment size | 0.017 |
| Sulis (2011) | Italian male workers, social security data,<br>1985 - 1996 cross sections, firm size | 0.041 |
| Scoppa (2014) | Italian full-time workers, social security<br>data, 1985-2002 cross sections, firm size | 0.043 |
| Pehkonen et al. (2017) | Finnish workers, register data,<br>2003-2010 cross sections, firm size | 0.007 |
| Barth, Davis, and Freeman (2018)* | US manufacturing workers, LEHD-ASM-COM link,<br>1992-2007 panel, establishment and firm size, | |
| | establishment size w/o firm fixed effects | 0.027 |
| | establishment size w/ firm fixed effects | 0.026 |
| Green et al. (2021) | UK line workers (BHPS),<br>1991-2016 cross sections, establishment size | 0.031 |
| Arellano-Bover (2024) | Spanish, male, native workers, social sec. data,<br>2005-2015 cross sections, within-region firm size | 0.059 |
| Bachmann et al. (2025) | West German workers, administrative survey<br>data, 2006-2014, 3 cross sections, establishment size | 0.061 |

*(continued on next page)*

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| Study | Design Features | Elasticity |
|---|---|---|
| *C: With worker fixed effects* | | |
| Arai (2003) | Swedish survey and register data, predicted worker fixed effects, firm size | 0.020 |
| Barth and Dale-Olsen (2011) | Norwegian workers, register data, 1991 - 1997 panel, establishment size | 0.015 |
| Scoppa (2014) | Italian full-time workers, social security data, 1985-2002 panel, firm size | 0.021 |
| Pehkonen et al. (2017) | Finnish workers, register data, 2003-2010 panel, firm size | 0.003 |
| Barth, Davis, and Freeman (2018)* | US manufacturing workers, LEHD-ASM-COM link, 1992-2007 panel, establishment and firm size | 0.031 |
| Green et al. (2021) | UK line workers (BHPS), 1991-2016 cross sections, establishment size | 0.019 |
| *D: Estimates based on AKM employer effects* | | |
| Alvarez et al. (2018) | Brazilian male workers, admin. data | |
| | 1996-2004 cross sections | 0.106 |
| | 2000-2004 cross sections | 0.080 |
| | 2004-2008 cross sections | 0.056 |
| | 2008-2012 cross sections | 0.047 |
| Lochner, Seth, and Wolter (2020) | German full-time workers, social sec. data | |
| | 1985-1992 cross sections | 0.041 |
| | 1993-1999 cross sections | 0.048 |
| | 1998-2004 cross sections | 0.053 |
| | 2003-2010 cross sections | 0.058 |
| | 2010-2017 cross sections | 0.048 |
| Kline, Saggio, and Sølvsten (2020) | Young Italian workers, Veneto region, social security data, 1999 and 2001 panel, firm size | 0.028 |

[*]Establishment size and firm size enter the regression jointly.

**Table A.2:** Meta-regressions of ESWE estimates listed in Table 1

| | (1) | (2) | (3) |
|---|---|---|---|
| Reference Group: Scandinavia (10) | | | |
| Continental Europe (13) | 0.039*** | 0.033*** | 0.031*** |
| | (0.006) | (0.005) | (0.005) |
| Rest of World (17) | 0.032*** | 0.030*** | 0.033*** |
| | (0.006) | (0.005) | (0.007) |
| Reference Group: No worker heterogeneity controls (9) | | | |
| Observable heterogeneity (22) | | -0.025*** | -0.025*** |
| | | (0.007) | (0.007) |
| With worker fixed effects (6) | | -0.035*** | -0.038*** |
| | | (0.011) | (0.012) |
| Outcome: AKM employer effects (3) | | -0.020 | -0.025 |
| | | (0.014) | (0.015) |
| Reference Group: Data from 1980s or earlier (8) | | | |
| 1990s (21) | | | 0.009 |
| | | | (0.008) |
| 2000s or later (11) | | | 0.013 |
| | | | (0.011) |
| Constant | 0.014*** | 0.037*** | 0.030*** |
| | (0.002) | (0.007) | (0.010) |
| $R^2$ | 0.425 | 0.661 | 0.685 |

*Note:* Mean of dependent variable is 0.040. Regression based on the 40 preferred estimates listed in Table 1. Numbers in () indicate the number of estimates (observations) in that group. Standard errors clustered at the study level. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

**Table A.3:** Summary Statistics by Establishment Type - Establishment Panel Survey

| | Establishment-weighted | | | Employment-weighted | | |
|---|---|---|---|---|---|---|
| | Full | SEF | MEF | Full | SEF | MEF |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Employment | 90.655 | 111.061 | 75.317 | | | |
| | (474.848) | (617.946) | (327.703) | | | |
| Average Real Daily Wages | 114.202 | 106.433 | 120.041 | 150.568 | 148.359 | 153.017 |
| | (53.194) | (46.233) | (57.188) | (63.054) | (59.150) | (67.032) |
| AKM FE | 0.021 | -0.032 | 0.060 | 0.118 | 0.109 | 0.129 |
| | (0.200) | (0.199) | (0.191) | (0.169) | (0.172) | (0.165) |
| Establishment Age | 21.412 | 24.668 | 18.965 | 30.604 | 33.219 | 27.706 |
| | (13.446) | (13.581) | (12.810) | (13.739) | (12.715) | (14.242) |
| Fraction Female | 0.459 | 0.355 | 0.538 | 0.348 | 0.311 | 0.389 |
| | (0.316) | (0.256) | (0.334) | (0.239) | (0.217) | (0.256) |
| Fraction Helper Activities | 0.156 | 0.172 | 0.144 | 0.164 | 0.158 | 0.170 |
| | (0.230) | (0.223) | (0.235) | (0.240) | (0.227) | (0.254) |
| Fraction Professional Activities | 0.634 | 0.619 | 0.645 | 0.556 | 0.566 | 0.545 |
| | (0.288) | (0.266) | (0.303) | (0.264) | (0.250) | (0.279) |
| Fraction Specialists | 0.113 | 0.115 | 0.111 | 0.149 | 0.149 | 0.150 |
| | (0.185) | (0.149) | (0.209) | (0.151) | (0.133) | (0.168) |
| Fraction Experts | 0.097 | 0.093 | 0.100 | 0.131 | 0.128 | 0.135 |
| | (0.163) | (0.157) | (0.167) | (0.161) | (0.152) | (0.170) |
| Hiring Rate | 0.232 | 0.197 | 0.260 | 0.178 | 0.159 | 0.200 |
| | (0.202) | (0.182) | (0.212) | (0.138) | (0.120) | (0.153) |
| Separation Rate | 0.224 | 0.185 | 0.255 | 0.166 | 0.144 | 0.192 |
| | (0.189) | (0.158) | (0.205) | (0.136) | (0.109) | (0.157) |
| Turnover | 0.452 | 0.379 | 0.509 | 0.342 | 0.302 | 0.388 |
| | (0.326) | (0.277) | (0.350) | (0.245) | (0.204) | (0.277) |
| Collective Bargaining Agreement | 0.575 | 0.410 | 0.699 | 0.756 | 0.705 | 0.812 |
| Works/Staff Council | 0.435 | 0.236 | 0.585 | 0.730 | 0.693 | 0.771 |
| Agriculture | 0.009 | 0.018 | 0.002 | 0.003 | 0.004 | 0.001 |
| Mining | 0.002 | 0.002 | 0.001 | 0.003 | 0.002 | 0.003 |
| Manufacturing | 0.188 | 0.348 | 0.068 | 0.417 | 0.516 | 0.306 |
| Energy, Electricity | 0.009 | 0.008 | 0.009 | 0.014 | 0.017 | 0.010 |
| Water | 0.007 | 0.012 | 0.003 | 0.011 | 0.016 | 0.005 |
| Construction | 0.054 | 0.109 | 0.013 | 0.025 | 0.035 | 0.014 |
| Wholesale & Retail Trade | 0.349 | 0.149 | 0.499 | 0.140 | 0.078 | 0.209 |
| Transportation, Storage | 0.092 | 0.060 | 0.117 | 0.089 | 0.072 | 0.107 |
| Accommodation | 0.034 | 0.040 | 0.029 | 0.016 | 0.018 | 0.014 |
| ICT | 0.026 | 0.031 | 0.023 | 0.030 | 0.023 | 0.038 |
| Banking, Insurance | 0.044 | 0.027 | 0.057 | 0.064 | 0.058 | 0.070 |
| Real Estate | 0.011 | 0.015 | 0.009 | 0.006 | 0.008 | 0.004 |
| Technical Service | 0.069 | 0.082 | 0.059 | 0.066 | 0.053 | 0.081 |
| Business Service | 0.085 | 0.066 | 0.099 | 0.097 | 0.074 | 0.123 |
| Other Service | 0.021 | 0.034 | 0.012 | 0.020 | 0.025 | 0.015 |

*Note:* The table provides summary statistics for the year 2019 for the full sample, single-establishment firms (SEF) and multi-establishment firms (MEF). The first three columns are establishment-weighted average statistics. The last three columns are employment-weighted average statistics. Average daily wages are measured in 2015 euros. Standard errors in parentheses for continuous variables.

**Table A.4:** Summary Statistics by Establishment Type - Vacancy Survey

| | Establishment-weighted | | | Employment-weighted | | |
|---|---|---|---|---|---|---|
| | Full | SEF | MEF | Full | SEF | MEF |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Employment | 72.667 | 72.119 | 105.689 | | | |
| | (387.874) | (390.347) | (183.574) | | | |
| Average Real Daily Wages | 106.200 | 105.959 | 120.537 | 133.743 | 133.312 | 151.430 |
| | (44.250) | (44.147) | (47.916) | (52.521) | (51.878) | (72.151) |
| AKM FE | -0.029 | -0.030 | 0.032 | 0.077 | 0.076 | 0.114 |
| | (0.184) | (0.184) | (0.178) | (0.176) | (0.176) | (0.169) |
| Establishment Age | 23.533 | 23.580 | 20.718 | 29.690 | 29.812 | 24.698 |
| | (13.225) | (13.207) | (13.978) | (13.881) | (13.842) | (14.585) |
| Vacancy Duration | 109.415 | 109.570 | 100.675 | 117.071 | 117.475 | 101.150 |
| | (96.659) | (96.770) | (89.916) | (88.422) | (88.731) | (73.637) |
| Hours Spent | 16.096 | 16.074 | 17.403 | 19.277 | 19.283 | 19.016 |
| | (17.848) | (17.845) | (18.017) | (19.741) | (19.830) | (15.714) |
| Euro Costs | 689.237 | 682.693 | 1079.684 | 1035.032 | 1022.562 | 1521.239 |
| | (1691.686) | (1680.853) | (2215.339) | (2059.405) | (2041.124) | (2636.560) |
| # Applicants | 2.731 | 2.715 | 3.649 | 4.159 | 4.150 | 4.482 |
| | (3.877) | (3.859) | (4.675) | (5.590) | (5.591) | (5.571) |
| Fraction Female | 0.358 | 0.358 | 0.344 | 0.321 | 0.321 | 0.323 |
| | (0.249) | (0.249) | (0.260) | (0.222) | (0.222) | (0.231) |
| Fraction Helper Activities | 0.179 | 0.179 | 0.189 | 0.173 | 0.172 | 0.211 |
| | (0.223) | (0.222) | (0.278) | (0.230) | (0.228) | (0.292) |
| Fraction Professional Activities | 0.599 | 0.599 | 0.580 | 0.567 | 0.569 | 0.509 |
| | (0.264) | (0.264) | (0.292) | (0.243) | (0.242) | (0.274) |
| Fraction Specialists | 0.123 | 0.123 | 0.135 | 0.142 | 0.143 | 0.140 |
| | (0.155) | (0.154) | (0.196) | (0.133) | (0.133) | (0.150) |
| Fraction Experts | 0.099 | 0.099 | 0.096 | 0.117 | 0.117 | 0.140 |
| | (0.162) | (0.163) | (0.154) | (0.151) | (0.149) | (0.195) |
| Hiring Rate | 0.216 | 0.216 | 0.240 | 0.178 | 0.177 | 0.205 |
| | (0.175) | (0.175) | (0.193) | (0.140) | (0.139) | (0.166) |
| Separation Rate | 0.205 | 0.204 | 0.277 | 0.163 | 0.162 | 0.218 |
| | (0.163) | (0.162) | (0.238) | (0.132) | (0.130) | (0.192) |
| Turnover | 0.418 | 0.417 | 0.504 | 0.339 | 0.337 | 0.415 |
| | (0.283) | (0.281) | (0.371) | (0.242) | (0.239) | (0.319) |
| Manufacturing | 0.298 | 0.300 | 0.145 | 0.457 | 0.460 | 0.314 |
| Construction | 0.073 | 0.073 | 0.026 | 0.044 | 0.044 | 0.025 |
| Wholesale & Retail Trade | 0.058 | 0.059 | 0.028 | 0.053 | 0.054 | 0.046 |
| Transportation, Storage | 0.062 | 0.063 | 0.040 | 0.054 | 0.055 | 0.022 |
| Accommodation | 0.056 | 0.056 | 0.063 | 0.033 | 0.033 | 0.025 |
| Technical Service | 0.063 | 0.063 | 0.054 | 0.049 | 0.048 | 0.074 |
| Business Service | 0.103 | 0.101 | 0.265 | 0.091 | 0.089 | 0.174 |

*Note:* The table provides summary statistics for the year 2019 for the full sample, single-establishment firms (SEF) and multi-establishment firms (MEF) covered in the Vacancy Survey. MEF sample is conditional on observing at least two establishments with information on either vacancy duration, hours spent, Euro costs or the number of applicants. Vacancy duration refers to the number of days between the opening and the closing to the vacancy. Hours spend refers to the number of hours spend to fill the vacancy. Euro costs refers to the euro amount spend to fill the vacancy (without labor costs). Applicants refers to the number of applicants. Selected sectors shown for table representation. The first three columns are establishment-weighted average statistics. The last three columns are employment-weighted average statistics. Average daily wages are measured in 2015 euros. Standard errors in parentheses for continuous variables.

**Table A.5:** Robustness Check: Weighting and Size

| | Establishment size | | Weighting | Within firm # of establishment | | | |
|---|---|---|---|---|---|---|---|
| | $\leq 5$ | $> 5$ | 1/N(est's) | 2 | 3 to 9 | 10 to 99 | $\geq 100$ |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Panel A: Log Mean Wages | | | | | | | |
| Est. Empl. | 0.0069 | 0.0016 | -0.0099*** | -0.0117*** | -0.0075*** | 0.0038* | 0.0148*** |
| | (0.010) | (0.001) | (0.001) | (0.002) | (0.002) | (0.002) | (0.002) |
| Observations | 12,406 | 80,403 | 112,660 | 40,464 | 27,963 | 23,637 | 13,621 |
| $R^2$ | 0.854 | 0.874 | 0.871 | 0.885 | 0.869 | 0.826 | 0.765 |
| Mean of $Y$ | 4.590 | 4.678 | 4.666 | 4.634 | 4.73 | 4.65 | 4.66 |
| Panel B: AKM FE | | | | | | | |
| Est. Empl. | -0.0073 | 0.0002 | 0.0004 | 0.0012 | -0.0017** | -0.0001 | -0.0026* |
| | (0.006) | (0.000) | (0.000) | (0.001) | (0.001) | (0.001) | (0.001) |
| Observations | 12,406 | 80,403 | 112,660 | 40,464 | 27,963 | 23,637 | 13,621 |
| $R^2$ | 0.733 | 0.768 | 0.832 | 0.851 | 0.818 | 0.699 | 0.465 |
| Mean of $Y$ | -.010 | .030 | .020 | -.014 | .032 | .032 | .072 |
| SIC × LMR | Y | Y | Y | Y | Y | Y | Y |
| Firm FE | Y | Y | Y | Y | Y | Y | Y |

*Note:* The table shows regression results of log establishment wages (Panel A) and AKM establishment effects (Panel B) on establishment employment for different subsamples of multi-establishment firms (MEF). Columns (1) and (2) differentiate between small establishments with at most 5 employees and with more than 5 employees. (Appendix Table A.6 presents additional variants for establishment size.) Column (3) weights the regression by the inverse of the number of establishments within a firm, so that all firms receive equal weight. Columns (4) to (7) shows the results for firms with different numbers of establishments. All specifications include 2-digit sector times labor market region FE and well as firm FE. Panel A shows the result for log establishment wages. Panel B shows the results for AKM establishment effects. Robust standard errors in parentheses. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

**Table A.6:** Robustness Check: Employment Size Cutoffs

| | SEF | | MEF | | | | |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | | | *At least 10 employees* | | | | |
| Panel A1: Log Mean Wages | | | | | | | |
| Est. Empl. | 0.0752*** | 0.0739*** | 0.0291*** | 0.0143*** | | 0.0054*** | 0.0031** |
| | (0.001) | (0.001) | (0.001) | (0.001) | | (0.001) | (0.001) |
| Firm Empl. | | | | 0.0433*** | 0.0448*** | | |
| | | | | (0.001) | (0.001) | | |
| Panel B1: AKM FE | | | | | | | |
| Est. Empl. | 0.0379*** | 0.0372*** | 0.0139*** | 0.0052*** | | 0.0012** | 0.0006 |
| | (0.000) | (0.000) | (0.001) | (0.001) | | (0.001) | (0.001) |
| Firm Empl. | | | | 0.0256*** | 0.0261*** | | |
| | | | | (0.000) | (0.000) | | |
| Observations | 350,103 | 350,103 | 57,642 | 57,642 | 57,642 | 57,642 | 57,642 |
| | | | *At least 20 employees* | | | | |
| Panel A2: Log Mean Wages | | | | | | | |
| Est. Empl. | 0.0747*** | 0.0733*** | 0.0299*** | 0.0140*** | | 0.0077*** | 0.0069*** |
| | (0.001) | (0.001) | (0.002) | (0.002) | | (0.002) | (0.002) |
| Firm Empl. | | | | 0.0408*** | 0.0427*** | | |
| | | | | (0.001) | (0.001) | | |
| Panel B2: AKM FE | | | | | | | |
| Est. Empl. | 0.0383*** | 0.0374*** | 0.0131*** | 0.0037*** | | 0.0014** | 0.0013 |
| | (0.000) | (0.000) | (0.001) | (0.001) | | (0.001) | (0.001) |
| Firm Empl. | | | | 0.0239*** | 0.0244*** | | |
| | | | | (0.001) | (0.001) | | |
| Observations | 174,150 | 174,150 | 30,945 | 30,945 | 30,945 | 30,945 | 30,945 |
| | | | *At least 10 full-time employees* | | | | |
| Panel A3: Log Mean Wages | | | | | | | |
| Est. Empl. | 0.0687*** | 0.0672*** | 0.0255*** | 0.0109*** | | 0.0011 | 0.0002 |
| | (0.001) | (0.001) | (0.002) | (0.002) | | (0.002) | (0.002) |
| Firm Empl. | | | | 0.0346*** | 0.0370*** | | |
| | | | | (0.001) | (0.001) | | |
| Panel B3: AKM FE | | | | | | | |
| Est. Empl. | 0.0360*** | 0.0351*** | 0.0117*** | 0.0043*** | | 0.0004 | 0.0002 |
| | (0.000) | (0.000) | (0.001) | (0.001) | | (0.001) | (0.001) |
| Firm Empl. | | | | 0.0173*** | 0.0183*** | | |
| | | | | (0.001) | (0.001) | | |
| Observations | 199,780 | 199,780 | 32,666 | 32,666 | 32,666 | 32,666 | 32,666 |
| SIC FE | Y | | | | | Y | |
| LMR FE | Y | | | | | Y | |
| SIC × LMR | | Y | Y | Y | Y | | Y |
| Firm FE | | | | | | Y | Y |

*Note:* The table shows regression results of log establishment wages (Panel A) and AKM establishment effects (Panel B) on establishment employment and firm employment selecting samples at different employment thresholds. The upper part conditions establishment size of at least 10 employees or above. The middle part conditions establishment size of at least 20 employees or above. The lower part conditions establishment size of at least 10 full-time employees or above. Columns (2) and (3) provide the results for single-establishment firms (SEF). Columns (3) to (7) provide the results for multi-establishment firms (MEF). Control variables refer to 2-digit sector FE and labor market region (LMR) FE. Firm size in columns (4) and (5) refers to the sum of all establishments within the firm identifier. Columns (6) and (7) include firm FE to identify the effect of size variation on the outcome variable within the firm. Panel A shows the result for log establishment wages. Panel B shows the results for AKM establishment effects. Robust standard errors in parentheses. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

**Table A.7:** Robustness Check: Main Results with Full-Time Employment (Establishment Level)

| | Pooled | | | Single-Establishment Firms (SEF) | | | Multi-Establishment Firms (MEF) (*Unique firms: 30,507*) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | No firm FE | | | | | With firm FE | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) |
| Panel A: Log Mean Wages | | | | | | | | | | | | | | |
| Est. Empl. | .1021*** | .0813*** | .0797*** | .1042*** | .0841*** | .0825*** | .0673*** | .0327*** | .0307*** | .0125*** | | .0044*** | -0.0040*** | -0.0048*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.001) | (0.001) | (0.001) | (0.001) | | (0.001) | (0.001) | (0.001) |
| Firm Empl. | | | | | | | | | | .0482*** | .0504*** | | | |
| | | | | | | | | | | (0.001) | (0.001) | | | |
| Obs. | 890,728 | 890,728 | 890,728 | 778,068 | 778,068 | 778,068 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 |
| $R^2$ | .101 | .377 | .404 | .101 | .379 | .408 | .056 | .405 | .463 | .501 | .500 | .808 | .828 | .849 |
| Mean of $Y$ | 4.506 | 4.506 | 4.506 | 4.482 | 4.482 | 4.482 | 4.668 | 4.668 | 4.668 | 4.668 | 4.668 | 4.668 | 4.668 | 4.668 |
| Panel B: AKM FE | | | | | | | | | | | | | | |
| Est. Empl. | .0487*** | .0409*** | .0402*** | .0512*** | .0426*** | .0419*** | .0236*** | .0166*** | .0157*** | .0055*** | | .0045*** | .0013*** | .0009** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | | (0.000) | (0.000) | (0.000) |
| Firm Empl. | | | | | | | | | | .0271*** | .0281*** | | | |
| | | | | | | | | | | (0.000) | (0.000) | | | |
| Obs. | 890,728 | 890,728 | 890,728 | 778,068 | 778,068 | 778,068 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 |
| $R^2$ | .075 | .238 | .264 | .077 | .242 | .269 | .030 | .254 | .315 | .366 | .365 | .724 | .735 | .757 |
| Mean of $Y$ | -.066 | -.066 | -.066 | -.078 | -.078 | -.078 | .020 | .020 | .020 | .020 | .020 | .020 | .020 | .020 |
| SIC | | Y | | | Y | | | Y | | | | | Y | |
| LMR | | Y | | | Y | | | Y | | | | | Y | |
| SIC × LMR | | | Y | | | Y | | | Y | Y | Y | | | Y |
| Firm | | | | | | | | | | | | Y | Y | Y |

*Notes:* The table replicates Table 3 for full-time employees as the employment measure.

**Table A.8:** Robustness Check: Log Median Wages & Censoring Share Across and Within Firms (Establishment Level)

| | Pooled | | | Single-Establishment Firms (SEF) | | | Multi-Establishment Firms (MEF) (*Unique firms: 30,507*) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | No firm FE | | | | | With firm FE | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) |
| Panel A: Log median wages | | | | | | | | | | | | | | |
| Est. Empl. | .0570*** | .0537*** | .0524*** | .0553*** | .0531*** | .0522*** | .0286*** | .0194*** | .0178*** | -.0052*** | | -.0128*** | -.0180*** | -.0187*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.001) | (0.001) | (0.001) | (0.001) | | (0.001) | (0.001) | (0.001) |
| Firm Empl. | | | | | | | | | | 0.0474*** | 0.0463*** | | | |
| | | | | | | | | | | (0.001) | (0.001) | | | |
| Obs. | 890,728 | 890,728 | 890,728 | 778,068 | 778,068 | 778,068 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 |
| $R^2$ | 0.026 | 0.334 | 0.364 | 0.023 | 0.333 | 0.365 | 0.008 | 0.384 | 0.445 | 0.482 | 0.482 | 0.795 | 0.815 | 0.837 |
| Mean of $Y$ | 4.474 | 4.474 | 4.474 | 4.454 | 4.454 | 4.454 | 4.620 | 4.620 | 4.620 | 4.620 | 4.620 | 4.620 | 4.620 | 4.620 |
| Panel B: Share of workers with censored wages | | | | | | | | | | | | | | |
| Est. Empl. | .0091*** | .0070*** | .0064*** | .0079*** | .0062*** | .0058*** | .0078*** | .0021*** | .0010** | -.0009** | | -.0058*** | -.0072*** | -.0072*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | | (0.001) | (0.001) | (0.001) |
| Firm Empl. | | | | | | | | | | 0.0037*** | 0.0036*** | | | |
| | | | | | | | | | | (0.000) | (0.000) | | | |
| Obs. | 890,728 | 890,728 | 890,728 | 778,068 | 778,068 | 778,068 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 | 112,660 |
| $R^2$ | 0.009 | 0.164 | 0.207 | 0.008 | 0.154 | 0.199 | 0.005 | 0.254 | 0.336 | 0.338 | 0.338 | 0.700 | 0.718 | 0.756 |
| Mean of $Y$ | .032 | .032 | .032 | .028 | .028 | .028 | .058 | .058 | .058 | .058 | .058 | .058 | .058 | .058 |
| SIC | | Y | | | Y | | | Y | | | | | Y | |
| LMR | | Y | | | Y | | | Y | | | | | Y | |
| SIC × LMR | | | Y | | | Y | | | Y | Y | Y | | | Y |
| Firm | | | | | | | | | | | | Y | Y | Y |

*Notes:* The table shows regression results of log establishment wages (Panel A) and AKM establishment effects (Panel B) on establishment employment (Est. Empl.) and firm employment (Firm Empl.). Columns (1) to (3) provide the results for all establishments (pooling SEFs and MEFs). Columns (4) to (6) provide the results for single-establishment firms (SEF). Columns (7) to (14) provide the results for multi-establishment firms (MEF). Control variables refer to 2-digit sector (SIC) FE and labor market region (LMR) FE. Firm size in columns (10) and (11) refers to the sum of all establishments within the firm identifier. Columns (12)-(14) include firm FE to identify the effect of size variation on the outcome variable within the firm. Panel A shows the result for log establishment wages. Panel B shows the results for AKM establishment effects. Robust standard errors in parentheses. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

**Table A.9:** Robustness Check: Aggregation of Establishments to County & Labor Market Region (From Municipality-Industry Level)

| | County Level Aggregation (*Unique firms: 17,582*) | | | | | | Labor Market Region Aggregation (*Unique firms: 16,379*) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Panel A: Log Mean Wages | | | | | | | | | | | | |
| Est. Empl. | -.0053*** | .0237*** | .0062*** | | -.0053*** | -.0063*** | .0207*** | .0204*** | .0033*** | | -.0077*** | -.0087*** |
| | (0.001) | (0.001) | (0.001) | | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | | (0.001) | (0.001) |
| Firm Empl. | | | .0369*** | .0383*** | | | | | .0370*** | .0378*** | | |
| | | | (0.001) | (0.001) | | | | | (0.001) | (0.001) | | |
| Obs. | 70,752 | 70,752 | 70,752 | 70,752 | 70,752 | 70,752 | 63,757 | 63,757 | 63,757 | 63,757 | 63,757 | 63,757 |
| $R^2$ | 0.837 | 0.481 | 0.501 | 0.501 | 0.837 | 0.859 | 0.423 | 0.484 | 0.502 | 0.502 | 0.836 | 0.860 |
| Mean of $Y$ | 4.696 | 4.696 | 4.696 | 4.696 | 4.696 | 4.696 | 4.704 | 4.704 | 4.704 | 4.704 | 4.704 | 4.704 |
| Panel B: AKM FE | | | | | | | | | | | | |
| Est. Empl. | -.0019*** | .0152*** | .0044*** | | -.0019*** | -.0024*** | .0137*** | .0141*** | .0036*** | | -.0020*** | -.0025*** |
| | (0.000) | (0.001) | (0.001) | | (0.000) | (0.001) | (0.001) | (0.001) | (0.001) | | (0.001) | (0.001) |
| Firm Empl. | | | .0229*** | .0238*** | | | | | .0227*** | .0236*** | | |
| | | | (0.000) | (0.000) | | | | | (0.000) | (0.000) | | |
| Obs. | 70,752 | 70,752 | 70,752 | 70,752 | 70,752 | 70,752 | 63,757 | 63,757 | 63,757 | 63,757 | 63,757 | 63,757 |
| $R^2$ | 0.752 | 0.334 | 0.369 | 0.369 | 0.752 | 0.777 | 0.276 | 0.341 | 0.374 | 0.374 | 0.757 | 0.784 |
| Mean of $Y$ | .030 | .030 | .030 | .030 | .030 | .030 | .032 | .032 | .032 | .032 | .032 | .032 |
| SIC | Y | | | | Y | | Y | | | | Y | |
| LMR | Y | | | | Y | | Y | | | | Y | |
| SIC × LMR | | Y | Y | Y | | Y | | Y | Y | Y | | Y |
| Firm | | | | | Y | Y | | | | | Y | Y |

*Notes:* The table shows regression results of log establishment wages (Panel A) and AKM establishment effects (Panel B) on establishment employment and firm employment. The unit of observation is production unit defined as establishments within the same county in columns (1) to (6) and within the same local labor market in columns (7) to (12). Size represents the sum of all establishments in the same county or local labor market. Sector affiliation represents the sector of the largest establishment. Wage and AKM effects are calculated as the weighted (by establishment size) average. Control variables refer to 2-digit sector FE and labor market region (LMR) FE. Firm size in Columns (3), (4), (9) and (5) refers to the sum of all establishments within the firm identifier. Columns (5), (6), (11) and (12) include firm FE to identify the effect of size variation on the outcome variable within the firm. Panel A shows the result for log establishment wages. Panel B shows the results for AKM establishment effects. Robust standard errors in parentheses. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

**Table A.10:** Effects by Distance between Establishments within Firms, MEFs Sample

| | Zero Distance | Positive Av. Dist. | Av. Dist. > 160km | Min. Dist. > 50km | Min. Dist. > 100km | Min. Dist. > 200km |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Panel A: Log mean wage | | | | | | |
| Est. Empl. | -0.009** | -0.003*** | -0.008*** | -0.020*** | -0.025*** | -0.031*** |
| | (0.004) | (0.001) | (0.001) | (0.002) | (0.003) | (0.005) |
| Observations | 18,580 | 89,880 | 54,891 | 20,917 | 13,533 | 6,399 |
| $R^2$ | 0.859 | 0.852 | 0.832 | 0.888 | 0.891 | 0.898 |
| Mean of $Y$ | 4.596 | 4.684 | 4.748 | 4.810 | 4.840 | 4.852 |
| Panel B: AKM | | | | | | |
| Est. Empl. | 0.006*** | -0.002*** | -0.002*** | -0.005*** | -0.007*** | -0.009*** |
| | (0.002) | (0.000) | (0.001) | (0.001) | (0.001) | (0.002) |
| Observations | 18,580 | 89,880 | 54,891 | 20,917 | 13,533 | 6,399 |
| $R^2$ | 0.826 | 0.742 | 0.673 | 0.854 | 0.868 | 0.873 |
| Mean of $Y$ | -.026 | .030 | .062 | .052 | .060 | .064 |
| SIC × LMR | Y | Y | Y | Y | Y | Y |
| Firm FE | Y | Y | Y | Y | Y | Y |

*Note:* The table shows regression results of log establishment wages (Panel A) and AKM establishment effects (Panel B) on establishment employment by different distances between establishments for multi-establishment firms (MEF). Distances are estimated based on the municipal location (geographic centroid). Control variables refer to 2-digit sector FE times labor market region (LMR) FE and firm FE to identify the effect of size variation on the outcome variable within the firm. Zero Distance indicates that all establishments are in the same municipality. Positive Av. Dist. refers to firms with at least two establishments located in different municipalities. Av. Dist. > 160 refers to firms with an average distance between their establishments above 160km. Min. Dist. refers to the smallest distance between two municipalities within the firm. Robust standard errors in parentheses. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

**Table A.11:** Effects by Local Wage Distance between Establishments within Firms, MEFs Sample

| | Distance < Mean | Distance ≥ Mean | Distance < Median | Distance ≥ Median | Min. Dist. > Mean | Min. Dist. > p(90) |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Panel A: Log mean wage | | | | | | |
| Est. Empl. | -0.004** | -0.003*** | -0.002 | -0.004*** | -0.014*** | -0.014*** |
| | (0.002) | (0.001) | (0.002) | (0.001) | (0.003) | (0.005) |
| Observations | 51,093 | 56,989 | 55,300 | 52,809 | 21,272 | 7,243 |
| $R^2$ | 0.866 | 0.842 | 0.859 | 0.848 | 0.908 | 0.923 |
| Mean of $Y$ | 4.616 | 4.714 | 4.616 | 4.722 | 4.704 | 4.738 |
| Panel B: AKM | | | | | | |
| Est. Empl. | 0.002** | -0.002*** | 0.002** | -0.001*** | -0.004*** | -0.003 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.002) |
| Observations | 54,300 | 53,914 | 58,213 | 49,998 | 20,708 | 7,012 |
| $R^2$ | 0.809 | 0.699 | 0.799 | 0.705 | 0.872 | 0.885 |
| Mean of $Y$ | -.010 | .050 | -.006 | .050 | .014 | .022 |
| SIC × LMR | Y | Y | Y | Y | Y | Y |
| Firm FE | Y | Y | Y | Y | Y | Y |

*Note:* The table shows regression results of log establishment wages (Panel A) and AKM establishment effects (Panel B) on establishment employment by different distances of local wages at the municipal level between establishments within multi-establishment firms (MEF). Distances are estimated based on mean log wages and mean AKM FE at the municipal level based on all observed establishments. Control variables refer to 2-digit sector FE times labor market region (LMR) FE and firm FE to identify the effect of size variation on the outcome variable within the firm. Zero Distance indicates that all establishments are in municipalities with the same local wage level. Mean and median refers to the average / median distance in the sample. Min. Dist. refers to the smallest wage distance between two municipalities within the firm. Robust standard errors in parentheses. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

**Table A.12:** Effects by Proxies for within-MEF Internal Labor Markets: Job-to-Job Transitions within MEFs

| | Any J2J mobility (1) | Any within firm J2J (2) | No within firm J2J (3) | Av. Dist. >100km (4) | Max. Dist. >100km (5) | Share of within firm J2J ≤ Median (6) | Share of within firm J2J > Median (7) |
|---|---|---|---|---|---|---|---|
| Panel A: Log mean wage | | | | | | | |
| Est. Empl. | -0.004*** | 0.000 | -0.009*** | -0.011*** | -0.001 | -0.008*** | 0.011*** |
| | (0.001) | (0.001) | (0.002) | (0.003) | (0.002) | (0.002) | (0.002) |
| Observations | 97,223 | 52,079 | 45,144 | 9,832 | 28,519 | 25,654 | 26,425 |
| $R^2$ | 0.848 | 0.847 | 0.865 | 0.869 | 0.833 | 0.856 | 0.851 |
| Mean of $Y$ | 4.67 | 4.686 | 4.652 | 4.818 | 4.728 | 4.656 | 4.714 |
| Panel B: AKM | | | | | | | |
| Est. Empl. | -0.000 | -0.001** | 0.001 | -0.001 | -0.002** | -0.001* | -0.001 |
| | (0.000) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Observations | 97,223 | 52,079 | 45,144 | 9,832 | 28,519 | 25,654 | 26,425 |
| $R^2$ | 0.749 | 0.702 | 0.811 | 0.759 | 0.605 | 0.740 | 0.681 |
| Mean of $Y$ | .022 | .044 | .000 | .060 | .066 | .026 | .060 |
| SIC × LMR | Y | Y | Y | Y | Y | Y | Y |
| Firm FE | Y | Y | Y | Y | Y | Y | Y |

*Note:* The table shows regression results of log establishment wages (Panel A) and AKM establishment effects (Panel B) on establishment employment for subsamples with and without job-to-job (J2J) transitions between 2018 and 2019 within multi-establishment firms (MEF). Distances are estimated based on the municipal location (geographic centroid). Control variables refer to 2-digit sector FE times labor market region (LMR) FE and firm FE to identify the effect of size variation on the outcome variable within the firm. Any J2J mobility indicates that the firm has experienced at least one job to job transition. Any within firm J2J indicates that the firm has experienced at least one transition between establishments within the firm. No within firm J2J indicates that the firm is not observed with an inflow from another establishment in the same firm (but has at least one observed mobility). Av. Dist. refers to the average distance of job-to-job flows. Max. Dist. refers to the maximum observed distance between the jobs. The share of within firm J2J transitions is calculated by the number of within firm J2J transitions divided by the overall J2J transitions. Below/above median calculated based on positive shares. The average within firm J2J transition (without zero) is equal to 23.3% (median: 17.7%). Including all firms with J2J transitions; mean: 12.3% (median 2.05%). Robust standard errors in parentheses. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

**Table A.13:** Effects by Firm-Level Collective Bargaining Coverage

| | SEF | | MEF (*CBA firms: 2,363; non-CBA firms: 1,351*) | | | |
|---|---|---|---|---|---|---|
| | w/o CBA | w/ CBA | w/o CBA | w/ CBA | w/o CBA | w/ CBA |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Panel A: Log Mean Wages | | | | | | |
| Est. Empl. | 0.0688*** | 0.0692*** | 0.0186*** | 0.0026 | -0.0032 | 0.0044*** |
| | (0.002) | (0.002) | (0.003) | (0.002) | (0.003) | (0.002) |
| Observations | 13,964 | 9,691 | 9,478 | 21,990 | 9,478 | 21,990 |
| $R^2$ | 0.546 | 0.694 | 0.603 | 0.580 | 0.826 | 0.820 |
| Mean of $Y$ | 4.534 | 4.68 | 4.572 | 4.77 | 4.572 | 4.77 |
| Panel B: AKM FE | | | | | | |
| Est. Empl. | 0.0357*** | 0.0331*** | 0.0110*** | -0.0004 | 0.0003 | -0.0007 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.002) | (0.001) |
| Observations | 13,964 | 9,691 | 9,478 | 21,990 | 9,478 | 21,990 |
| $R^2$ | 0.432 | 0.563 | 0.340 | 0.428 | 0.564 | 0.657 |
| Mean of $Y$ | -.076 | .030 | -.028 | .098 | -.028 | .098 |
| SIC × State FE | Y | Y | Y | Y | Y | Y |
| Firm FE | | | | | Y | Y |

*Note:* The table shows regression results of log establishment wages (Panel A) and AKM establishment effects (Panel B) on establishment employment differentiating by collective bargaining agreement (CBA). CBA information is based on the Establishment Panel Survey (*IAB Betriebspanel*) over the years between 1993-2023. The closest to 2019 survey wave is selected to infer the CBA status. CBA status is imputed for establishments not observed in the survey with information on matched establishments within the same firm. Columns (1) and (2) provide the results for single-establishment firms (SEF). Columns (3) to (6) provide the results for multi-establishment firms (MEF). Control variables refer to 2-digit sector FE and Federal State FE. Columns (5) and (6) include firm FE to identify the effect of size variation on the outcome variable within the firm. Panel A shows the result for log establishment wages. Panel B shows the results for AKM establishment effects. Robust standard errors in parentheses. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

**Table A.14:** Effects by Works Council Coverage

| | SEF | | MEF (*Council firms: 2,047; non-Council firms: 1,671*) | | | |
|---|---|---|---|---|---|---|
| | w/o WC | w/ WC | w/o WC | w/ WC | w/o WC | w/ WC |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Panel A: Log Mean Wages | | | | | | |
| Est. Empl. | 0.0624*** | 0.0367*** | 0.0288*** | 0.0042** | 0.0028 | 0.0028 |
| | (0.002) | (0.004) | (0.003) | (0.002) | (0.003) | (0.002) |
| Observations | 18,167 | 5,383 | 12,870 | 18,486 | 12,870 | 18,486 |
| $R^2$ | 0.515 | 0.608 | 0.493 | 0.579 | 0.810 | 0.811 |
| Mean of $Y$ | 4.500 | 4.896 | 4.554 | 4.824 | 4.554 | 4.824 |
| Panel B: AKM FE | | | | | | |
| Est. Empl. | 0.0313*** | 0.0198*** | 0.0167*** | 0.0000 | 0.0004 | -0.0009 |
| | (0.001) | (0.002) | (0.001) | (0.001) | (0.001) | (0.001) |
| Observations | 18,167 | 5,383 | 12,870 | 18,486 | 12,870 | 18,486 |
| $R^2$ | 0.389 | 0.543 | 0.382 | 0.363 | 0.653 | 0.588 |
| Mean of $Y$ | -.078 | .120 | -.016 | .116 | -.016 | .116 |
| SIC × State FE | Y | Y | Y | Y | Y | Y |
| Firm FE | | | | | Y | Y |

*Note:* The table shows regression results of log establishment wages (Panel A) and AKM establishment effects (Panel B) on establishment employment differentiating by works council coverage. Works council (WC) information is based on the Establishment Panel Survey (*IAB Betriebspanel*) over the years between 1993-2023. The closest to 2019 survey wave is selected to infer the council status. Works council status is imputed for establishments not observed in the survey with information on matched establishments within the same firm. Columns (1) and (2) provide the results for single-establishment firms (SEF). Columns (3) to (6) provide the results for multi-establishment firms (MEF). Control variables refer to 2-digit sector FE and Federal State FE. Columns (5) and (6) include firm FE to identify the effect of size variation on the outcome variable within the firm. Panel A shows the result for log establishment wages. Panel B shows the results for AKM establishment effects. Robust standard errors in parentheses. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

**Table A.15:** Effects by HR Departments, MEFs Sample

| | Narrow definition | | | Medium definition | | | Broad definition | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 HR | > 1 HR | No HR | 1 HR | > 1 HR | No HR | 1 HR | > 1 HR | No HR |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Panel A: Log mean wage | | | | | | | | | |
| Est. Empl. | -0.005*** | -0.010*** | -0.001 | 0.000 | -0.011*** | 0.009*** | 0.008*** | -0.011*** | 0.018*** |
| | (0.002) | (0.002) | (0.001) | (0.002) | (0.001) | (0.002) | (0.002) | (0.001) | (0.003) |
| Observations | 23,349 | 12,698 | 70,668 | 22,556 | 39,191 | 42,984 | 27,250 | 60,281 | 17,829 |
| $R^2$ | 0.865 | 0.859 | 0.850 | 0.844 | 0.846 | 0.854 | 0.846 | 0.839 | 0.866 |
| Mean of $Y$ | 4.760 | 4.774 | 4.612 | 4.714 | 4.796 | 4.522 | 4.588 | 4.772 | 4.588 |
| Panel B: AKM | | | | | | | | | |
| Est. Empl. | -0.002** | -0.002* | 0.000 | 0.000 | -0.002*** | 0.002 | 0.004*** | -0.002*** | 0.002 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.000) | (0.002) |
| Observations | 23,349 | 12,698 | 70,668 | 22,556 | 39,191 | 42,984 | 27,250 | 60,281 | 17,829 |
| $R^2$ | 0.711 | 0.778 | 0.772 | 0.743 | 0.694 | 0.791 | 0.764 | 0.728 | 0.793 |
| Mean of $Y$ | .052 | .080 | -.004 | .034 | .078 | -.042 | -.016 | .060 | -.016 |
| SIC × LMR | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Firm FE | Y | Y | Y | Y | Y | Y | Y | Y | Y |

*Note:* The table shows regression results of log establishment wages (Panel A) and AKM establishment effects (Panel B) on establishment employment by concentration of human resources (HR) departments for multi-establishment firms (MEF). Control variables refer to 2-digit sector FE times labor market region (LMR) FE and firm FE to identify the effect of size variation on the outcome variable within the firm. 1 HR refers to firms with one establishment that has employees in HR occupation. >1 HR refers to firms with more than 1 of establishment that have employees in HR occupation. No HR refers to firms without HR employees. Narrow HR definition is based on individuals in the following occupations: Personnel Development / Administrative Processing, Personnel Services, Leadership – Human Resources and HR Services (codes: 71512, 71513, 71514, 71522, 71523, 71524, 71594). Mild definition include: Corporate Organization / Management Consulting, Office / Secretariat / Administration, Training and Continuing Education / Vocational Training (codes: 71512, 71513, 71514, 71522, 71523, 71524, 71594, 71314, 71382, 71383, 71384, 71393, 71394, 71324, 73212, 73213, 73214, 73222, 73223, 73224, 73282, 73283, 73284, 84223, 84224). Broad definition include: Corporate organization / strategy / consulting, Office / Secretariat / Coding / Information, Public administration / general administration, Archive, Library, Documentation, Vocational Training / Educational Pedagogy, Other leadership positions (codes: 71512, 71513, 71514, 71522, 71523, 71524, 71594, 71314, 71324, 71382, 71383, 71384, 71393, 71394, 71401, 71402, 71403, 71412, 71413, 71423, 71424, 71432, 71433, 71442, 71452, 71493, 73201, 73202, 73203, 73204, 73212, 73213, 73214, 73222, 73223, 73224, 73231, 73232, 73233, 73234, 73241, 73242, 73243, 73244, 73252, 73253, 73254, 73282, 73283, 73284, 73293, 73294, 73312, 73313, 73314, 73322, 73323, 73324, 73332, 73333, 73334, 73342, 73394, 84223, 84224, 84294, 11194, 11294, 11394, 11494, 24193, 24293, 24393, 27194, 27294, 27394, 28194, 28294, 28394, 33193, 33293, 33393, 34193, 34293, 34393, 41194, 41294, 41394, 41494, 51193, 51293, 51394, 81394, 82594, 83194, 83293, 83394, 84194). Robust standard errors in parentheses. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

**Table A.16:** Effects on Recruitment Effort

| | Vacancy duration | | Hours spent | | Euro costs | | Applicants | |
|---|---|---|---|---|---|---|---|---|
| | SEF | MEF | SEF | MEF | SEF | MEF | SEF | MEF |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Est. Empl. | 0.015** | -0.080 | 0.078*** | -0.216* | 0.411*** | -0.716 | 0.153*** | 0.054 |
| | (0.007) | (0.137) | (0.008) | (0.122) | (0.028) | (0.721) | (0.006) | (0.096) |
| Observations | 18,165 | 299 | 16,538 | 191 | 13,913 | 138 | 17,474 | 276 |
| Mean of $Y$ | 4.982 | 5.022 | 2.964 | 3.148 | 3.432 | 4.100 | 1.374 | 1.620 |
| SIC | Y | Y | Y | Y | Y | Y | Y | Y |
| LMR | Y | Y | Y | Y | Y | Y | Y | Y |
| Firm FE | | Y | | Y | | Y | | Y |

*Note:* The table shows regression results of establishment recruitment variables on establishment employment. Recruitment information is based on the Establishment Vacancy Survey (*IAB Stellenerhebung*) over the years between 2014-2019 and refers to questions on the most recent vacancy in the establishment. The most recent year of the survey is selected to infer the information. Vacancy duration refers to the (log) number of days between the opening and the closing to the vacancy. Hours spend refers to the (log) number of hours spend to fill the vacancy. Euro costs refers to the (log) euro amount spend to fill the vacancy (without labor costs). Applicants refers to the (log) number of applicants. Columns (1), (3), (5) and (7) provide the results for single-establishment firms (SEF). Columns (2), (4), (6) and (8) provide the results for multi-establishment firms (MEF). Control variables refer to 2-digit sector FE and labor market region (LMR) FE. Specifications with MEF units include firm FE to identify the effect of size variation on the outcome variable within the firm. Robust standard errors in parentheses. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

**Table A.17:** Effects on Worker AKM FE, Tenure, Hires from Non-Employment

| | SEF | | | MEF | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | W-AKM | Tenure | Non-emp | W-AKM | Tenure | Non-emp | W-AKM | Tenure | Non-emp |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Est. Empl. | .022*** | .176*** | .016*** | .004*** | .195*** | .031*** | -.009*** | .183*** | .030*** |
| | (0.000) | (0.001) | (0.000) | (0.001) | (0.002) | (0.001) | (0.001) | (0.003) | (0.001) |
| Obs. | 776,302 | 776,302 | 596,670 | 112,433 | 112,433 | 95,985 | 112,433 | 112,433 | 89,445 |
| $R^2$ | 0.291 | 0.161 | 0.055 | 0.487 | 0.253 | 0.128 | 0.775 | 0.702 | 0.434 |
| Mean of $Y$ | 4.422 | 7.316 | .352 | 4.488 | 7.186 | .298 | 4.488 | 7.186 | .298 |
| SIC × LMR | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Firm FE | | | | | | | Y | Y | Y |

*Note:* The table shows regression results of average worker AKM FE (W-AKM), log average tenure (measured in days), and the share of new hires from non-employment. Columns (1) to (3) provide the results for single-establishment firms (SEF). Columns (4) to (9) provide the results for multi-establishment firms (MEF). Control variables refer to 2-digit sector FE times labor market region (LMR) FE. Columns (7) to (9) include firm FE to identify the effect of size variation on the outcome variable within the firm. Robust standard errors in parentheses. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

**Table A.18:** Effects on Turnover: Hiring and Separation Rates

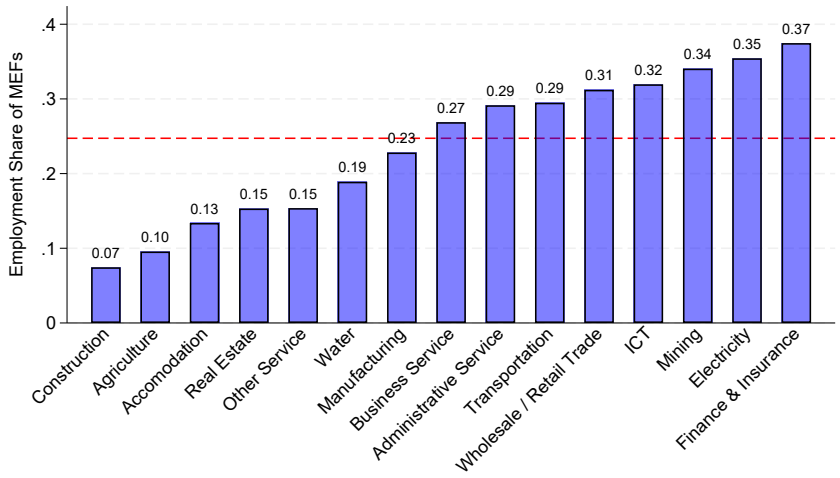
| | SEF | | | MEF | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | HR | SR | TR | HR | SR | TR | HR | SR | TR |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Est. Empl. | -.0045*** | -.0081*** | -.0126*** | -.0051*** | -.0126*** | -.0177*** | .0041*** | -.0151*** | -.0109*** |
| | (0.000) | (0.000) | (0.000) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Obs. | 719,271 | 719,271 | 719,271 | 98,497 | 98,497 | 98,497 | 98,497 | 98,497 | 98,497 |
| $R^2$ | 0.067 | 0.115 | 0.116 | 0.160 | 0.286 | 0.260 | 0.484 | 0.586 | 0.577 |
| Mean of $Y$ | .246 | .208 | .454 | .260 | .242 | .502 | .260 | .242 | .502 |
| SIC × LMR | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Firm FE | | | | | | | Y | Y | Y |

*Note:* The table shows regression results of hiring, separation and turnover rate on establishment employment. Concretely, we sum all hiring flows, separation flows, and their sum (turnover) in 2019 and divide by 2018 employment (so this number be higher than one, so that control means seem high), and relate those three outcome variables to establishment employment in 2019. Columns (1) to (3) provide the results for single-establishment firms (SEF). Columns (4) to (9) provide the results for multi-establishment firms (MEF). Control variables refer to 2-digit sector FE times labor market region (LMR) FE. Columns (7) to (9) include firm FE to identify the effect of size variation on the outcome variable within the firm. Hiring rate (HR) is calculated as the number of inflows in 2019 over total employment in 2018. Separation rate (SR) is calculated as the number of outflows in 2019 over total employment in 2018. Variables are trimmed at 100%. Turnover rate (TR) is calculated as the sum of inflows and outflows in 2019 over total employment in 2018. Robust standard errors in parentheses. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

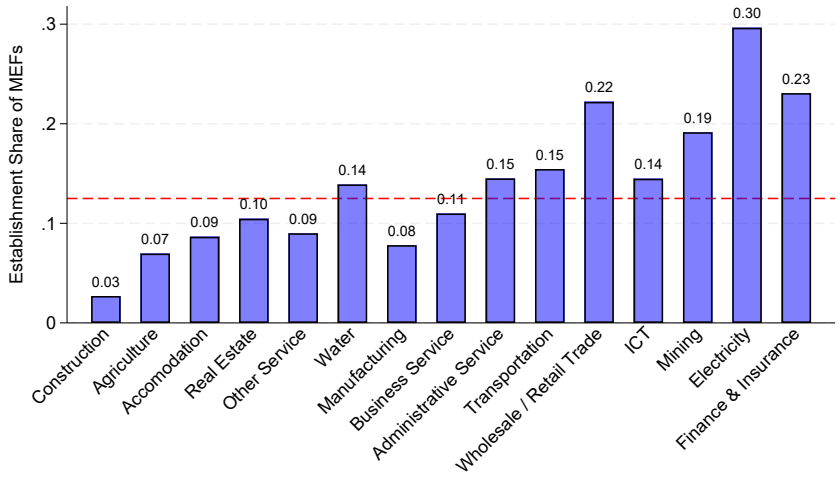
# Additional figures

**Figure A.1:** Employment and Establishment Share of MEFs by Industry

**(a)** MEF Employment Share

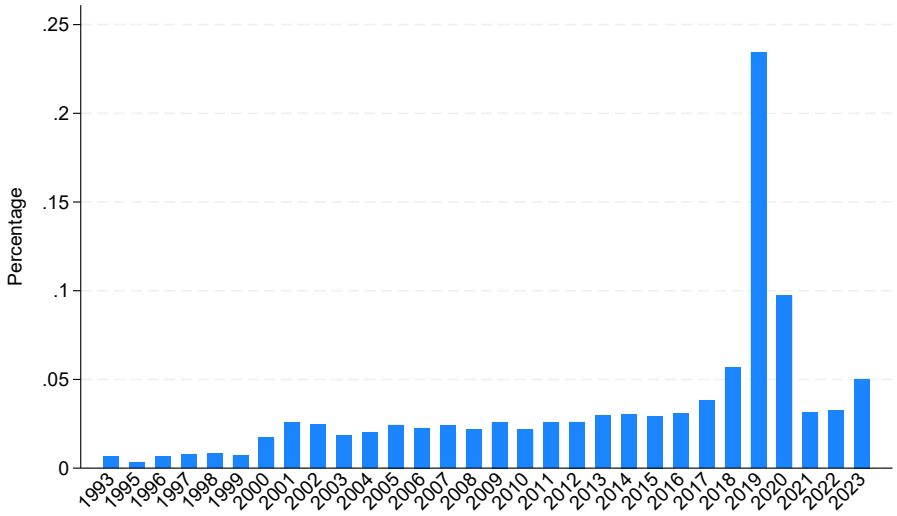



**(b)** MEF Establishment Share




*Note:* The figure reports the share of multi-establishment firms (MEF) over industries for the year 2019. Excluded sectors: public & defense, education, health, art & entertainment. Sector classification refers to WZ08 classification of the German Statistical Office. Panel (a) shows the employment share. Panel (b) shows the count share. The red lines show the average across all sectors. The employment share of MEFs is equal to 25%. The share of MEFs among all establishments is equal to 12%.

**Figure A.2:** Information Measured in Establishment Panel Survey

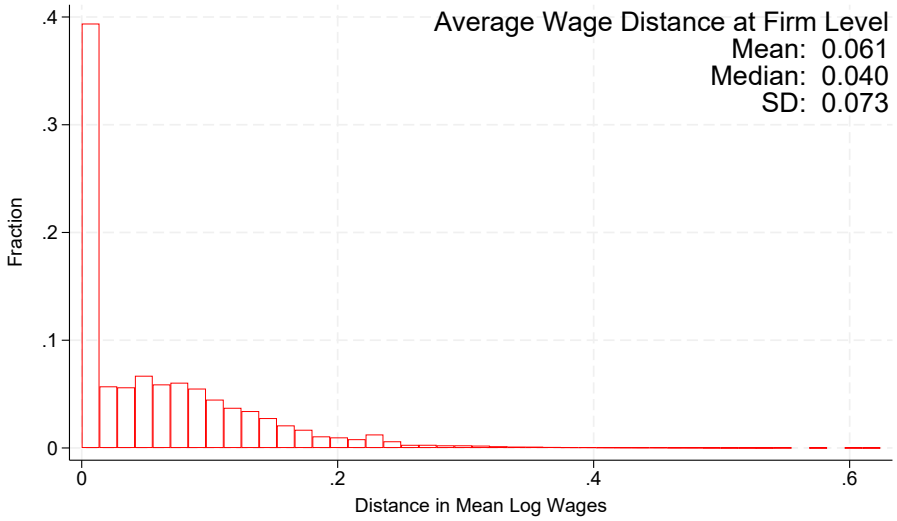



*Notes:* The figure shows the closest to 2019 survey wave for each establishment that provides information on collective bargaining agreements conditional on establishments observed in the Establishment History Panel (BHP) in 2019. In case of a tie situation (e.g., 2018 vs 2020), the earlier wave is selected.

**Figure A.3:** Local Wage Distances between Establishments within MEFs

**(a)** Distance between Establishments

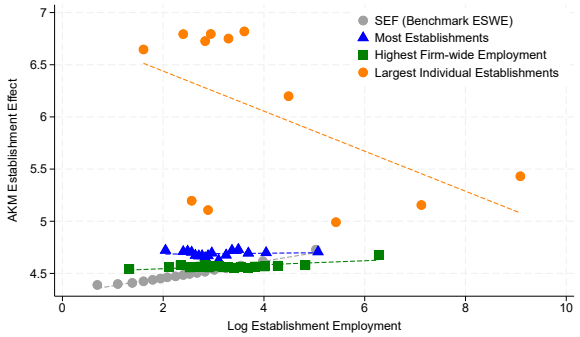

**(b)** Average Distance within Firms



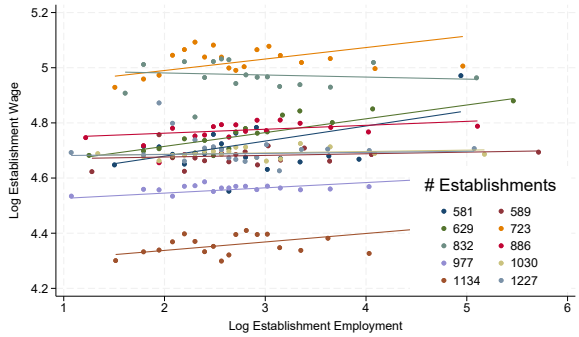

*Notes:* The figure shows histograms of wtihin-MEF distances between all possible unique combinations of distances in absolute mean log wages between establishments within firms in Panel (a) and average mean log wage distances at the firm level for multi-establishment (MEF) firms. Distances are estimated based on mean log wages and mean AKM FE at the municipal level based on all observed establishments.

**Figure A.4:** Firm-level Case Studies: ESWE (Raw Wages) within Individual Multi-Establishment Firms

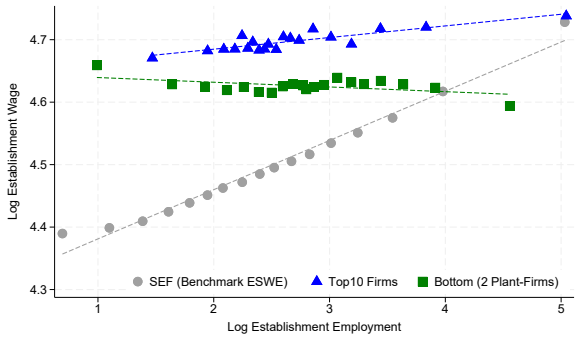
**(a)** Largest Firms



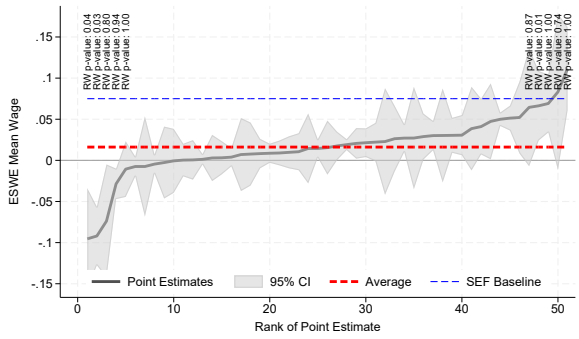

**(b)** Top10 Firms by # of Establishments




**(c)** Top 10 Firms (by Establishment Count) vs. Bottom (2-Establishment MEFs)

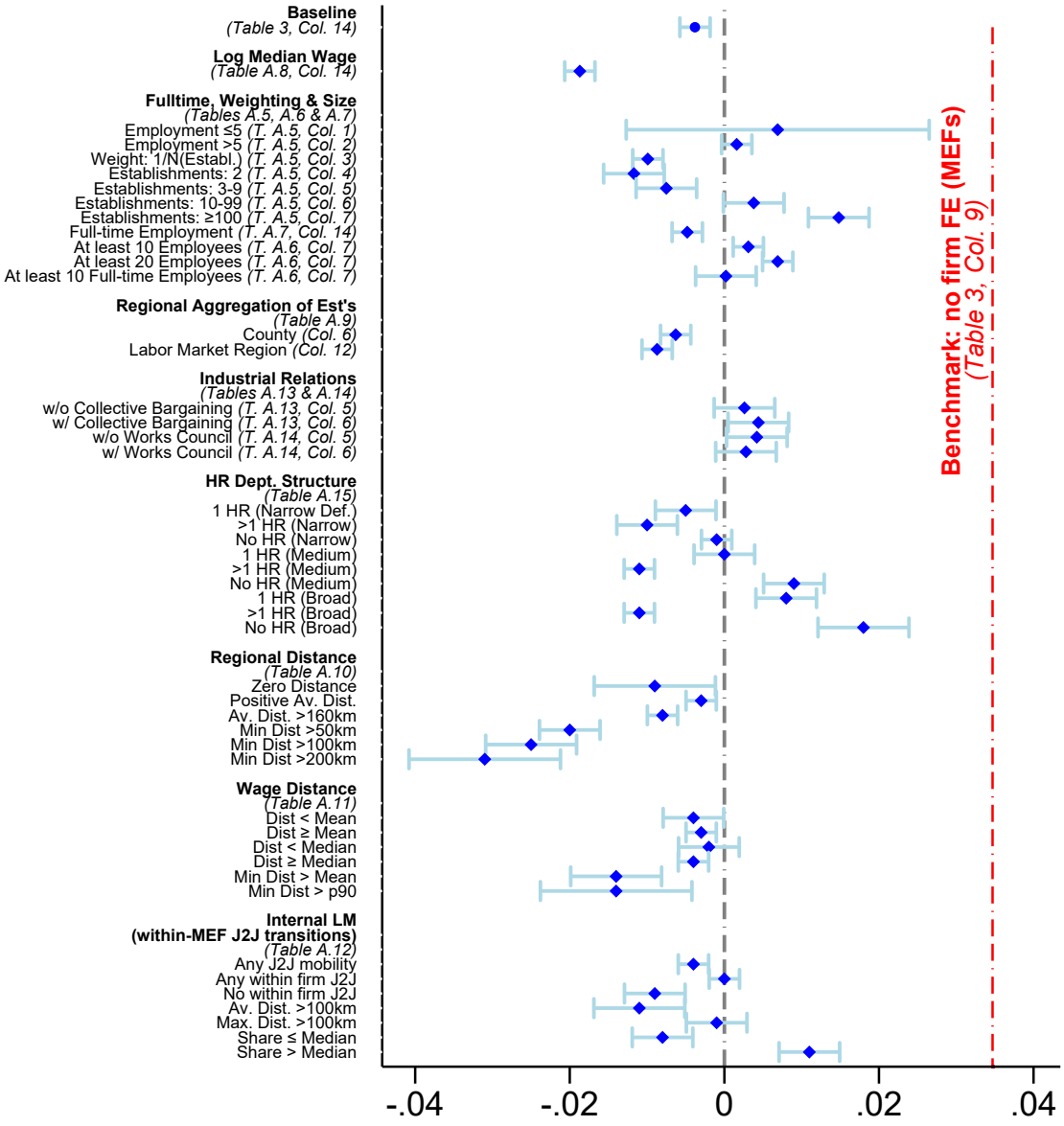



**(d)** ESWE Slope Estimates in Firm with at least 100 Establishments, Ranked by Point Estimate



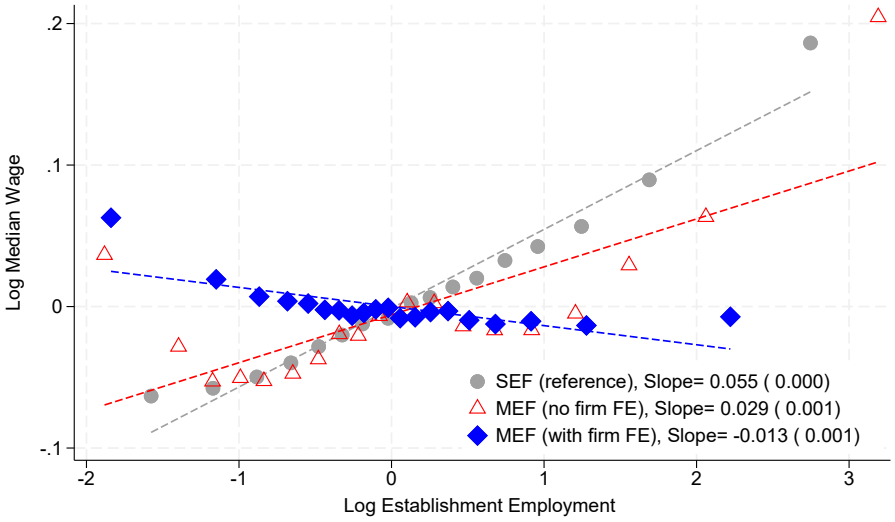

*Notes:* The figure replicates Figure 9 for raw wages instead of establishment AKM fixed effects.

**Figure A.5:** Summary of Robustness Checks: The ESWE Across Establishments Within Firms, i.e., Estimated With Firm FEs (Pay Variable: Log Mean Establishment Wage)



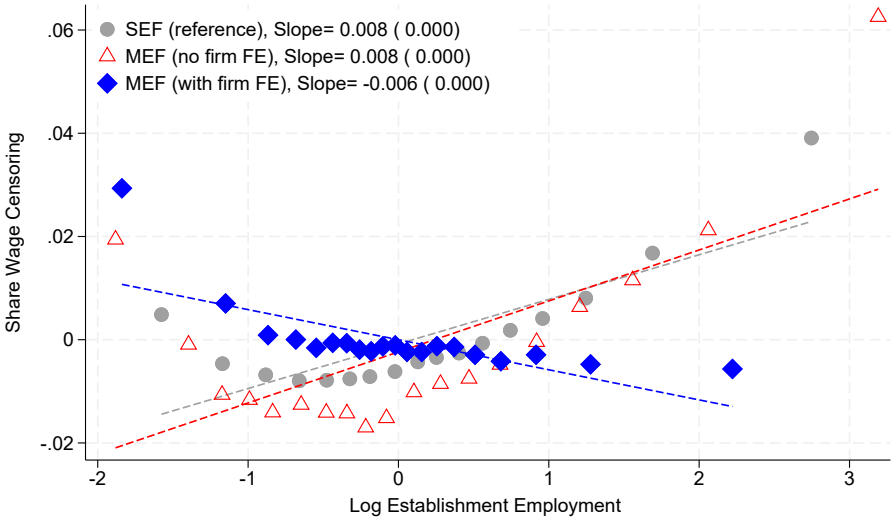

*Notes:* The figure replicates Figure 10 for mean log establishment wages rather than establishment AKM effects.

**Figure A.6:** Within-Firm vs. Across Firms: The Employer Size Wage Effect with Median Wages




*Notes:* The figure shows binned scatter plots of log establishment size and log median wages for the year 2019 differentiating by single-establishment firms (SEF) and multi-establishment firms (MEF) with and without firm fixed effects. The dashed lines represent linear fits based on a univariate linear OLS model. Point estimates are shown in the top left corner with robust standard errors in parentheses. The SEF sample covers 778,068 establishments. The MEF sample covers 112,660 establishments. In the cases without firm fixed effects, each variable is normalized by a constant.

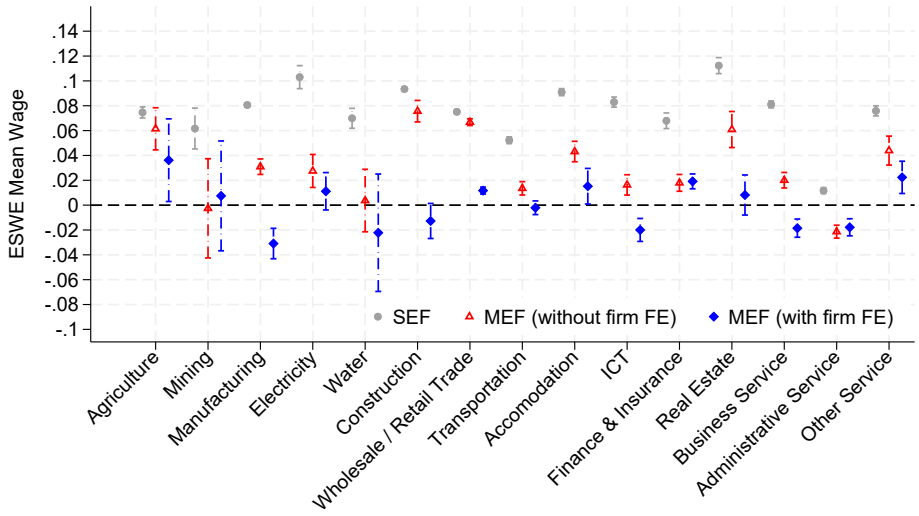
**Figure A.7:** Within-Firm vs. Across Firms: Share of Wage Censoring



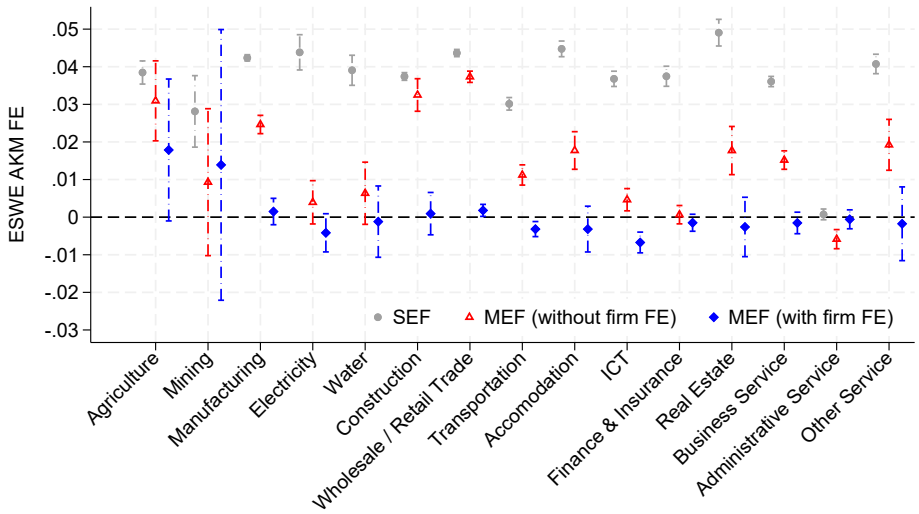

*Notes:* The figure shows binned scatter plots of log establishment size and the share of censored workers for the year 2019 differentiating by single-establishment firms (SEF) and multi-establishment firms (MEF) with and without firm fixed effects. The dashed lines represent linear fits based on a univariate linear OLS model. Point estimates are shown in the top left corner with robust standard errors in parentheses. The SEF sample covers 778,068 establishments. The MEF sample covers 112,660 establishments. In the cases without firm fixed effects, each variable is normalized by a constant.

**Figure A.8:** The Employer Size Wage Effect by Broad Industries

**(a)** ESWE Based on Log Mean Wage



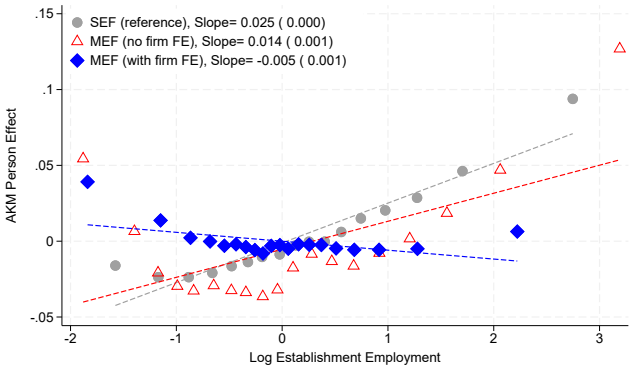

**(b)** ESWE Based on AKM Establishment Effects



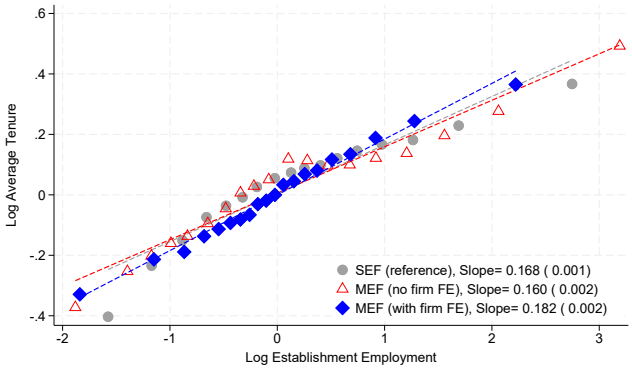

*Notes:* The figure shows regression results (coefficient estimates with 95% CI) of log mean wages (Panel (a) and AKM establishment FEs (Panel b) on establishment employment by broad industry classifications (WZ08). Each dot represents a single regression. The gray dots refer to single-establishment firms (SEF). The red dots refer to multi-establishment firm without controlling for firm FEs. The blue dots refer to multi-establishment firm controlling for firm FEs. Each regression controls for 2-digit industry times labor market region FEs.

**Figure A.9:** Other Outcome Variables

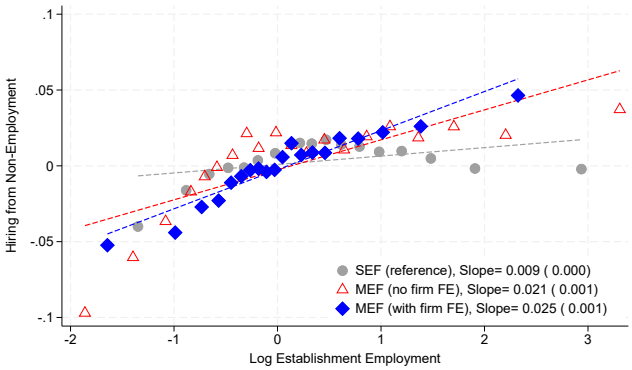
**(a)** Average AKM Worker FE




**(b)** Average Worker Tenure



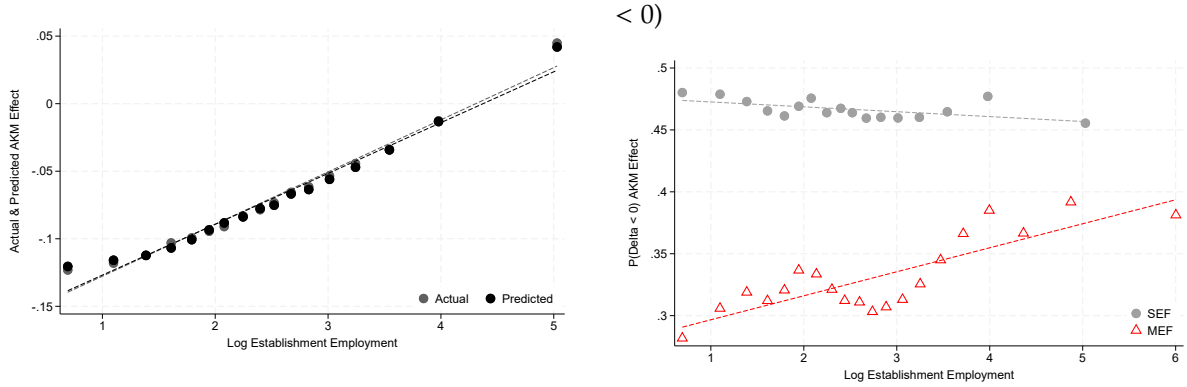

**(c)** Share of Hires out of Non-employment




*Note:* The figure shows binned scatter plots of log establishment size and AKM worker FE (Panel (a)), log average individual tenure (Panel (b)), and the share of hires out of non-employment (Panel (c)) for the year 2019 differentiating by single-establishment firms (SEF) and multi-establishment firms (MEF) with and without firm fixed effects. The dashed lines represent linear fits based on a univariate linear OLS model. Point estimates are shown in the top left corner with robust standard errors in parentheses. In the cases without firm fixed effects, each variable is normalized by a constant.

**Figure A.10:** Supplementary Material for Lasso Model: Predicted Pay (AKM-based) by Employment

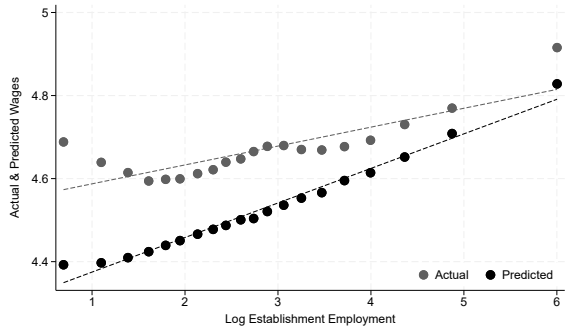
**(a)** Actual and Predicted Pay, SEFs (Hold-out Sample) **(b)** Share Negative Premium (Actual − Predicted Pay < 0)



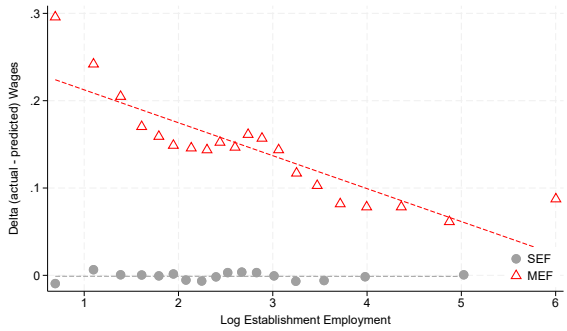

*Note:* The figure supplements Figure 11. Panel (a) shows the actual and lasso-predicted pay (for AKM establishment effects) along log establishment size for the SEF hold-out sample, confirming the (average) fit throughout the size distribution. Panel (b) shows the share of establishments with negative pay premia (actual below predicted pay) along log establishment size for both SEF (hold-out sample) and MEF establishments. Dashed lines represent linear fits. The pay variables are based on AKM establishment effects. Appendix Figure A.11 replicates this figure for raw wages.

**Figure A.11:** Pay Premia (Actual minus Lasso-Predicted Pay) by Employment: Log Mean Wage Rather than AKM Establishment Effects

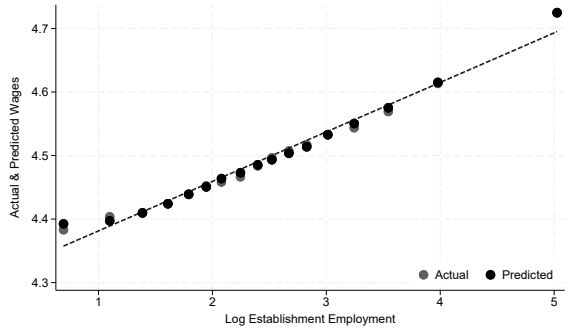
**(a)** Actual and Predicted Pay, MEFs (Wage-based)



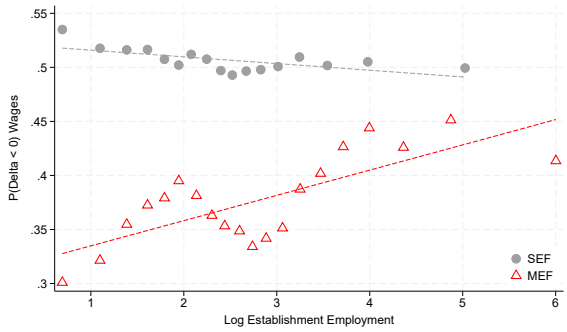

**(b)** Pay Premium (Actual – Predicted Pay) (AKM-based)




**(c)** Actual and Predicted Pay, SEFs (Hold-out Sample)




**(d)** Share Negative Premium (Actual – Predicted Pay $< 0$)




*Note:* The figure reports lasso-predicted wages and premia for mean log wages rather than AKM establishment fixed effects. Panels (a) and (b) replicate Figure 11 Panels (a) and (b); Panels (c) and (d) replicate Appendix Figure A.10.