# The Employer Size Wage Effect: Within and Across Firms

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*New, preliminary, and incomplete.*
*Please do not circulate.*

**Abstract**

We revisit the employer size wage effect (ESWE)—arguably the most influential and basic 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 operating in different 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. This demanding specification is new to the ESWE literature (for which we also provide the first systematic meta-analysis) because it requires population-wide triple-merged firm-establishment-employee data, which we obtain for Germany. This wage-size decoupling is hard to square with the view that employment is determined *along* a finitely elastic firm-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 employers evidently hire *off* their labor-supply curves (or those curves are very elastic), pay wage premia above the monopsonistic minimum, and leave excess labor supply. Overall, at least for the 25% of German employment in large firms for which the ESWE disappears, wage setting and employment determination require alternative models able to rationalize non-market-clearing wage premia and labor supply rationing, 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 human capital 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 the first meta-analysis of the ESWE in this paper shows, the estimated elasticities of wages to employment range between 0.020 at the 25th percentile and 0.056 at the 75th percentile, thereby implying large wage differentials given the wide dispersion in firm size. Besides rent sharing or compensating differentials, the perhaps most prominent contemporary explanation is employer monopsony (see, e.g., Green, Machin, and Manning, 1996; Bachmann, Bayer, Stüber, and Wellschmied, 2022). 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. To do so, we draw on *new triple-matched firm-establishment-employee data* covering the (near-)universe of German social security records (Diegmann, Doherr, Hälbig, and Wolter, 2024). In fact, our meta-analysis also confirms that such a within-firm between-establishment analysis has not yet been conducted in any other context.[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 premia (as given by firm fixed effects identified by movers Abowd, Kramarz, and Margolis, 1999; Card, Heining, and Kline, 2013), and we also consider worker-level and firm-weighted specifications.

The irrelevance of establishment size for wages within firms holds for both raw wages and firm wage premia adjusting 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, establishments are large or small without any relationship to wages 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] Existing studies may include firm or establishment employment concepts. A handful of studies, e.g. (Brown and Medoff, 1989; Bayard and Troske, 1999; Troske, 1999), also include both firm and establishment employment information as continuous controls but do not include a firm-fixed effect, thereby not permitting our analysis.

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

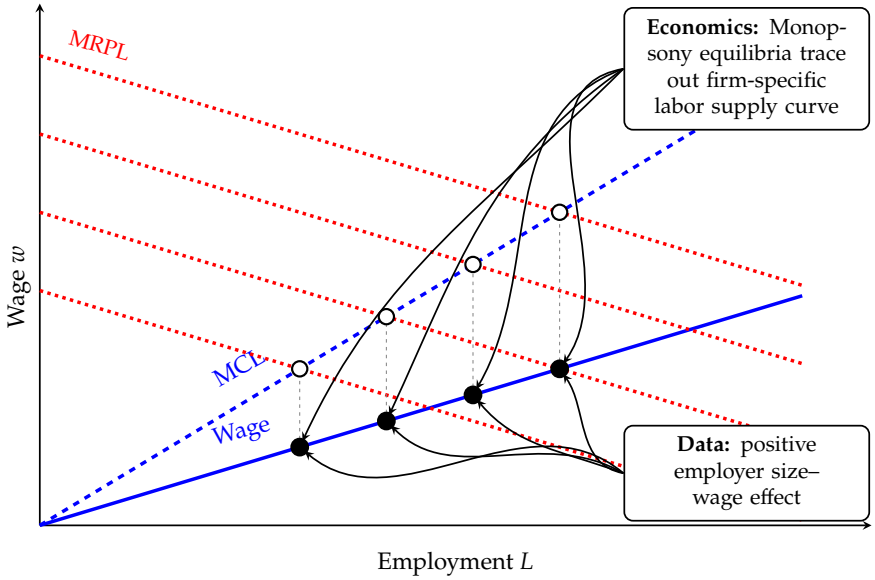
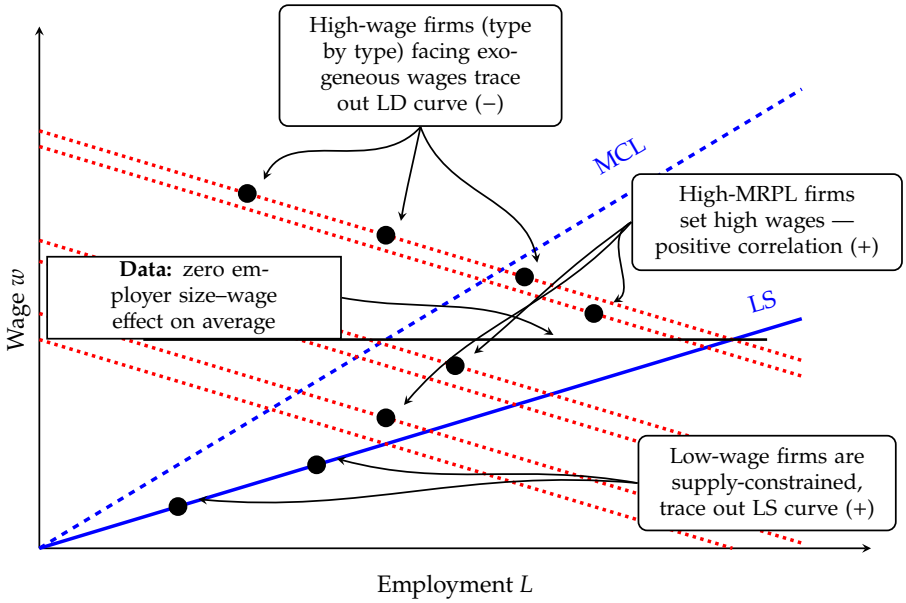



**Figure 2:** Preferred model: exogenous wages imposed on heterogeneous establishments




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 0.000), (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.

The decoupling of wages from employment is puzzling through the monopsony lens. After all, one may be tempted to view the ESWE as 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 not immediately resolve the puzzle. In those models (Manning, 2003, 2006; Burdett and Mortensen, 1998; Bloesch, Larsen, and Yding, 2024), firms can also exert non-wage expenses to recruit workers, such as investing in recruitment. We find no offsetting boost in other recruitment margins; if anything, within MEFs, we find no, or even 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-specification 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—but 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

[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 reduced form "tastes" for employers (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).

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 should reemerge whether wages are monopsonistic or exogenous, with employment 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 a predicted labor-supply-required wage: the 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. 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 zoom into 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. Our design, however, leaves open whether firms actively set wages as intentional monopsonists in low-wage MEFs or whether the ESWE draws out a labor supply curve by wage-taking individual establishments hiring until their marginal product equals any given parametric wage without actual markdowns (see Faia, Lochner, and Schoefer, 2026, for an attempt

[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.

to directly study markdowns in response to exogenous wages).

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 diagnoses 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 zooming into within-firm variation across establishments, we connect to an emerging literature on the role of firm-level wage setting that has emphasized evidence for *wage compression*, including 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 business units' wages may be subject to firm-wide wage policies. Recent work by Hjort, Li, and Sarsons (2024) 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 absolutely 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.[6]

[6]For instance, across their instructive suite of model variants dissected in Hazell, Patterson, Sarsons, and Taska

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 zooms into 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 A1. To our knowledge, this is the first such meta-analysis.[7] *Importantly, none of the existing studies has conducted a within-firm between-establishment analysis, which is the innovation of our paper.*

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 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 that class also has not featured our within-firm ESWE analysis.

We identify 61 preferred estimates from 25 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.[8] Studies with preferred estimates belonging to 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

(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.

[7] To be included, studies must (1) be published or (conditionally) accepted in a refereed journal at the time of the meta-analysis (i.e., August 25, 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.

[8] 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 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.

estimate per study and category.[9] This yields 37 estimates from 25 studies. We list those estimates in Figure 3 and Table 1, which we complement with additional information in Appendix Table A1.

Overall, we find consistently positive ESWE estimates. Based on the 37 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 0.056, resulting in an interquartile range of 0.036.[10]

Turning to different empirical contexts, Table 1 shows that ESWE estimates are lowest in the Scandinavian countries (0.014)—a new result that may reflect wage compression. They are similar in continental Europe excluding Scandinavia (0.051) and the rest of the world (0.048; 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 (0.060) among studies that do not control for worker heterogeneity. Among studies that control for observable worker characteristics, the average drops to 0.037, and it declines further to 0.015 in studies that control for unobserved worker heterogeneity using worker fixed effects, consistent with high-wage workers tend to sort 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 (0.05) 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 Panel B and C of Table 1.

We also summarize those patterns in a regression analysis based on the 37 preferred estimates, reported in Appendix Table A2: (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,[11] somewhat higher when observable worker

[9] We anticipate that coefficients across separate regressions within the same study may be positively correlated (due to study design etc.) 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.

[10] 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.

[11] 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).

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).[12]

Importantly, while some studies also include firm-level employment (on its own or in a horse race with establishment employment), none of those studies includes a specification that includes a firm fixed effect—the key innovation of our study.

# 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 supplement this analysis with 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-matched firm-establishment-employee data from Germany, which we detail below in Section 3.2:

$$\ln w_j = \alpha + \nu_{m(j)} + \theta_{f(j)} + \gamma \ln n_{j(i)} + \varepsilon_i. \tag{2}$$

Index $j$ denotes establishments, as our main specification is an establishment-level variant. We also replicate our results while firm-weighting (inversely weighting establishments by their firm's

[12]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).

establishment count) and effectively weighting by establishment size in a worker-level (universe-based) specification. Our regressions are cross-sectional, so that the fixed effect specification cleanly isolates within-firm size differences rather than mixing in changes over time.

Our 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. We here note that by considering AKM establishment effects as a *dependent* variable, we circumvent the debate on precision in those variables (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 (*Kreis*, see below), or their interaction. By studying relative size within the market, the specifications with local labor market fixed effects moreover would capture 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 notify all employees who are subject to social security contributions. Thus, the data cover the universe 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 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. From the perspective of the 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.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.

**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

[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 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.

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 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 district (*Kreis*) or local labor market region level, summing establishment employment across industries and municipalities (*Gemeinden*) 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, and 257 local labor market regions.[14]

A *firm* in the MUP data is defined in terms of legal units defined 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 et al., 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 etc., 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

[14]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.

employees only.

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 in a panel regression of worker-level log wages on worker-level controls, worker fixed effects, and establishment fixed effects.[15] 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 premium. Moreover, as mentioned above in Section 3.1, that 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. 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). Our most basic definition does so on the basis of at exactly one (pre-sample restrictions) vs. 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

[15] 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.

employees, the shares of MEF employees and establishments is 27% and 7.9%, 36% and 21%, and 41% and 29%, respectively. Figure 4 reports these numbers by sector, and shows that 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.[16] Appendix Table A3 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 A4 provides summary statistics for

[16]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. 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.1 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 5. 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. Wages and AKM effects have standard deviations of 0.17 for MEFs and 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. (Appendix Figures A.2 and A.3 complement this perspective by further reporting on the "dispersion of dispersion" of wage and AKM effects, by plotting the histogram of within-MEF interquartile ranges.) 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, indicating 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.

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 relative standard deviations.

### 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 6. 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, we find an effect about half, 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.

We find similar ESWE coefficients of about 0.055-0.060 with standard errors around 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) in Column (1) and in Column (2) 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 dependent 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.

**Benchmark monopsony view.** 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 neot 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.

### 4.3 ESWE across SEF and MEF establishments: omitting the firm FEs

As a stepping stone towards out within-firm (within-FIRM) between-establishment specification, we report the results for the ESWE separately for SEF and MEFs. We do so in Table 3 Columns (4)-(11) as well as in Figures 7 (raw levels) and 8 (residualized after fixed effects ranging from simple intercepts to firm fixed effects).

**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). While we leave open the interpretation of these results, we overall find strong a ESWE for MEF establishments no matter the specification and interpret the strong effect of firm-level employment as a stepping stone towards our analysis with firm fixed effects.[17]

[17] 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.

Complementing the regression, Figure 11 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 7 above.

While consistent with firm-level labor supply (rather than at the establishment), this wage effect of firm-wide employment may reflect rent sharing 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 8.

**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 smaller positive effects.

**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 also hold at the worker level (Table 4 Columns (5)-(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 phenomenon of the ESWE and hence a departure from the patterns we documented in 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. We interpret and further dissect the data from that perspective in Section 6, while first further deepening the pattern 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.6 does so 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) zooms into the three largest MEFs in three senses: (i) with the most establishments, with the highest total employment, and 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) zooms into 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 gradient we had 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, suggestive of the few ESWE draws simply 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 establishment employment as well as establishment

count). 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

**Worker-level specification.** We also replicate the establishment-level specification (unweighted) with the worker-level versions, reporting these results in Table 4 already discussed above. We consider SEF and MEFs separately, and then within the MEFs additionally include the firm FE. Here, the standard ESWE again moves to zero (in fact, slightly negative) once we control for the firm FE.

**Weighting and size cutoffs.** Supplementing the worker-level specification, which already evokes a weighting by employment count, in Table 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 Table 5, we separately consider MEF establishments with more than or at most 5 employees. Appendix Table A6 additionally considers higher establishment size cutoffs of 10 and 20 employees and at least 10 full-time employees.

Second, in Column (3), 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.

**Median vs. mean wage, and censoring.** In Appendix Table A5 and Appendix Figures A.4 and A.5, 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 Figure 12 (AKM FEs) and Appendix Figure A.9 (raw wages). 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.

## 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 construction 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.[18] This scenario play plausibly describe the extreme case of a 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 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 definit ion 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.

[18] 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-specification 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.

**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).[19] We report those results in Table 6. 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 within a MEF. We do so in Table 12. Specifically, we split up MEFs by the average distance of their establishments (focusing on their municipality). Appendix Figure A.12 plots the distribution and summary statistics of this geographic distance measure, showing that MEF establishment are seperated by considerable geographic distance.

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 160km (which gives us about half the sample), and again find similar results. Finally, we consider the minimum distance of all establishments from one another in Columns (4)-(6), considering cutoffs of 50 km, 100 km, and 200 km. Results yield precisely estimated zero point estimates (which turn, if anything, 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 our MEF sample into firms by "wage distance:" we take all establishments in a given municipality and classify distance based on wage differences, considering zero distance (i.e., same municipality), whether the MEF's mean wage difference is above or below the mean or median distance in the sample, and whether the minimum distance within the MEF is above the mean and the 90th percentile. Our wage measure by which we classify municipalities are log wages (AKM establishment FEs) when considering log wages (AKM establishment FEs) as the dependent (in-

[19] 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.

dependent) variable). Appendix Figure A.13 plots the distribution and summary statistics of this wage-level 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 idea that MEFs place establishments catering to wage levels (see also Hazell, Patterson, Sarsons, and Taska, forthcoming; Carry, Kleinman, and Nimier-David, 2025). Moreover, Appendix Figure A.14 plots the relationship between geographic and wage level differences (for raw wages and AKM establishment effects), showing that the wage sorting likely substantially coincidences with the geographic one above.

Table 13 reports the regression results for the ESWE, splitting up MEFs by how heterogeneous the local labor markets' wage levels are that their establishments operate in. We do not find any evidence for positive ESWE in any subgroup—not even in those where the firm already faces different local labor market conditions across establishments.[20]

**Internal labor markets.** We close our analysis with the perhaps most simple "revealed preference" proxy for how the workers perceive their MEF establishment as substitutes: frequent job-to-job transitions between establishments of the MEF. Table 14 reports those results. (As a benchmark, Appendix TableA7 reports heterogeneity cuts by such transitions to any employer.) MEFs with vs. without such internal job transitions between 2018 and 2019 exhibit the same zero ESWE. Hence, even for MEFs featuring no observable internal labor market so that their individual establishments very plausibly face the standard local labor supply curve, the ESWE remains absent within MEFs.

### 5.2 Other labor demand margins and trade-offs: turnover and recruitment

To shed additional light on how employers evidently are larger or smaller without tantamount wage adjustment, we study alternative adjustment margins of labor demand on top of wages. That is, we study other outcomes for the specification in Equation (2): turnover and recruitment, worker quality, and, tentatively, productivity. This perspective also foreshadows our prime lens of monopsony, which we develop and dissect below in Section 6 next.

**Dynamic monopsony: 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 study these outcomes separately for SEFs and MEF establishments. Results are reported in Table 8.

[20] Importantly, we reiterate that we have included local labor market (location times industry) fixed effects so that our employment and wage variation was always relative to other (MEF) establishments already.

Strikingly, if anything, we find that 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. The relative pattern is reversed for the number of applicants per vacancy, although we note that the MEF coefficient remains (insignificantly) positive and MEFs at baseline have higher applicant levels than SEFs (see control means in the table). For applicant numbers, SEFs receive (or as a result of more recruitment effort, obtain) more applicants per hire. 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. Our results are therefore not just hard to reconcile with standard monopsony models in which employment and wages are chosen among a menu given the firm-specific labor supply curve, but also in richer dynamic monopsony models with turnover costs (see, e.g. Manning, 2003, 2006; Bloesch, Larsen, and Yding, 2024).

**Turnover: hiring and separation rates.** We now turn to a direct analysis of worker flows: hiring and separation rates as well as turnover. We rely on administrative worker flow data from the BHP (see Section 3). Concretely, we sum all new hires, separators, 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 Table 9, again by SEF and MEF establishments, and the latter separately with and without firm fixed effects.

Across samples and specifications, we find that the turnover rate decreases in firm size. That is, larger SEFs and MEF establishments see lower turnover, with point estimates around -0.011 to -0.018. Most of this stems from the contribution of the separation margin, meaning that larger establishments see lower separation rates. This would imply either better or more stable jobs when establishments are large—from a labor supply side perhaps reflecting higher wages or non-wage benefits.

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.

Turning to the hiring margin (and complementing the recruitment perspective explored above already), we find that across SEF and MEF establishments (before including firm fixed effects in the latter), the hiring rate falls in larger establishments, with coefficients around $-0.0045$ to $-0.0051$. However, once we include fixed effects, we actually find that the size effect on hiring turns *positive*

between establishments in the same firm, with a positive estimate of 0.0041. (All turnover effects are precisely estimated with SEs below 0.001.)

We close by noting that this check is tentative, there is a mechanical relationship between separations and hires, and it would be useful to draw on voluntary job separations instead, which are not readily available in the BHP (and the IAB Establishment Panel would only yield limited coverage of multiple establishments within a MEF required for our analysis). Similarly, revealed-preference rankings of firms (Sorkin, 2018) might be a promising complementary outcome variable.

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

Another trade-off, besides size and recruitment effort, that firms face when setting wages may be worker quality. By comparing the employment effects on raw wages and composition-adjusted wage premia, we have already indirectly been able to gauge effects on worker quality. That is, we can consider the difference between the coefficient for raw wages and AKM effects for SEFs and MEF establishments in Table 3. Here, we find that MEF establishments, once firm FEs are included, have a considerably smaller sensitivity of worker quality to employment than SEFs do, which suggests that MEF establishments—perhaps because they do not pay wage premia for size; this suggests that within MEFs, there is less positive sorting by size that across SEFs (but MEFs still have much higher average worker quality, see group means in the regression table).

In Table 10 Columns (1) and (4), we study worker quality directly. Specifically, we put as the dependent variable the AKM *worker* effect. Figure A.7 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.)

### 5.4 A brief check on the role of wage setting 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, we will 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—although those floors typically do not bind in large and productive covered firms (see, e.g. 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 sample size by filling in missing 2019 survey observations from other years in which our 2019 establishment analysis sample may have been surveyed, and classify the entire MEF based on establishment survey information, but note that the sample shrinks, as we only keep the subset of MEFs with at least one establishment surveyed.

Table 7 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 A8. 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.6 (raw wages).

**Centralized human resource (HR) departments.** Some firms may also self-impose wage policies, even in unregulated contexts such as the United States (even amounting to national wage setting for a significant minority of U.S. employers, see Hazell et al., forthcoming). A proxy for this practice may be a centralized HR department.

In Table 11, we split the MEF sample into firms depending on their HR department structure. 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.

**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 (Figure 12 for AKM effects and Appendix Figure A.9 for raw wages) does not suggest a role for resolution as the ESWE remains flat in plausibly less tradable industries, too. However, as we discuss next, a standard monopsony story might rationalize wage compression through any of the mechanisms discussed here, but would not necessarily imply the decoupling from employment as prescribed by the ESWE regularity.

### 5.5 A note on wage policies and the ESWE within monopsony

We close the discussion on firm-wide pay policies—whether reflecting CBAs or internal pay policies—by reiterating a claim discussed in the introduction and depicted in Figure 2: even exogenous wages need not lead to a zero ESWE. The puzzle 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 employment remains on the establishment-specific labor supply curves. 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.

## 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.

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

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. Intuitively, by zooming into employer-specific supply and demand, our starting point is akin to the monopsony setup. But we intentionally accommodate disequilibria. Put differently: we will more generally consider outcomes within the broader feasible set of labor demand and supply curves and a wage that may *or may not* equilibrate the two.

**A minimal model.** Denoting the employer by $j$ (rather than "firm," to avoid confusion) 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 the minimum of labor demand $n^D$ and supply $n^S$ at the given wage $w_j$:[21]

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

Our design analyzes such employer-level employment and wages in cross-sectional observational data—depicted as black dots in Figures 1 and 2. Absent assumptions on market clearing, Expression 3 makes few predictions for their constellation, obviously preventing identification and clear-cut interpretation

**Reading the MEF data as equilibria.** The assumption of monopsony essentially firms' flexibly setting wage to equilibrate supply and demand (subject to a markdown), similarly for the (employer-specific) "competitive" equilibrium (see Footnote 21). In either "market-clearing "case, the wage-employment data points would reflect rich combinations of labor demand and supply shifters. The "normal" picture painted by the ESWE is that (at least on average), wages and employment trace out an upward-sloping relationship, one that we documented in our data and is a canonical regularity across studies and settings (see our meta-analysis in Section 2). This pattern is of course consistent with—but does not uniquely identify—a scenario in which, on net, labor demand rather than supply shifters dominate the variation (a strong further assumption), so that the wage-employment data points would trace out employers' labor supply curves. This interpre-

[21] We can sketch a simple model by specifying the following functions for labor supply and demand: $\ln n_j^D(w) = a_j^D - b_j^D \left(\ln w + x_j^D\right)$ and $\ln n_j^S(w) = a_j^S + b_j^S \left(\ln w + x_j^S\right)$, where $a$ capture shifters of the curve, $b$ capture the slopes (in absolute magnitude), and $x$ capture "wedges" acting on the wage. For effect, all those parameters are permitted to be $j$-specific. We can make point predictions by assuming an employer-specific equilibrium (i.e., an equality in Expression (3)): $\ln w^* = \frac{a_j^S - a_j^D + b_j^S x_j^S - b_j^D x_j^D}{b_j^S + b_j^D}$, with $n_j^D(w^*) = n_j^S(w^*)$ and 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. Clearly, if we had at our disposal a clean shifter in either the labor supply or labor demand curve, one could identify the respective counterparty's curve's elasticity (by measuring wage and employment responses, and then taking the ratio in the original instrumental-variables logic). The cross-sectional nature of the ESWE design amounts to an identification assumption whereby the on-net positive relationship must hence denote that between-employer employment variation is dominated by labor demand factors, such as in $a_j^D$, in a matter that is sufficiently orthogonal to the other sources of potential variation, and then traces out an average elasticity. But of course, it is possible to devise a perfectly offsetting variation in other parameters that would leave the cross-sectional relationship flat for some set of firms such as multi-establishment ones. For instance, if larger employment solely reflects shifts in the labor supply curve, and if labor demand is very elastic, this pattern could rationalize our findings—as long as this heterogeneity differs systematically within multi- compared to single-establishment firms; 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). The model becomes even less predictive if one permits departures from the in this footnote assumed equality specification of the weak inequality in Expression (3), as may emerge with rationing—indeed our preferred interpretation.

tation is popular, in particular in the literature on monopsony, given its foundation in a finitely elastic employer-specific labor supply curve (see our introduction for the literature and this view).

**Reading the MEF data as disequilibria.** While we document the ESWE on average, it breaks down across employers (establishments) within the same MEF. We attempt a parsimonious but powerful rationalization *within* the framework above, basing it on *above-market-clearing wage premia and rationing*: namely, MEF pay above-market-clearing wages, so that employment is solely labor demand-determined, with labor supply *rationed*. Hence, the labor supply curve no longer plays an active role. This simple logic is depicted in Figure 2, where MEF establishments' wages are (exogenously) high so that labor demand exceeds supply. If high productivity firms impose pay premia across their establishments, then a zero ESWE can emerge even in a latently monopsonistic setup characterized by finitely elastic labor supply.[22] 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." We also note (with further references in Footnote 5) that this notion of disequilibrium and rationing is employer-specific and hence closer to the notion of queuing for "good jobs"—rather than referring to unemployment or market-level distortions. Rationed labor supply here means workers employed in other firms (MEFs or SEFs) that would strictly prefer to work in a specific high-wage MEF establishment.

**Empirical predictions and test.** Next, we support this view of the labor market. First, we document true pay premia—defined as wage levels above the market-clearing level in particular for MEFs. Second, we show that even among MEFs, the ESWE reemerges for MEFs that do not appear to pay a premium above what the SEF-based wage function would predict.

**An obvious smoking gun: MEFs are high-wage employers.** We start by reiterating that MEFs are, on average, high wage firms. For instance, our descriptive analysis of the distributions of wages across MEFs and SEFs (Figure 5) already foreshadowed that MEF establishments are not only larger but also pay higher wages. Approximating the idea of a pay premium, the scatter plots tracing out the ESWE by group (Figure 7) showed that the MEF wage and AKM effect levels are higher for any establishment size, echoing the vertical hierarchy in the case studies of individual largest MEFs on top of the SEF reference (Figure 9). However, these "vertical premia" may be insufficient as they ignore market levels and other firm characteristics that may shape labor supply curves. At the same time, we know of no existing study has attempted, let alone delivered, a method to construct this notion of wage premia or rationed labor supply. Our check hence remains tentative.[23]

[22] Figure 2 also shows the counterfactual negative relationship that would emerge without the positive correlation between wages and productivity for premium-paying firms.

[23] We also note that despite the colloquial use of between-firm wage dispersion to colloquially imply "wage premia," these pay differentials do not reflect or generate disequilibria: with finitely elastic employer-specific labor supply, size and wage differentials go hand in hand; the premium we are after is one that entails rationed labor supply.

### 6.2 Constructing pay premia

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. We proxy for this concept by constructing a flexible reduced-form "wage function." To recap: economically, the wage function proxies for the inverse labor supply curve in Figures 1 and 2, with employment to be read as a level, or share if in relative terms, of local labor market employment, thanks to our fixed effect specifications and the lasso implementation below.

**Constructing the labor supply-consistent wage level: the lasso wage function fitted among SEFs.** We make progress by constructing a reduced-form wage function *conditional* on the establishment's employment/local labor market employment share that is meant to proxy for the labor supply curve in a flexible way *in a given labor market*. We do so by fitting a flexible Lasso model *among SEFs* (assumed to be on their labor supply curve) of the log wage (or AKM effect) on establishment characteristics including local labor market—and importantly establishment size.

Specifically, we estimate a lasso-penalized linear regression of the outcome variable (AKM establishment effects) on the covariate set. The covariates include 2-digit sector FE, labor market FE, log firm size, log firm size squared, interaction of log firm size with broad sector FE, and interaction of log firm size squared with broad sector FE. The penalty parameter $\lambda$ is selected by 10-fold cross-validation. The lasso model takes a 75% random sample among SEF units. The lasso-selected coefficients are then used to predict the outcome variable for SEF and MEF units.

**Constructing the wage premium conditional on size.** Second, for each MEF establishment, the premium is then simply its actual wage minus its thus-predicted counterpart. Economically, this premium corresponds to the vertical gap between the actual wage and the minimum (labor-supply-required) wage at the given employment level in Figures 1 and 2.

**Results.** We present results in Figure 10, for AKM establishment fixed effects, and find similar results for raw wages (Appendix Figure A.8).

Figure 10 Panel (a) shows actual and predicted values for the left-out 25% SEF sample along log establishment size. The model performs nearly perfectly (so that the reader may not be able to distinguish the bins for predicted and actual wage levels).

Panel (b) shows the analog for the MEF establishments: it plots actual AKM effects and the predicted counterparts (based on the SEF wage function). A striking result—one that rhymes with the raw wage level Figure 7—emerges: MEFs pay higher wages *no matter the establishment size* and even flexibly controlling for characteristics of the establishment and labor market. This gap is largest for smaller establishments—consistent with an idea that MEFs may compress wages across establishments.

Finally, Panel (d) plots the establishment-level difference between actual and predicted wages, separately for MEF and SEF establishments—the pay premium—which we intend to flexibly proxy for the vertical gap between the actual wage and the minimum wage level required to attract the current employment level in Figures 1 and 2. Indeed, there are large wage premia even in large establishments compared to their labor market SEF peers. Evidently, MEFs overpay across the board—even in their largest establishments.

Panels (b) and (c) show mean gaps in firms' wages but mask heterogeneity. We therefore also provide a tentative check on the fraction of MEF establishments that pay above or below the predicted wage. To answer this question, Panel (d) plots, separately for MEF and SEF establishments, the share of establishments in a given size bin with actual AKM effects below their idiosyncratic wage prediction. The figure makes clear that there is substantial dispersion and overlap: only about 25% of MEF establishments pay *below* the wage that a SEF would be predicted to pay for that establishment type and labor market, which rises to about 40% towards the top tier of MEF establishments in terms of size. (As expected, the gradient for SEFs is stable at about 50%.) Hence, MEF establishments are generally premium-payers even conditional on size and local labor market characteristics. We caveat that prediction errors of course inflate this share.

**Interim conclusions.** With this flexible empirical analog of Figures 1 and 2 in hand, we show that the narrative described above provide a coherent account of the data. To take stock, we have documented that MEF establishments pay substantial wage premia *conditional on size and market shares*—constructed as above and hence distinct from the (size-independent) AKM effects also sometimes referred to as "premia." Next, we study this mechanism in action in rationalizing the zero ESWE.

**Implication in the form of a test: does the ESWE reemerge in MEFs that do not pay a premium?** MEFs tend to pay wage premia above what is required to satisfy labor supply at their establishment employment levels. As a result, MEF employment is plausibly detached from labor supply—lying below it and hence generating rationed labor supply and queuing. This *rationed firm-specific labor supply* should generate a buffer for MEF establishments to grow larger at constant wages. The logic of the model, illustrated in Figure 2, motivates an associated test: for firms that do not pay a premium, the labor supply curve should still guide the wage boosts required to grow employment. Hence, for such a set of MEFs, their employment-wage relationship would trace out a positive ESWE.

**Implementing the test and findings.** We implement this test by zooming into low-premium and low-wage MEFs and checking whether the ESWE reemerges among low-premium firms. These results are contained in Figures 13-15. The analysis classifies each entire MEF by its establishment premia, and then splits them into 20 bins. Figure 13 does so based on the MEF-level average

of establishment premia; Figure 14 does so with a randomly drawn establishment. Each figure does so for premia defined with AKM effects (left panels) and raw wages (right panels), and then estimates the ESWE (using wage-based ESWE for wage-based premia, and AKM-based ESWE for AKM-based premia). It does so for three definitions of the premia (i.e., ranks establishments within a cell): in the full population, within sectors, and within sector-local labor market region cells (i.e., essentially controlling for these cells). Moreover, the ESWE regressions are then always run in the specification that includes sector-local labor market region effects—and, of course, separately without and with MEF firm fixed effects. Finally, as a simple complement not directly mapping into our conceptual framework, Figure 15 replicates the analysis by simply using the average establishment AKM effect rather than the premium measure.

Broadly across specifications, we confirm the key prediction developed above: *for the lowest-premium firms, the ESWE reemerges within MEFs*—that is, in the specification with firm fixed effects, for which the ESWE had completely disappeared on average. Overall, 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 just is not relevant to firms operating off it. We close our empirical with an interpretation below.

**A final note on interpretation of the residual ESWE.** Finally, we note that this additional research design does not speak to the *economic* mechanisms behind the reemergence of the ESWE in the low-premium MEF establishments. For instance, they may act locally monopsonistically establishment by establishment, actively setting wages to maximize profits with markdowns, or these firms may passively accept wages and actively adjust inputs until the individual establishment's marginal labor product equals the parametric wage, without actual markdowns (see Faia, Lochner, and Schoefer, 2026, for an attempt to directly study markdowns in response to exogenous wages). As noted above, the same ESWE would be traced out (except that monopsonists may end up distorting employment levels downward, along the labor supply curve). Our test leaves this question open, and we raise additional open questions in the conclusion.

# 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. 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 firm-specific labor supply curve view of monopsony. Instead, our findings point towards rationed labor supply, 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.

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 variation in labor demand or supply to probe how MEFs respond to those shocks, establishment-specific or common (as in Hjort, Li, and Sarsons, 2024, 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-matched 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 zooming into the significant share of 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
(Preferred Estimates, for Details on the Studies see Appendix Table A1)

| Study | Country | Elasticity | SE |
|---|---|---|---|
| *(1) Without any controls for worker heterogeneity (mean elasticity: 0.060)* | | | |
| 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. |
| *(2) With controls for observable worker heterogeneity (mean elasticity: 0.037)* | | | |
| 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 |
| 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) Worker Fixed Effects (mean elasticity: 0.015)* | | | |
| 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 |
| 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 |

Standard errors are bounded for averaged estimates. See the text and Appendix Table A1 for additional details.

† Average over estimates for different countries. Only non-Scandinavian estimates in (Lallemand, Plasman, and Rycx, 2007) reported.

* Average 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 est. 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 trade | 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 |
| Accomodation | 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. size | .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 size | | | | | | | | | | .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 | 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. size | .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 size | | | | | | | | | | .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 | -.066 | -.066 | -.066 | -.078 | -.078 | -.078 | .02 | .02 | .02 | .02 | .02 | .02 | .02 | .02 |
| 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 on establishment size (Est. size) and firm size (Firm size).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) and (13) 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. size | 0.0607*** | 0.0547*** | 0.0628*** | 0.0569*** | 0.0330*** | 0.0300*** | -0.0056*** | -0.0041*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.002) | (0.001) |
| Obs. | 7,797,739 | 7,797,739 | 5,595,534 | 5,595,534 | 2,195,236 | 2,195,236 | 2,195,236 | 2,195,236 |
| $R^2$ | 0.604 | 0.645 | 0.599 | 0.640 | 0.635 | 0.673 | 0.705 | 0.731 |
| Mean | 4.512 | 4.512 | 4.472 | 4.472 | 4.616 | 4.616 | 4.616 | 4.616 |
| *Worker-level controls* | | | | | | | | |
| Mincer vars | Y | Y | Y | Y | Y | Y | Y | Y |
| 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 size. 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 with 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. 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 clustered at the firm level in parentheses. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

**Table 5:** Robustness to 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. size | 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 |
| Outcome mean | 4.59 | 4.678 | 4.666 | 4.634 | 4.73 | 4.65 | 4.66 |
| Panel B: AKM FE | | | | | | | |
| Est. Size | -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 |
| Outcome mean | -.01 | .03 | .02 | -.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 on establishment size 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 A6 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 6:** Robustness to 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. size | -.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 size | | | .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 |
| Outcome mean | 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. size | -.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 size | | | .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 |
| Outcome mean | .03 | .03 | .03 | .03 | .03 | .03 | .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 on establishment size and firm size. 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 7:** The Role of 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. Size | 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 |
| Outcome | 4.534 | 4.68 | 4.572 | 4.77 | 4.572 | 4.77 |
| Panel B: AKM FE | | | | | | |
| Est. Size | 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 |
| Outcome | -.076 | .03 | -.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 on establishment size 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 8:** 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. size | 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 |
| Outcome mean | 4.982 | 5.022 | 2.964 | 3.148 | 3.432 | 4.1 | 1.374 | 1.62 |
| 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 size. 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 9:** 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. size | -.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 | .246 | .208 | .454 | .26 | .242 | .502 | .26 | .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 size. Concretely, we sum all new hires, separators, 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.

**Table 10:** Effects on Other Outcomes: Worker AKM FE, Tenure, Hires from Non-Employment

| | SEF | | | MEF | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | AKM | Tenure | Non-emp | AKM | Tenure | Non-emp | AKM | Tenure | Non-emp |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Est. size | .018*** | .158*** | .018*** | .004*** | .191*** | .032*** | -.006*** | .180*** | .030*** |
| | (0.000) | (0.001) | (0.000) | (0.001) | (0.002) | (0.001) | (0.001) | (0.003) | (0.001) |
| Obs. | 678,023 | 678,023 | 539,777 | 100,420 | 100,420 | 87,724 | 100,420 | 100,420 | 82,654 |
| $R^2$ | 0.129 | 0.167 | 0.059 | 0.265 | 0.259 | 0.132 | 0.536 | 0.709 | 0.438 |
| Mean | 4.456 | 7.356 | .348 | 4.508 | 7.208 | .298 | 4.508 | 7.208 | .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, 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 11:** 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. size | -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 | 4.76 | 4.774 | 4.612 | 4.714 | 4.796 | 4.522 | 4.588 | 4.772 | 4.588 |
| Panel B: AKM | | | | | | | | | |
| Est. size | -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 | .052 | .08 | -.004 | .034 | .078 | -.042 | -.016 | .06 | -.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 on establishment size 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 12:** 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. size | -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 |
| Outcome mean | 4.596 | 4.684 | 4.748 | 4.81 | 4.84 | 4.852 |
| Panel B: AKM | | | | | | |
| Est. size | 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 |
| Outcome mean | -.026 | .03 | .062 | .052 | .06 | .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 on establishment size 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 13:** 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. size | -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 |
| Outcome | 4.616 | 4.714 | 4.616 | 4.722 | 4.704 | 4.738 |
| Panel B: AKM | | | | | | |
| Est. size | 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 |
| Outcome | -.01 | .05 | -.006 | .05 | .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 on establishment size 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.

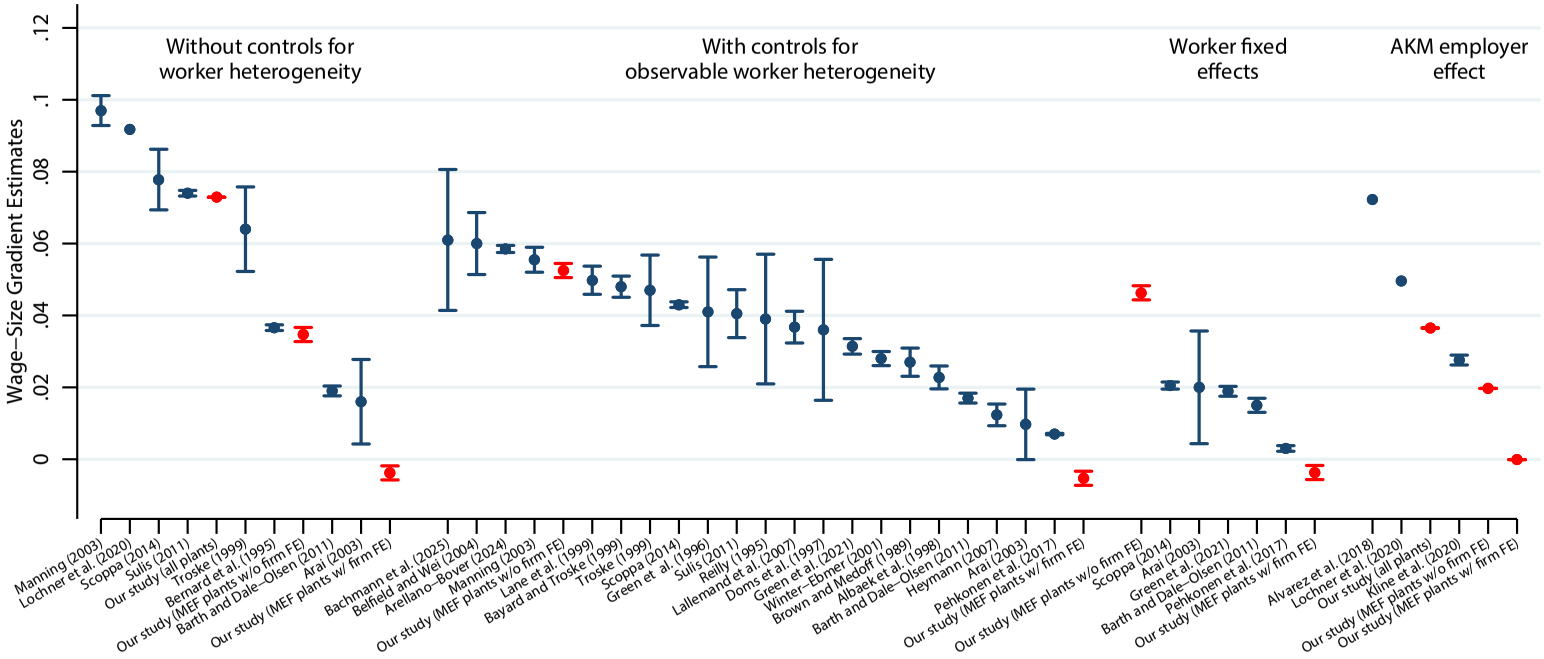
**Table 14:** Effects by Job-to-Job Transitions within MEFs

| | No J2J | J2J | Av. Dist. >100km | Max. Dist. >100km |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Panel A: Log mean wage | | | | |
| Est. size | -0.008*** | 0.000 | -0.012*** | -0.002 |
| | (0.002) | (0.001) | (0.003) | (0.002) |
| Observations | 54,269 | 54,239 | 10,249 | 29,338 |
| $R^2$ | 0.862 | 0.848 | 0.870 | 0.834 |
| Outcome mean | 4.64 | 4.692 | 4.822 | 4.736 |
| Panel B: AKM | | | | |
| Est. size | 0.001 | -0.001** | -0.002 | -0.002*** |
| | (0.001) | (0.000) | (0.001) | (0.001) |
| Observations | 54,269 | 54,239 | 10,249 | 29,338 |
| $R^2$ | 0.805 | 0.708 | 0.763 | 0.610 |
| Outcome mean | -.006 | .044 | .064 | .068 |
| SIC × LMR | Y | Y | Y | Y |
| Firm FE | Y | Y | Y | Y |

*Note:* The table shows regression results of log establishment wages on establishment size 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. No J2J indicates that the firm is not observed with an inflow from another job in the same firm. Av. Dist. refers to the average distance of job-to-job flows. Max. Dist. refers to the maximum observed distance between the jobs. Robust standard errors in parentheses. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

## Figures

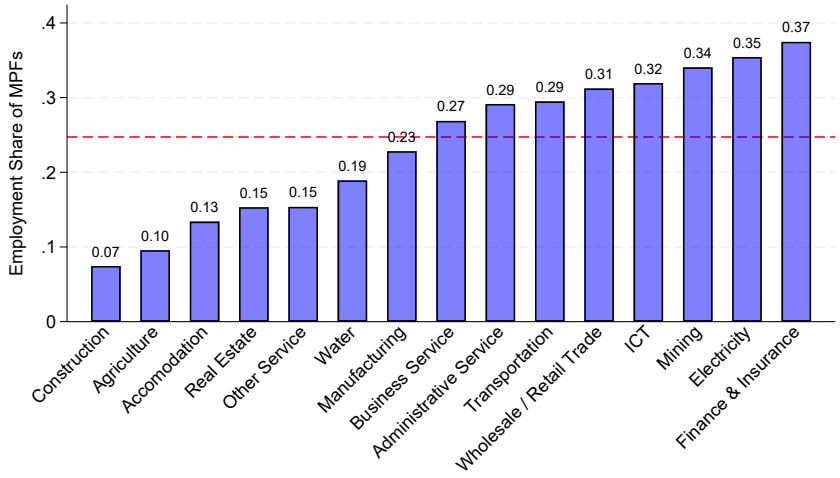
**Figure 3:** Meta-Analysis of Estimated Size-Wage Elasticities from the Literature



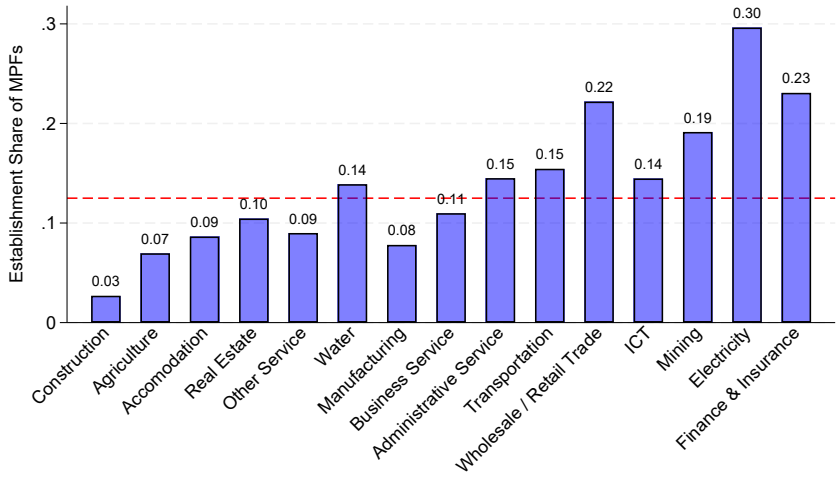

*Note:* The figure presents the results from Table 1 and incorporates our own main estimates from Table 3(establishment level) and Table 4 (worker level) in red. Studies are ordered by coefficient size within each of the four categories in Table 1. The first block includes studies that do not control for worker heterogeneity, followed by those controlling for observables, then those with worker fixed effects, 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 9 in Section 2.

**Figure 4:** Employment and Establishment Share of MEFs by Industry

**(a)** MEF Employment Share



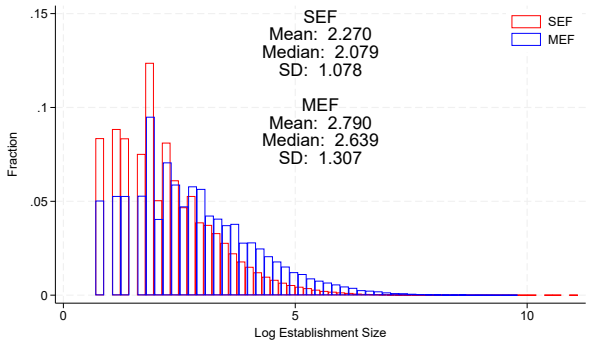

**(b)** MEF Establishment Share



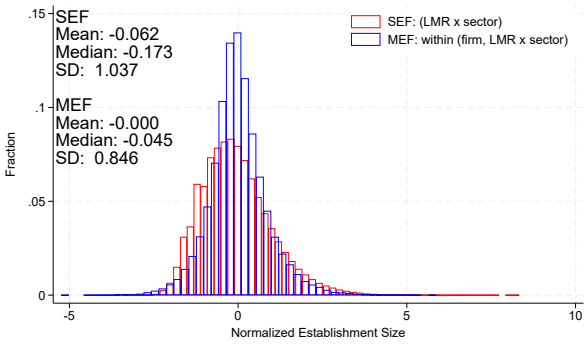

*Note:* The figure reports the share of multi-establishment firms (MEF) over industries for the year 2019. Excluded sectors: public & defense, education, health, art & entertainment. Sector classification refers to WZ08 classification of the German Statistical Office. Panel (a) shows the employment share. 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 5:** Size, Wage, and AKM Effect Distribution across Establishments For Single- and Multi-Establishment Firms

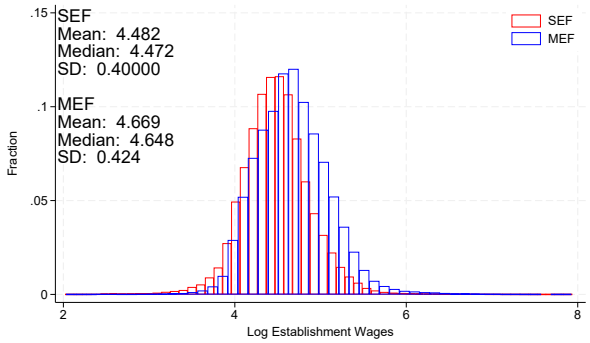
**(a)** Raw Log Size Distribution



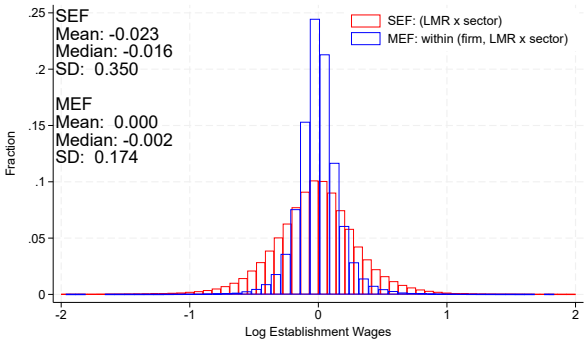

**(b)** Normalized Log Size Distribution



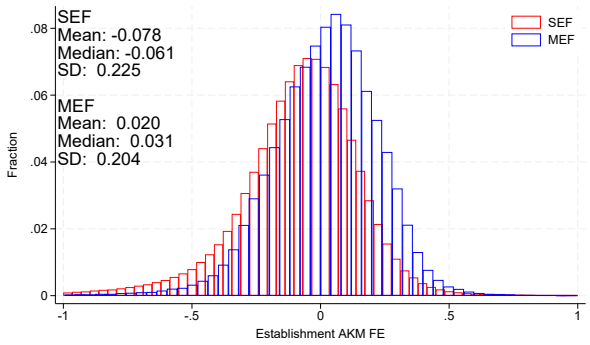

**(c)** Raw Wage Distribution



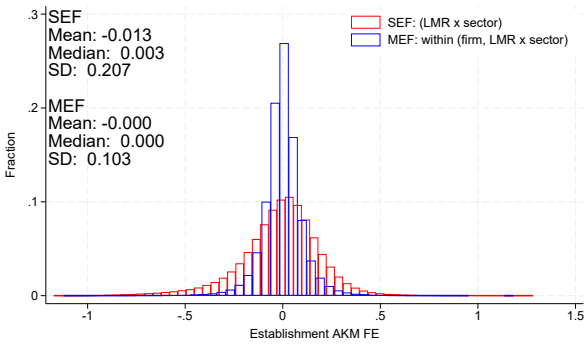

**(d)** Normalized Wage Distribution




**(e)** Raw AKM Distribution

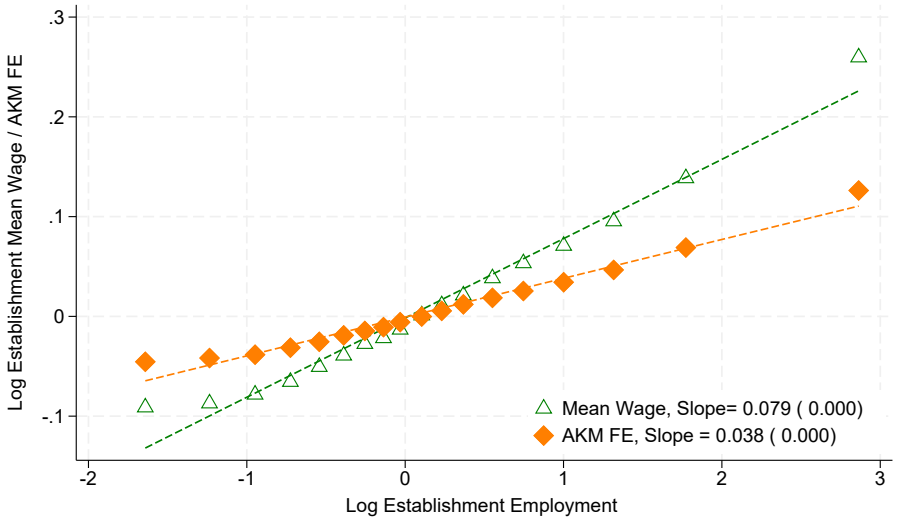



**(f)** Normalized AKM Distribution




*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) shows 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.

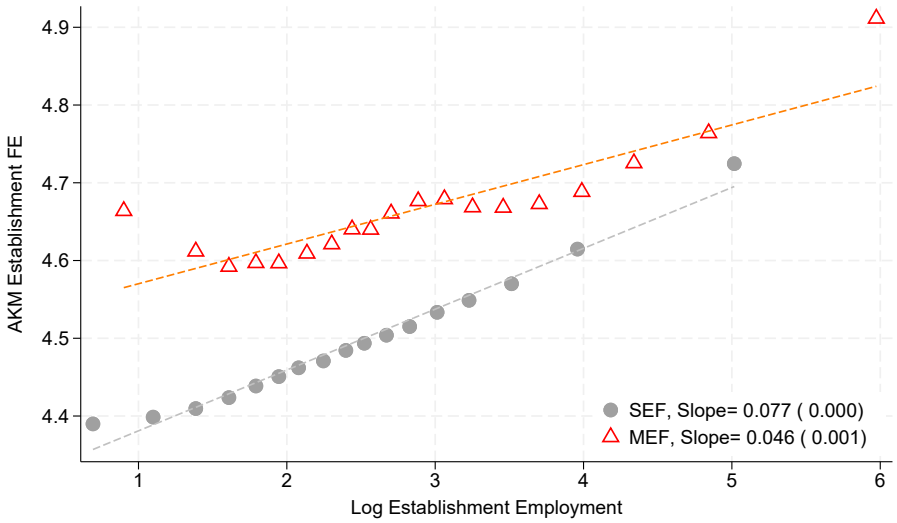
**Figure 6:** The Standard Employer Size Wage Effect in Germany: Across all Establishments



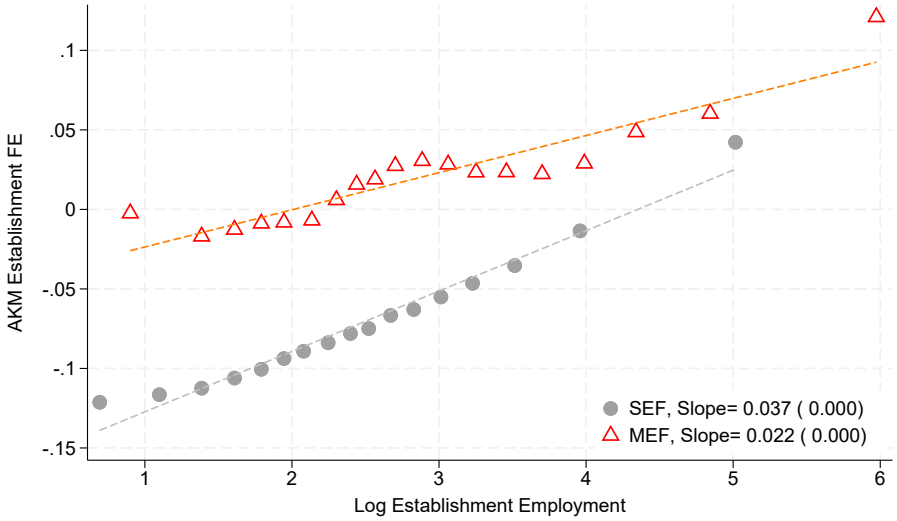

*Notes:* The figure shows binned scatter plots of log establishment size and log real average wages (orange dots) AKM FE (blue dots) for the year 2019. The dashed lines represent linear fits based on a univarite linear OLS model. Point estimates are shown in the top left corner with robust standard errors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

**Figure 7:** Across Firms, by SEF vs. MEF Status: The Employer Size Wage Effect

**(a)** Raw Wages



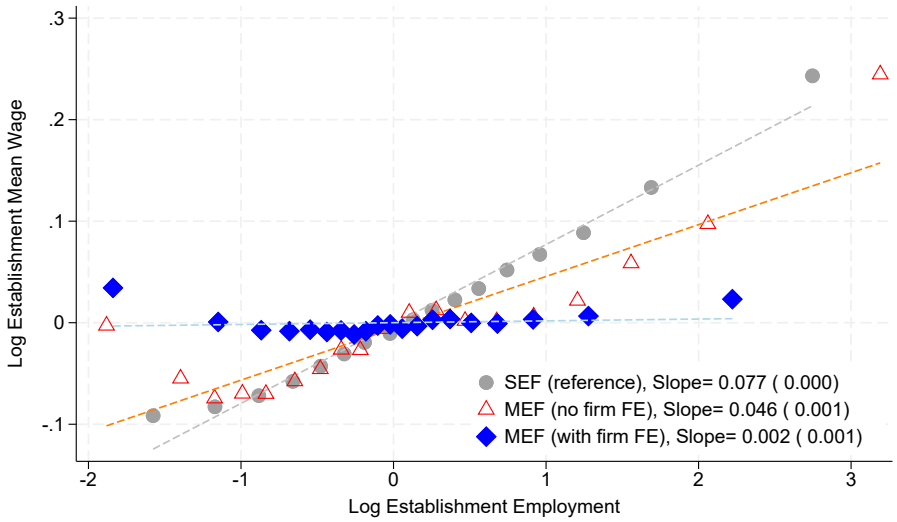

**(b)** AKM Establishment Effects



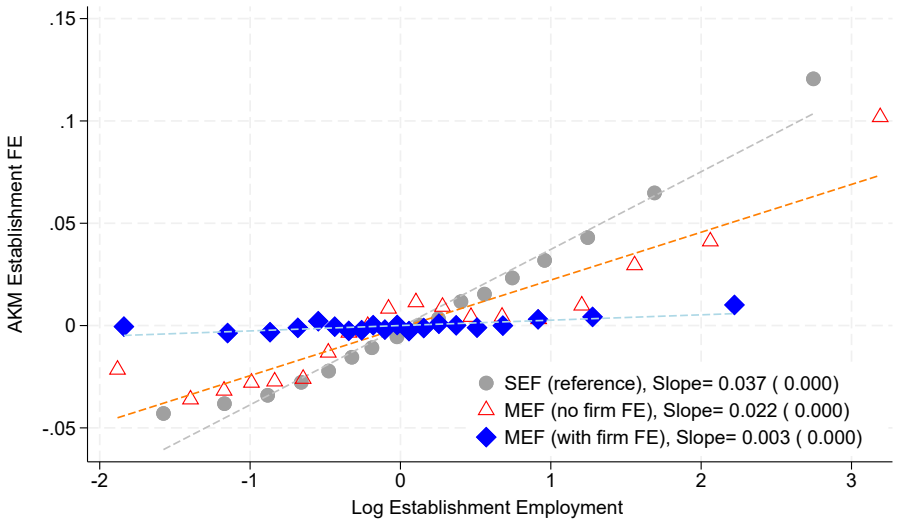

*Notes:* The figure shows binned scatter plots of log establishment size and log real average wages (Panel (a)) and AKM establishment effects (Panel (b)) for the year 2019 differentiating by single-establishment firms (SEF) and multi-establishment firms (MEF) without firm fixed effects. The dashed lines represent linear fits based on a univarite 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 8:** Within-Firm vs. Across Firms, by SEF vs. MEF Status: The Employer Size Wage Effect

**(a)** Raw Wages



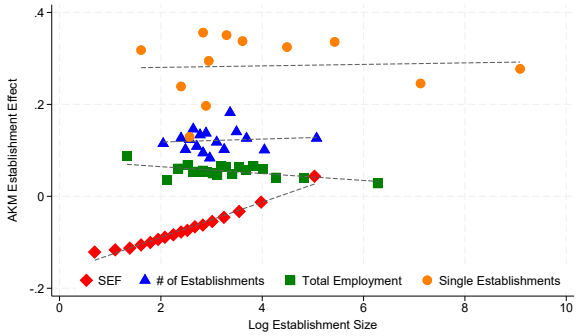

**(b)** AKM Establishment Effects



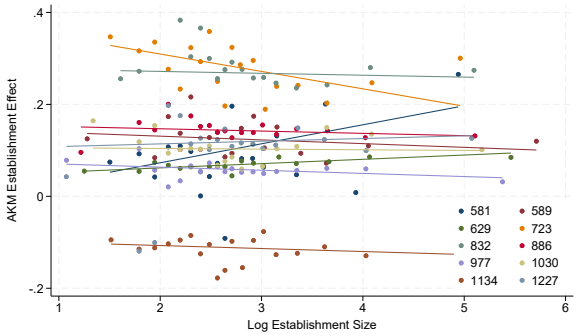

*Notes:* The figure shows binned scatter plots of log establishment size and log real average wages (Panel (a)) and AKM establishment effects (Panel (b)) for the year 2019 differentiating by single-establishment firms (SEF) and multi-establishment firms (MEF) with and without firm fixed effects. The dashed lines represent linear fits based on a univarite 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. Each variable is normalized by a constant (and firm fixed effects) for ease of representation.

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

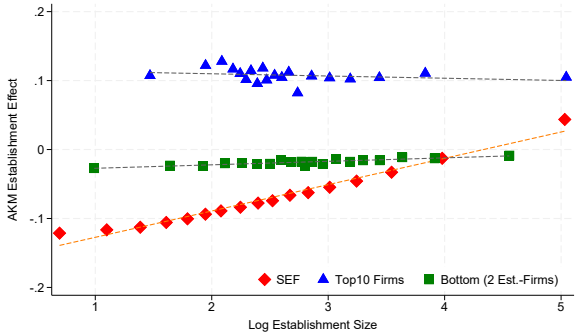
**(a)** Largest Firms



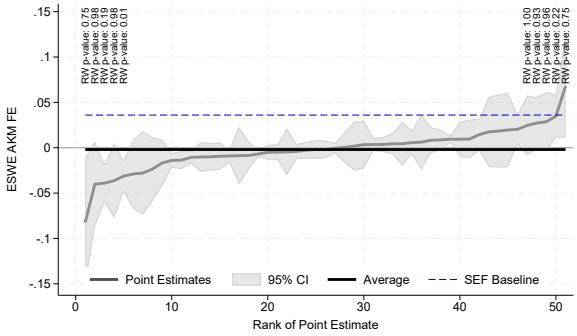

**(b)** Top10 Firms by # of Establishments




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

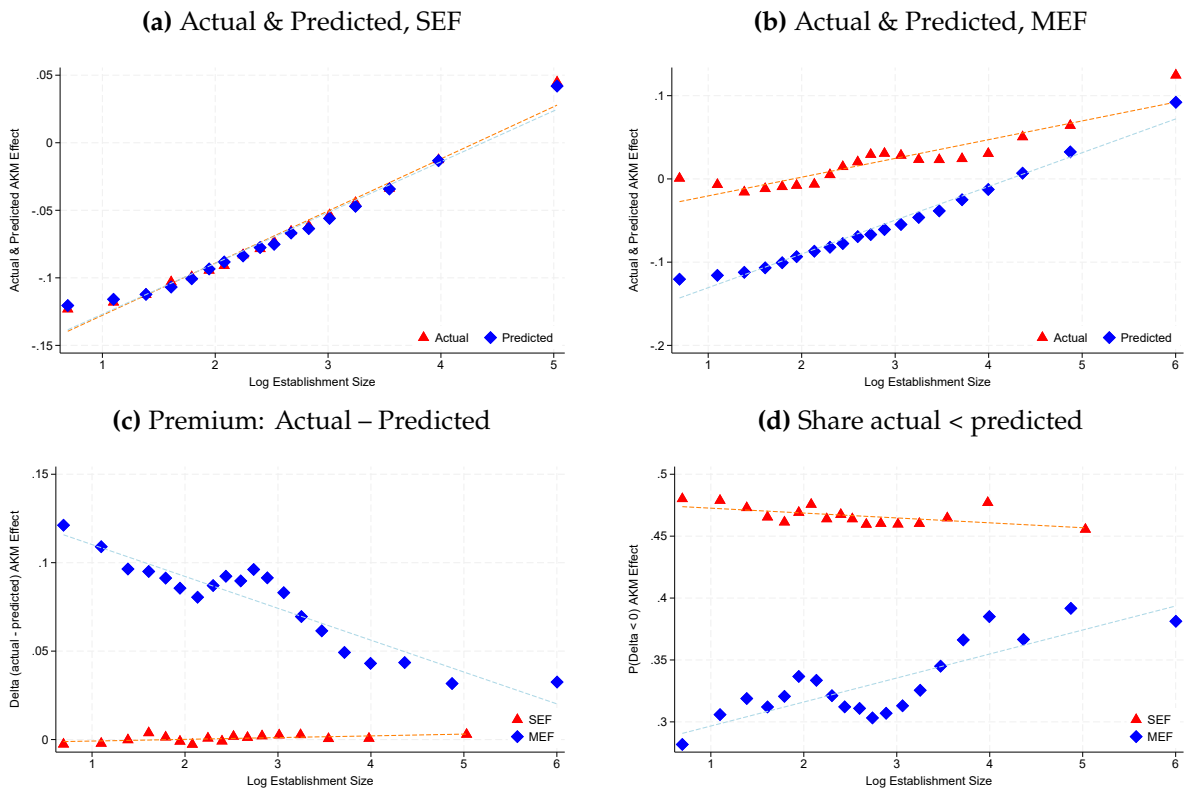



**(d)** ESWE Slope Estimates (AKM) in Firm with at least 100 Establishments, Ranked by Point Estimate



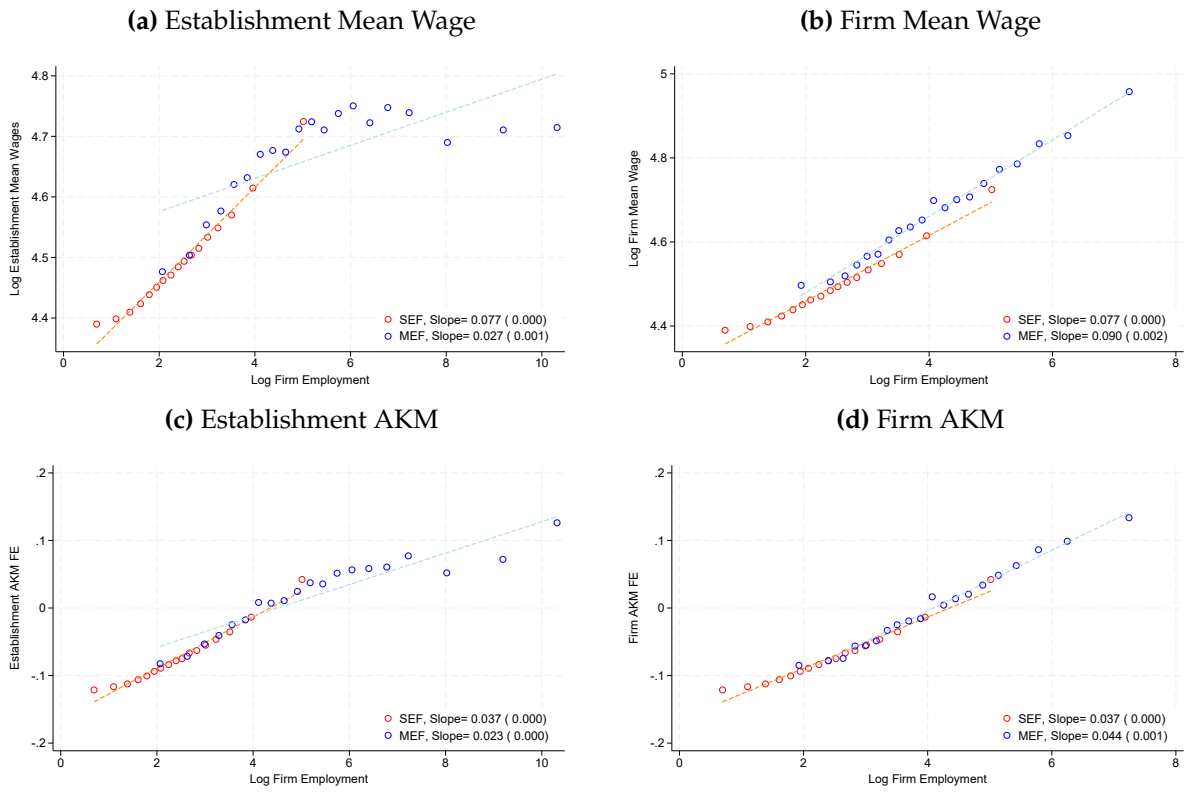

*Notes:* The figure shows binned scatter plots of log establishment size and AKM establishment effects for the year 2019 for selected large firms, i.e., blue, green and orange dots refer to establishments within one selected firm. Panel (a) defines large by the number of establishments, sum of size employment, and by the 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 average AKM establishment effect is added for illustration.) Panel (d) zooms into the (51) MEFs with at least 100 establishments 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.6 replicates this figure for raw wages instead of establishment AKM fixed effects.

**Figure 10:** Establishment AKM – Lasso Model Specification



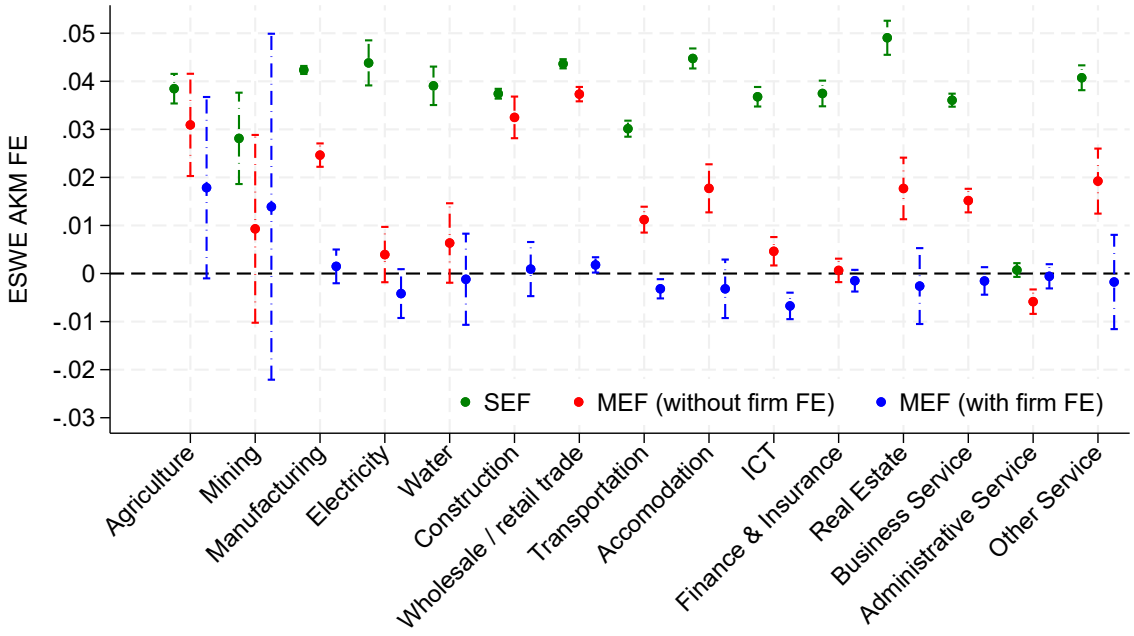

*Note:* The figure reports actual and predicted values for single-establishment firms (SEF) and multi-establishment firms (MEF). We estimate a lasso-penalized linear regression of the outcome variable (AKM establishment effects) on the covariate set. The covariates include 2-digit sector FE, labor market FE, log firm size, log firm size squared, interaction of log firm size with broad sector FE, and interaction of log firm size squared with broad sector FE. The penalty parameter $\lambda$ is selected by 10-fold cross-validation. The lasso model takes a 75% random sample among SEF units. Selected coefficients are then used to predict the outcome variable for SEF and MEF units. Panel (a) shows actual and predicted values for the left-out 25% SEF sample along log establishment size. Panel (b) show actual and predicted values for the MEF sample (based on SEF model specification) along log establishment size. Panel (c) shows differences between actual and predicted outcomes along log establishment size for both SEF and MEF units. Panel (d) shows the share of establishments with actual outcomes being below predicted outcomes along log establishment size for both SEF and MEF units. Dashed lines represent linear fits. Appendix Figure A.8 replicates this figure for raw wages rather than AKM establishment fixed effects.

**Figure 11:** The ESWE with Firm vs. Establishment Size



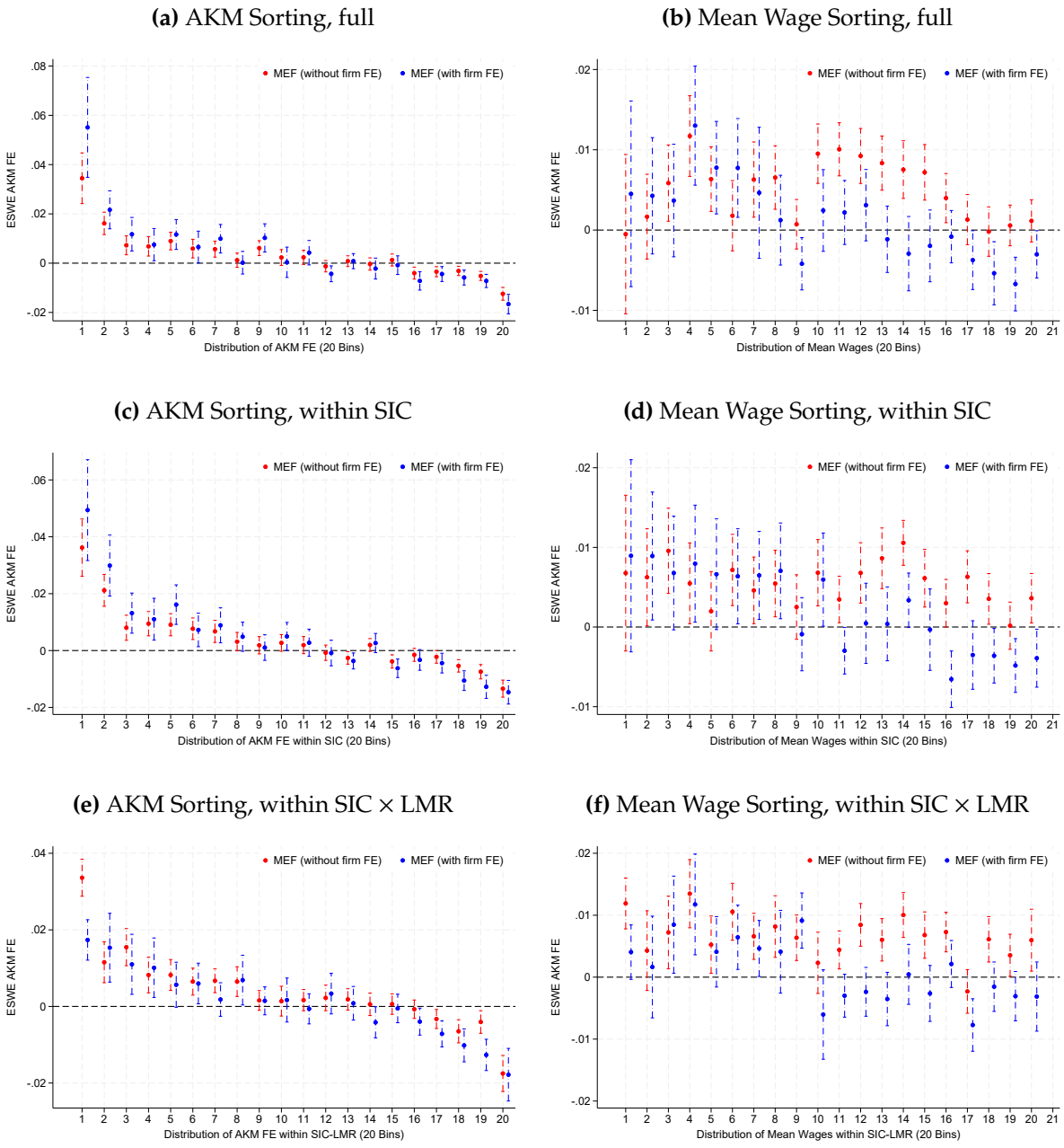

*Note:* The figure shows binned scatter plots of log firm size and establishment-level outcome variable (Panels a and c) and firm-level outcome variables (Panels b and d) for the year 2019. The dashed lines represent linear fits based on a univarite linear OLS model. Point estimates are shown in the lower right corner with robust standard errors in parentheses. Panel (a) uses log establishment mean wages. Panel (b) uses log firm mean wages. Panel (c) uses establishment AKM FE. Panel (d) uses firm AKM FE. Firm-level wages and AKM effects are calculated as employment-weighted averages of establishment wage and AKM information.

**Figure 12:** The Standard Employer Size Wage Effect (AKM Effects) by Broad Industries



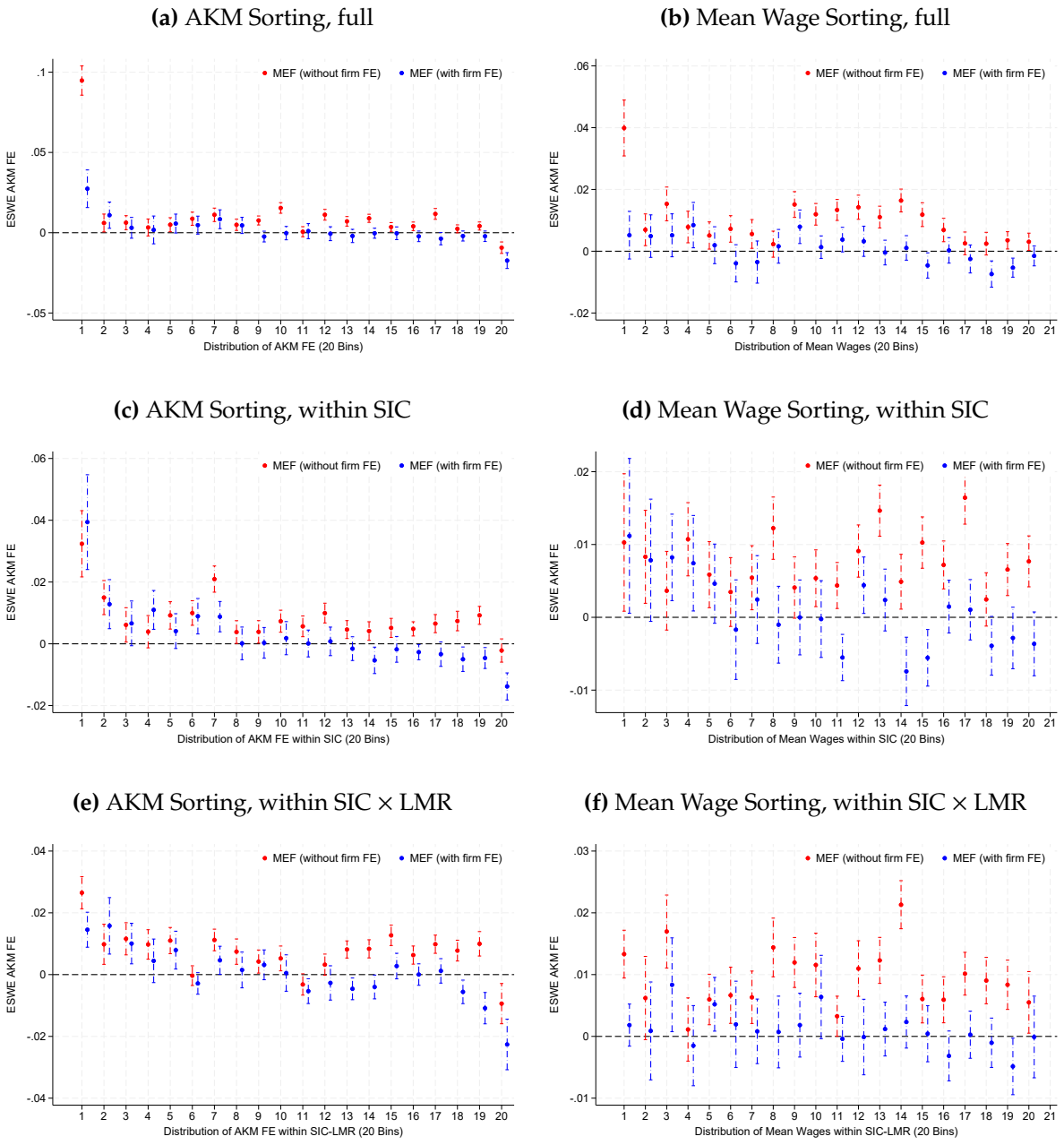

*Notes:* The figure shows regression results (coefficient estimates with 95% CI) of AKM establishment FE on establishment size by broad industry classifications (WZ08). Each dot represents a single regression. The green dots refer to single-establishment firms (SEF). The red dots refer to multi-establishment 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. Appendix Figure A.9 replicates this analysis for log wages as the outcome variable instead of the establishment AKM fixed effect.

**Figure 13:** ESWE(AKM FE) by AKM/Wage Distribution based on Average Establishment



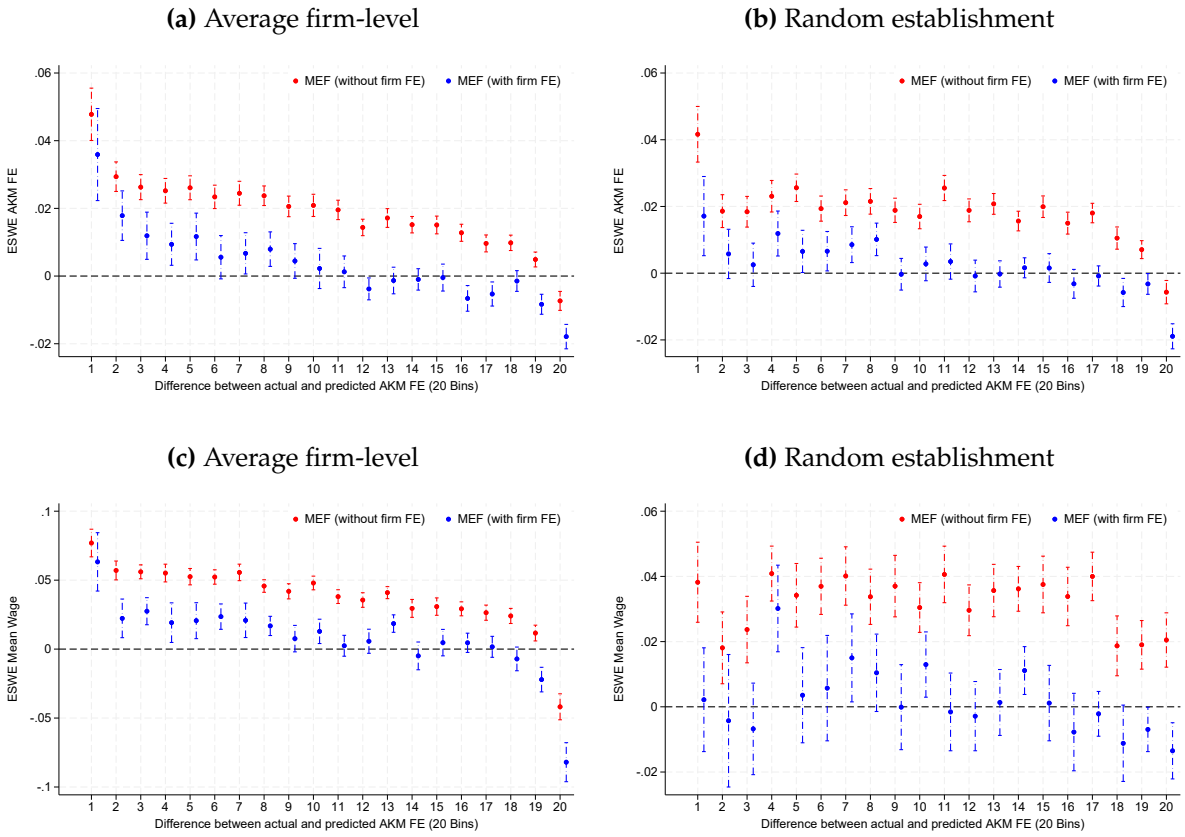

*Notes:* The figure shows regression results (coefficient estimates with 95% CI) of AKM establishment FE on establishment size within 20 bins along the AKM distribution in Panels (a), (c) and (e) as well as mean wages in Panels (b), (d) and (f). Classification into the 20 bins is based on the average AKM/wage value of all establishments within firms (unweighted mean). Each dot represents a single regression controlling for 2-digit industry times labor market region FEs. Blue dots in addition control for firm FE.

**Figure 14:** ESWE (AKM FE) by AKM/Wage Distribution based on Randomly Drawn Establishment




*Notes:* The figure shows regression results (coefficient estimates with 95% CI) of AKM establishment FE on establishment size within 20 bins along the AKM distribution in Panels (a), (c) and (e) as well as mean wages in Panels (b), (d) and (f). Classification into the 20 bins is based on the AKM/wage value of a randomly drawn establishment within firms. Each dot represents a single regression controlling for 2-digit industry times labor market region FEs. Blue dots in addition control for firm FE.

**Figure 15:** ESWE by AKM Premium




*Notes:* The figure shows regression results (coefficient estimates with 95% CI) of AKM establishment FE and log mean wages on establishment size within 20 bins along the AKM premium defined as the difference between the predicted AKM effect minus the actual AKM. Classification into the 20 bins is based on average premium estimates at the firm level in Panel (a) and (c). Panels (b) and (d) select a random establishment with each firm and assigned all establishments into the corresponding bin. Each dot represents a single regression controlling for 2-digit industry times labor market region FEs. Blue dots in addition control for firm FE.

# Online Appendix of:

# The Employer Size Wage Effect: Within and Across Firms

**André Diegmann, Steffen Müller, and Benjamin Schoefer**

# A Appendix Tables

**Table A1:** Additional Details: Meta-Analysis of Estimated Size-Wage Elasticities from the Literature

| 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 |
| *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 |

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| Study | Design Features | Elasticity |
|---|---|---|
| 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 | 0.025 |
| | Finnish manuf. workers, register data, 1985 | 0.020 |
| | Norwegian workers, survey data, 1989 | 0.025 |
| | Swedish workers, survey data, 1991 | 0.021 |
| Troske (1999) | US manufacturing workers (WECD) and establishments (LRD), 1990 cross section | 0.047 |
| Lane et al. (1999) | State of Maryland, male workers (CPS), 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 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 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 |

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| Study | Design Features | Elasticity |
|---|---|---|
| Winter-Ebmer (2001) | Austrian male workers, social security data, 1991 cross section, establishment size | 0.028 |
| Heyman (2007) | Swedish survey and register data 1987, 1991, 1995, cross sections, firm size | 0.012 |
| Barth and Dale-Olsen (2011) | Norwegian workers, register data, 1991 - 1997 cross sections, establishment size | 0.017 |
| Sulis (2011) | Italian male workers, social security data, 1985 - 1996 cross sections, firm size | 0.041 |
| Scoppa (2014) | Italian full-time workers, social security data, 1985-2002 cross sections, firm size | 0.043 |
| Pehkonen et al. (2017) | Finnish workers, register data, 2003-2010 cross sections, firm size | 0.007 |
| Green, Heywood, and Theodoropoulos (2021) | UK line workers (BHPS), 1991-2016 cross sections, establishment size | 0.031 |
| Arellano-Bover (2024) | Spanish, young, male, native workers, social sec. data, 2005-2015 cross sections, firm size | 0.059 |
| Bachmann et al. (2025) | West German workers, administrative survey data, 2006-2014, 3 cross sections, establishment size | 0.061 |
| *C: 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 |
| Green, Heywood, and Theodoropoulos (2021) | UK line workers (BHPS), | 0.019 |

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| Study | Design Features | Elasticity |
|---|---|---|
| | 1991-2016 cross sections, establishment size | |
| *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 A2:** Meta-regressions of ESWE estimates listed in Table 1

| | (1) | (2) | (3) |
|---|---|---|---|
| Reference Group: Scandinavia (10) | | | |
| Continental Europe (12) | 0.037*** | 0.032*** | 0.031*** |
| | (0.006) | (0.005) | (0.005) |
| Rest of World (15) | 0.034*** | 0.031*** | 0.035*** |
| | (0.006) | (0.006) | (0.008) |
| Reference Group: No worker heterogeneity controls (8) | | | |
| Observable heterogeneity (21) | | -0.023*** | -0.023*** |
| | | (0.008) | (0.008) |
| Worker fixed effects (5) | | -0.033** | -0.036** |
| | | (0.012) | (0.013) |
| AKM Employer effects (3) | | -0.018 | -0.022 |
| | | (0.015) | (0.016) |
| Reference Group: Data from 1980s or earlier (8) | | | |
| 1990s (19) | | | 0.012 |
| | | | (0.008) |
| 2000s or later (10) | | | 0.013 |
| | | | (0.012) |
| Constant | 0.014*** | 0.036*** | 0.026** |
| | (0.002) | (0.008) | (0.011) |
| $R^2$ | 0.447 | 0.650 | 0.682 |

*Note:* Mean of dependent variable is 0.040. Regression based on the 37 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 A3:** 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 |
| Accomodation | 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 A4:** 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 |
| Accomodation | 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 A5:** 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. size | .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 size | | | | | | | | | | 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 | 4.474 | 4.474 | 4.474 | 4.454 | 4.454 | 4.454 | 4.62 | 4.62 | 4.62 | 4.62 | 4.62 | 4.62 | 4.62 | 4.62 |
| Panel B: Share of workers with censored wages | | | | | | | | | | | | | | |
| Est. size | .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 size | | | | | | | | | | 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 | .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 on establishment size (Est. size) and firm size (Firm size). 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) and (13) 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 A6:** Additional Robustness Checks for Employment Definition and Cutoffs

| | SEF | | MEF | | | | |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | | | *At least 10 employees* | | | | |
| Panel A1: Log mean wages | | | | | | | |
| Est. size | 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 size | | | | 0.0433*** | 0.0448*** | | |
| | | | | (0.001) | (0.001) | | |
| Panel B1: AKM FE | | | | | | | |
| Est. Size | 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 size | | | | 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. size | 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 size | | | | 0.0408*** | 0.0427*** | | |
| | | | | (0.001) | (0.001) | | |
| Panel B2: AKM FE | | | | | | | |
| Est. Size | 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 size | | | | 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. size | 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 size | | | | 0.0346*** | 0.0370*** | | |
| | | | | (0.001) | (0.001) | | |
| Panel B3: AKM FE | | | | | | | |
| Est. Size | 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 size | | | | 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 on establishment size and firm size 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 A7:** Effects by Job-to-Job Transitions

| | SEF | | | | MEF | | | |
|---|---|---|---|---|---|---|---|---|
| | No J2J | J2J | Av. Dist. >100km | Max. Dist. >100km | No J2J | J2J | Av. Dist. >100km | Max. Dist. >100km |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Panel A: Log mean wage | | | | | | | | |
| Est. size | .078*** | .066*** | .043*** | .042*** | .024** | -.004*** | -.009*** | -.007*** |
| | (0.001) | (0.000) | (0.002) | (0.001) | (0.011) | (0.001) | (0.003) | (0.001) |
| Obs. | 380,830 | 394,462 | 57,041 | 99,975 | 4,541 | 105,155 | 13,866 | 74,930 |
| $R^2$ | 0.331 | 0.453 | 0.498 | 0.513 | 0.869 | 0.848 | 0.863 | 0.843 |
| Mean | 4.432 | 4.528 | 4.65 | 4.648 | 4.512 | 4.676 | 4.826 | 4.72 |
| Panel B: AKM | | | | | | | | |
| Est. size | .036*** | .033*** | .025*** | .025*** | .002 | -.000 | -.001 | -.001** |
| | (0.000) | (0.000) | (0.001) | (0.000) | (0.007) | (0.000) | (0.001) | (0.000) |
| Obs. | 380,830 | 394,462 | 57,041 | 99,975 | 4,541 | 105,155 | 13,866 | 74,930 |
| $R^2$ | 0.208 | 0.319 | 0.374 | 0.397 | 0.814 | 0.753 | 0.815 | 0.721 |
| Mean | -.102 | -.054 | -.018 | -.012 | -.07 | .026 | .058 | .048 |
| SIC × LMR | Y | Y | Y | Y | Y | Y | Y | Y |
| Firm FE | Y | Y | Y | Y | Y | Y | Y | Y |

*Note:* The table shows regression results of log establishment wages on establishment size for subsamples with and without job-to-job (J2J) transitions between 2018 and 2019 for single-establishment (SEF) and 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. No J2J indicates that the firm is not observed with an inflow from another job. Av. Dist. refers to the average distance of job-to-job flows. Max. Dist. refers to the maximum observed distance between the jobs. Robust standard errors in parentheses. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

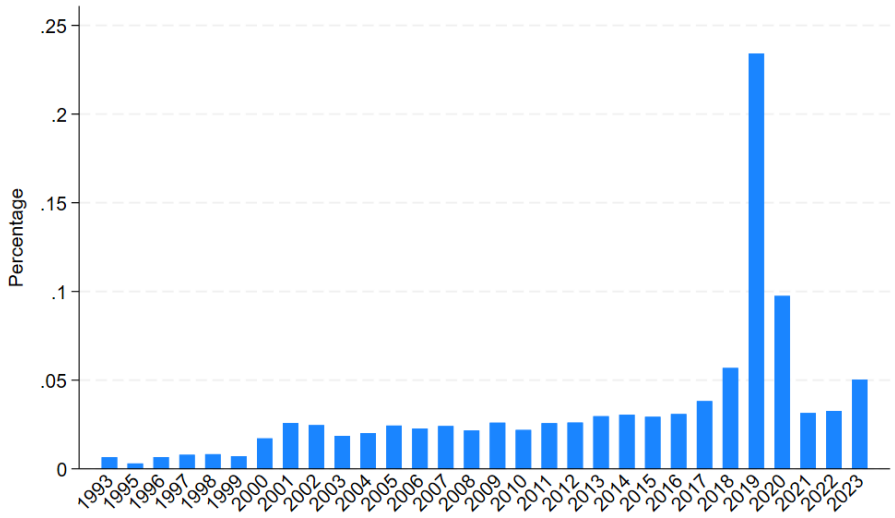
**Table A8:** The Role of Works Council Coverage

| | 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. Size | 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 |
| Outcome | 4.5 | 4.896 | 4.554 | 4.824 | 4.554 | 4.824 |
| Panel B: AKM FE | | | | | | |
| Est. Size | 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 |
| Outcome | -.078 | .12 | -.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 on establishment size 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.

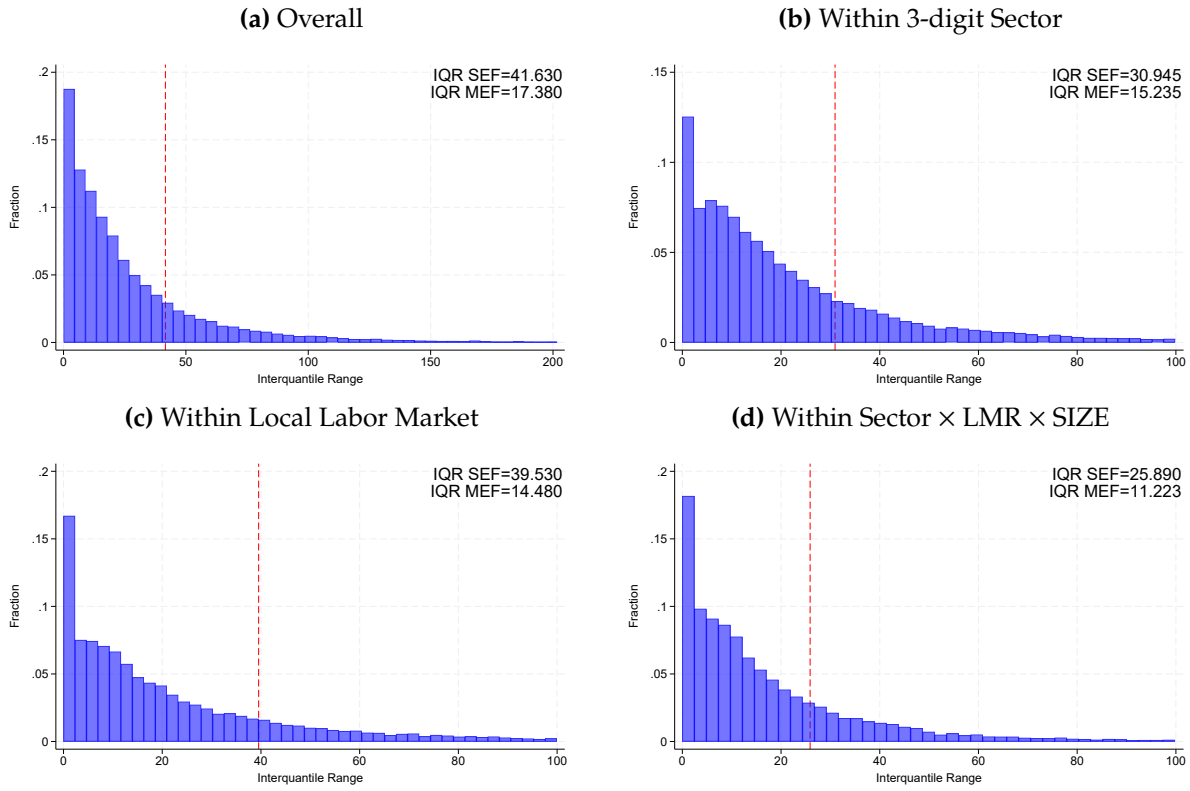
# Appendix Figures

**Figure A.1:** Information Measured in Establishment Panel Survey



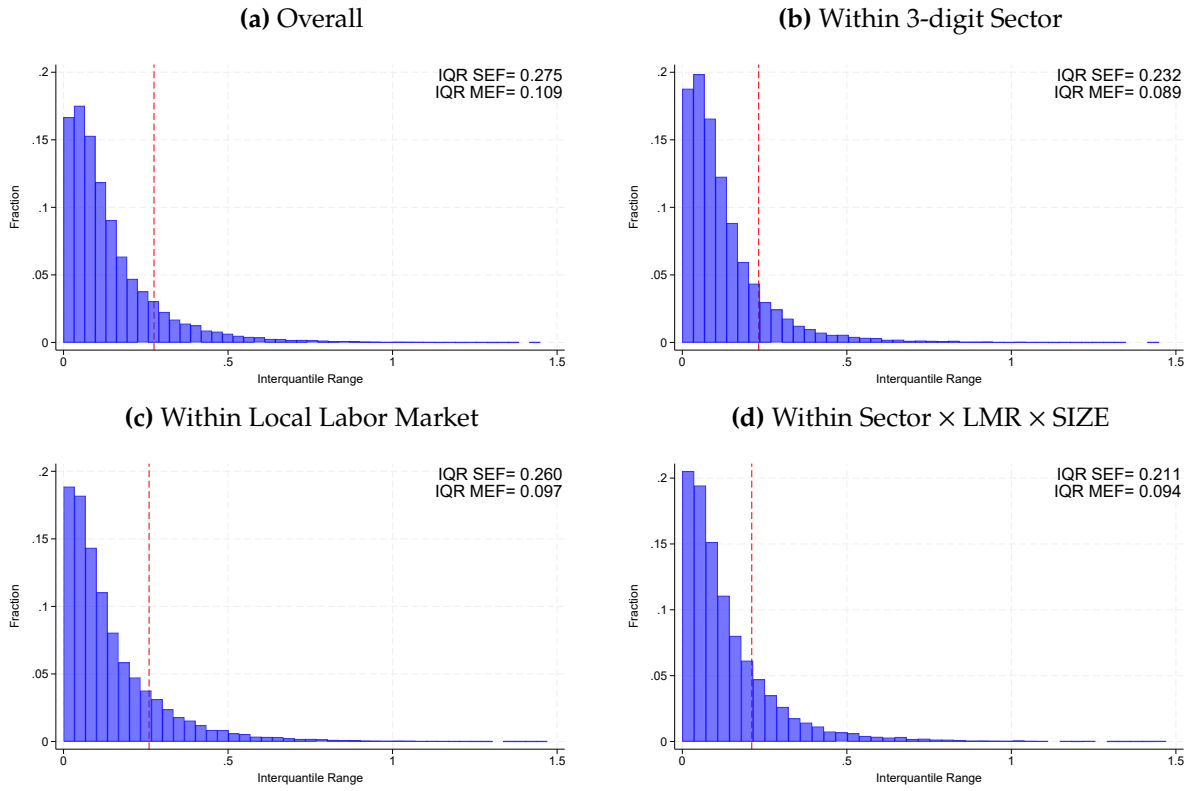

*Notes:* The figure shows the closest to 2019 survey wave for each establishment that provides information on collective bargaining agreements conditional on establishments observed in the Establishment History Panel (BHP) in 2019. In case of a tie situation (e.g., 2018 vs 2020), the earlier wave is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

**Figure A.2:** Establishment Wage Interquartile Range



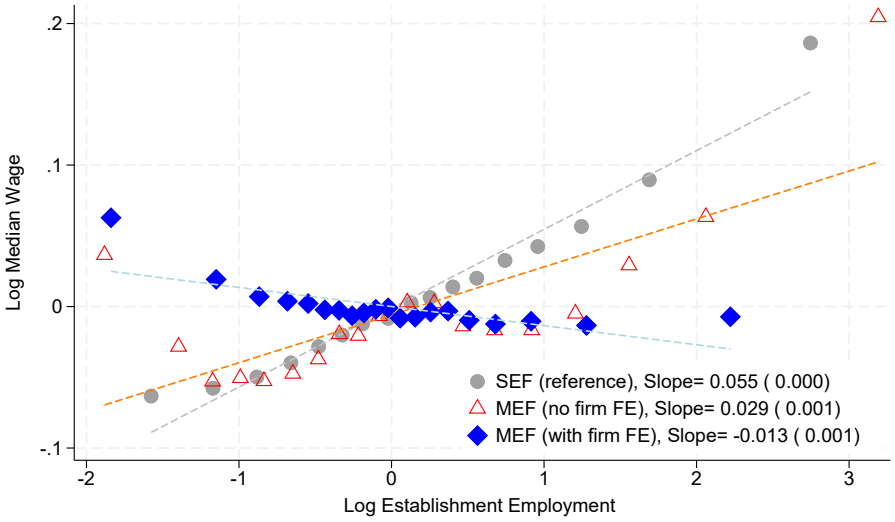

*Note:* The figure reports the distribution of the establishment wage interquartile range (IQR) for multi-establishment firms (MEF). Panel (a) shows IQR for the full sample. The IQR among single-establishment firms (SEF) is equal to 49.32. The median IQR among MEF is equal to 15.37. Panel (b) provides the results within 3-digit industries. The red line refers to median IQR for SEF. Panel (c) provides the results within local labor market regions (LMR). The red line refers to median IQR for SEF. Panel (c) provides the results within sector, LMR and establishment size cells. Size categories are below 50, 50-99, 100-249, and 250 and above. The red line refers to median IQR for SEF. Panel (b) and (c) condition the MEF sample on at least 2 observations within the cells.

**Figure A.3:** AKM Interquartile Range



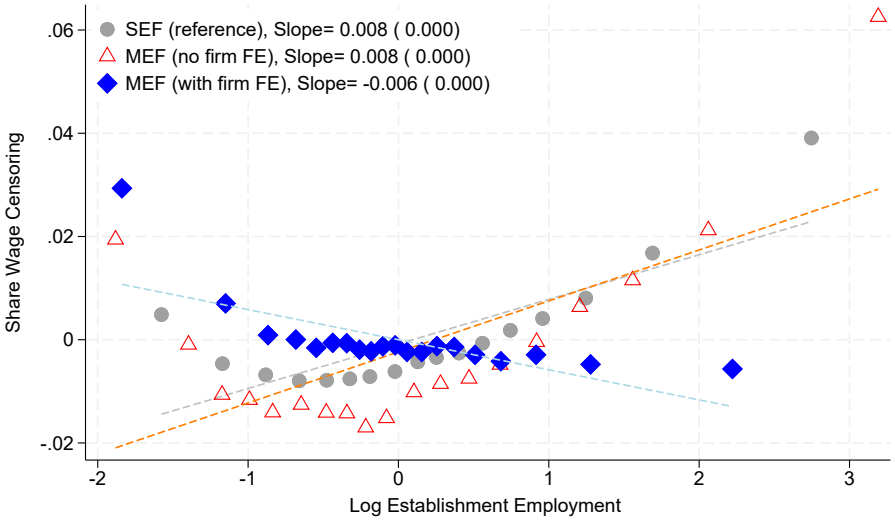

*Note:* The figure reports the distribution of the AKM interquartile range (IQR) for multi-establishment firms (MEF). Panel (a) shows IQR for the full sample. The IQR among single-establishment firms (SEF) is equal to 0.28. The median IQR among MEF is equal to 0.11. Panel (b) provides the results within 3-digit industries. The red line refers to median IQR for SEF. Panel (c) provides the results within local labor market regions (LMR). The red line refers to median IQR for SEF. Panel (c) provides the results within sector, LMR and establishment size cells. Size categories are below 50, 50-99, 100-249, and 250 and above. The red line refers to median IQR for SEF. Panel (b) and (c) condition the MEF sample on at least 2 observations within the cells.

**Figure A.4:** 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 univarite 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. Each variable is normalized by a constant (and firm fixed effects) for ease of representation.

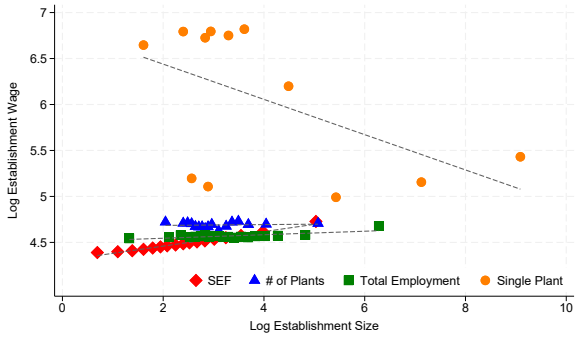
**Figure A.5:** Within-Firm vs. Across Firms: Share of Wage Censoring



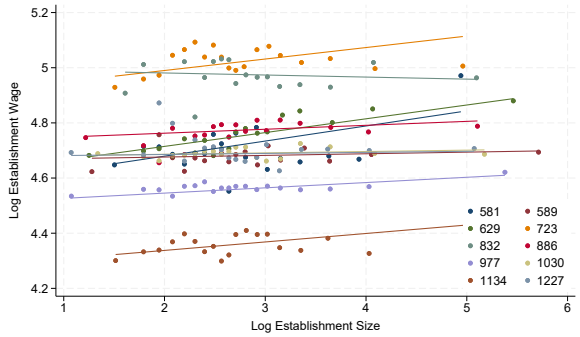

*Notes:* The figure shows binned scatter plots of log establishment size and the share of censored workers for the year 2019 differentiating by single-establishment firms (SEF) and multi-establishment firms (MEF) with and without firm fixed effects. The dashed lines represent linear fits based on a univarite 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. Each variable is normalized by a constant (and firm fixed effects) for ease of representation.

**Figure A.6:** Firm-level Case Studies: ESWE (Raw Wages) within Individual Multi-Establishment Firms

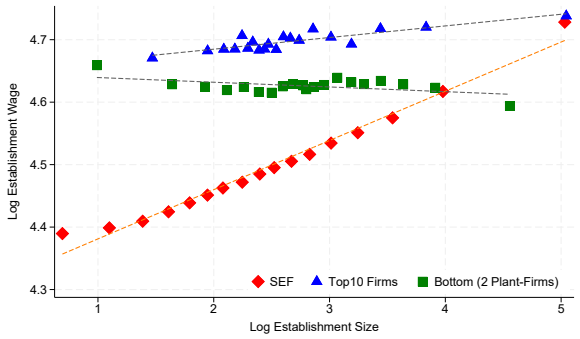
**(a)** Largest Firms



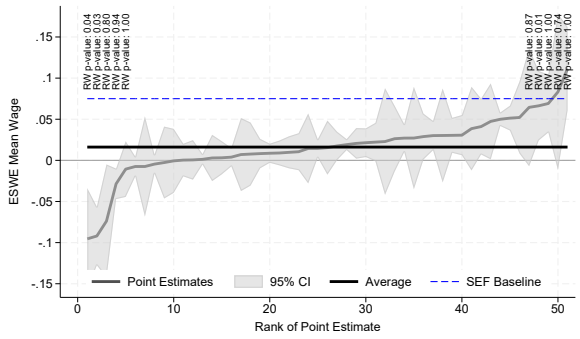

**(b)** Top10 Firms by # of Establishments




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



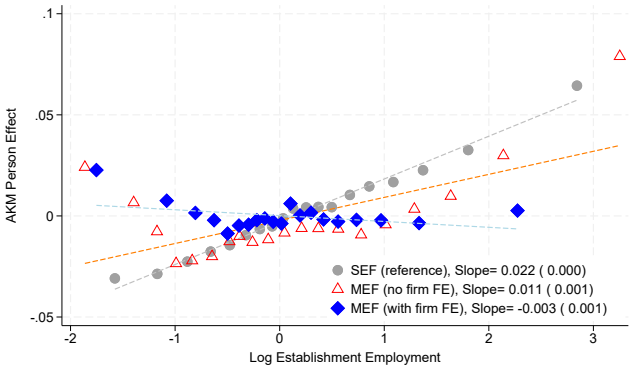

**(d)** ESWE Slope Estimates in Firm with at least 100 Establishments, Ranked by Point Estimate



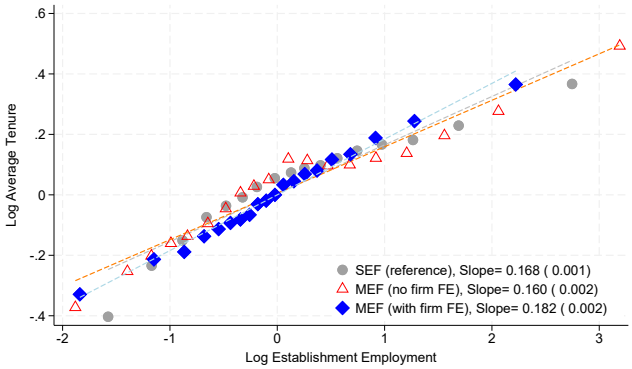

*Notes:* The figure replicates Figure 9 for raw wages instead of establishment AKM fixed effects.

**Figure A.7:** Other Outcome Variables

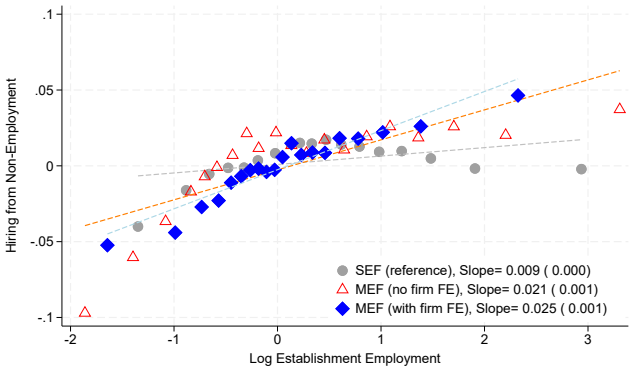
**(a)** Average AKM Worker FE




**(b)** Average Worker Tenure

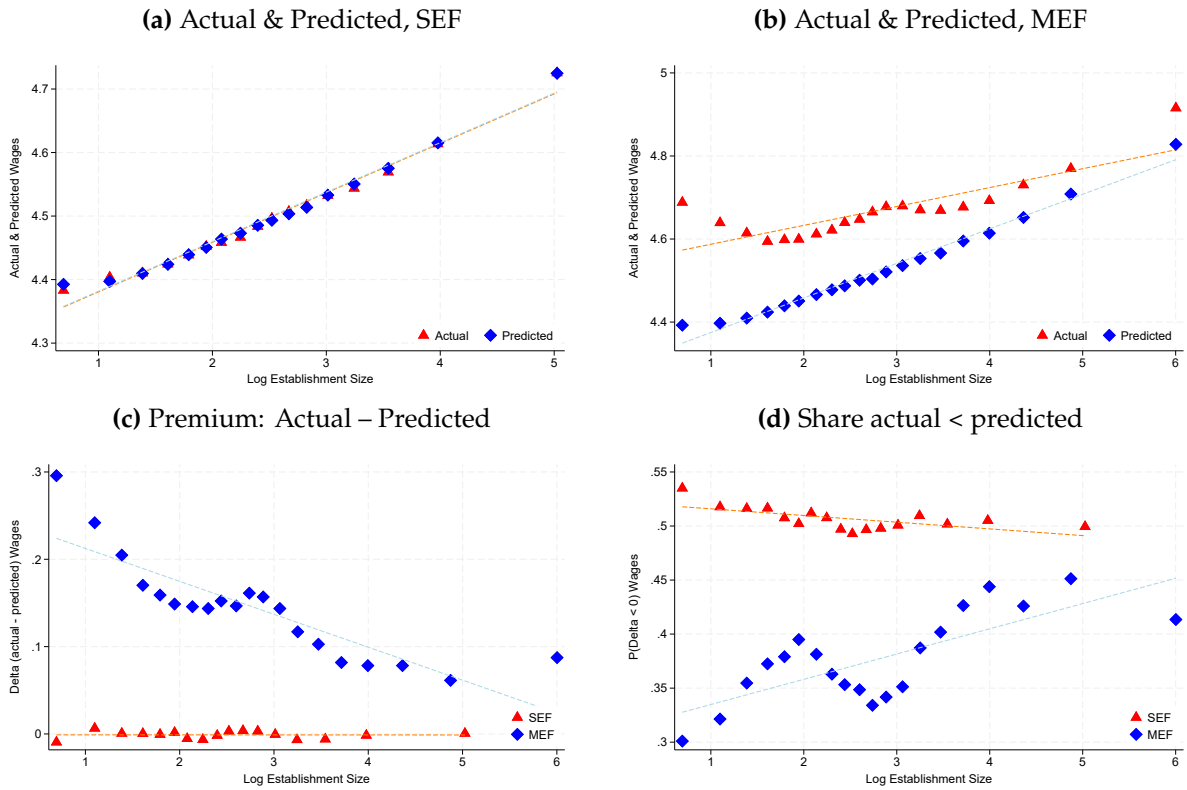



**(c)** Share of Hires out of Non-employment



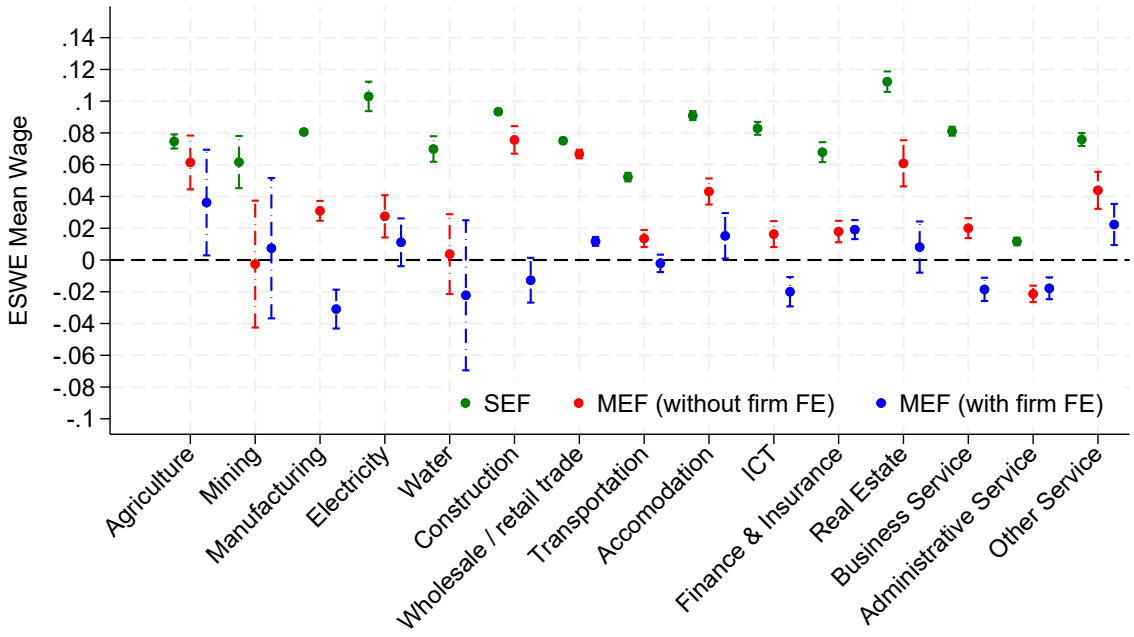

*Note:* The figure shows binned scatter plots of log establishment size and AKM worker FE (Panel (a)), log average individual tenure (Panel (b)), and the share of hires out of non-employment (Panel (c)) for the year 2019 differentiating by single-establishment firms (SEF) and multi-establishment firms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

**Figure A.8:** Establishment Wage – LASSO Model Specification



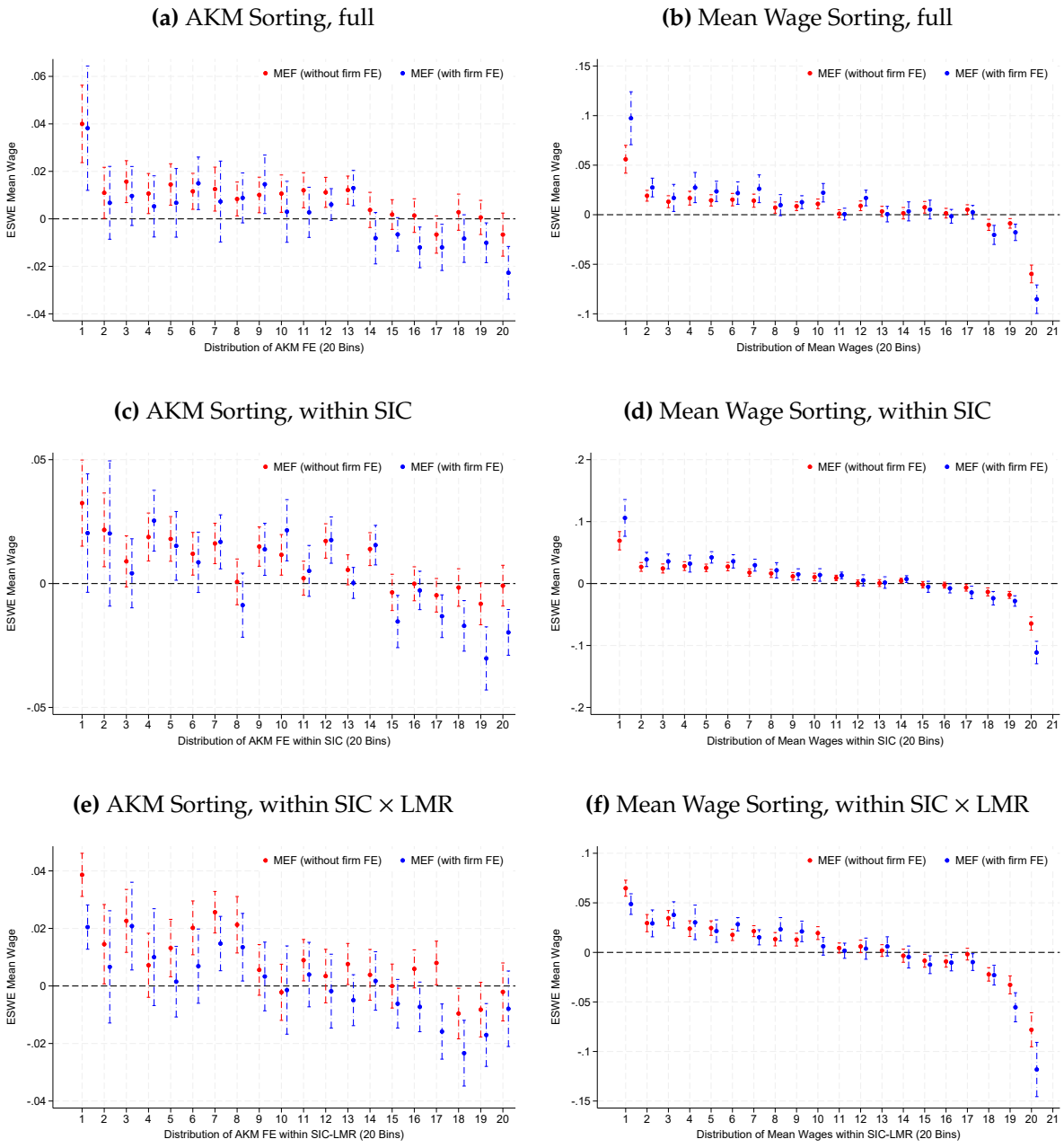

*Note:* The figure replicates Figure 10 for raw wages rather than AKM establishment fixed effects.

**Figure A.9:** The Standard Employer Size Wage Effect (Raw Wages) by Broad Industries




*Notes:* The figure replicates Figure 12 for log wages as the outcome variable instead of the establishment AKM fixed effect.

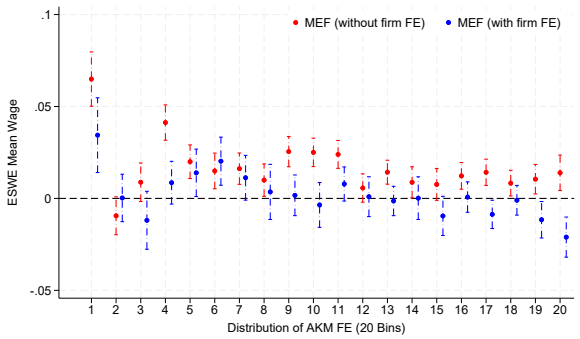
**Figure A.10:** ESWE (Wages) by AKM/Wage Distribution based on Average Establishment



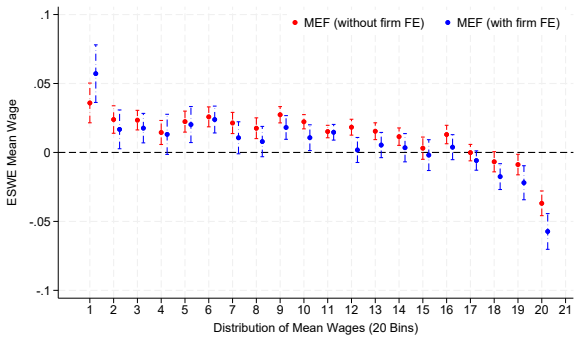

*Notes:* The figure shows regression results (coefficient estimates with 95% CI) of establishment mean wages on establishment size within 20 bins along the AKM distribution in Panels (a), (c) and (e) as well as mean wages in Panels (b), (d) and (f). Classification into the 20 bins is based on the average AKM/wage value of all establishments within firms (unweighted mean). Each dot represents a single regression controlling for 2-digit industry times labor market region FEs. Blue dots in addition control for firm FE.

**Figure A.11:** ESWE (Wages) by AKM/Wage Distribution based on Randomly Drawn Establishment

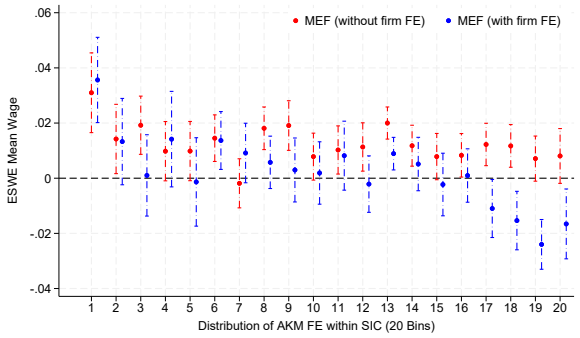
**(a)** AKM Sorting, full



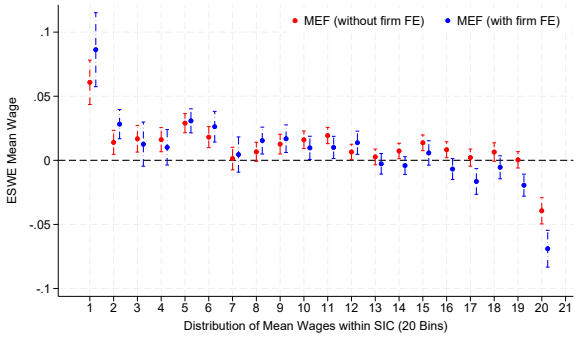

**(b)** Mean Wage Sorting, full



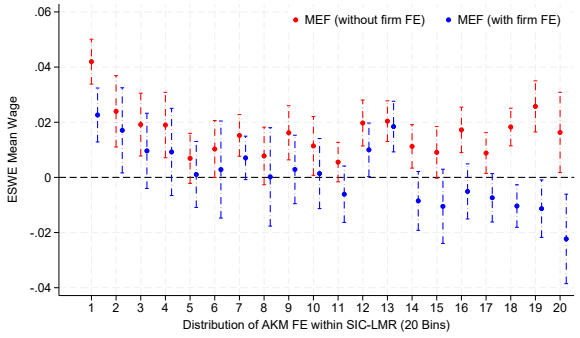

**(c)** AKM Sorting, within SIC



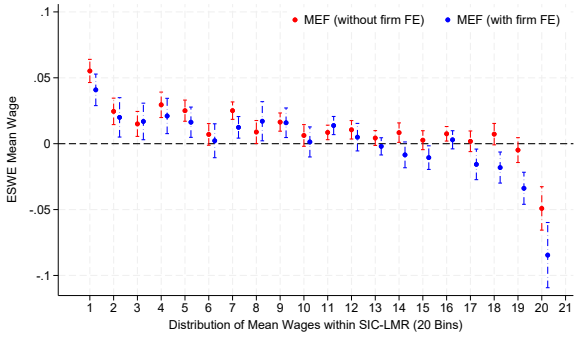

**(d)** Mean Wage Sorting, within SIC




**(e)** AKM Sorting, within SIC × LMR



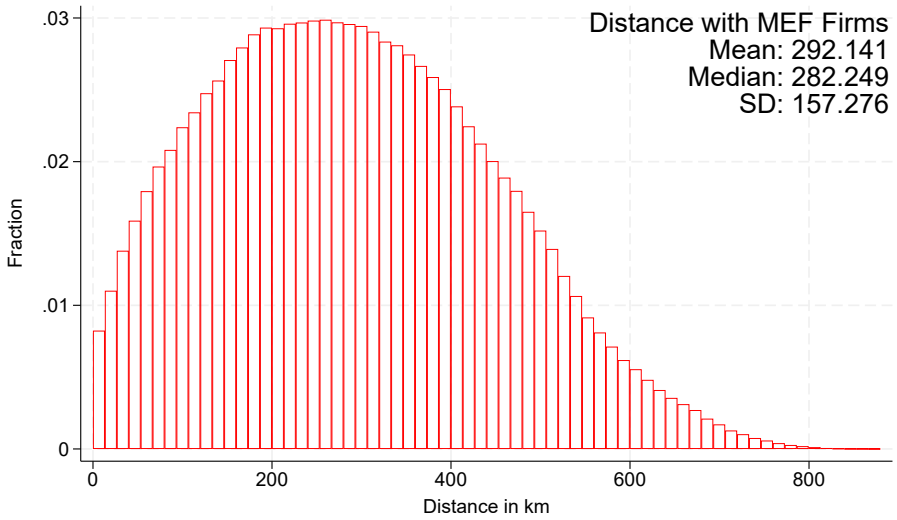

**(f)** Mean Wage Sorting, within SIC × LMR



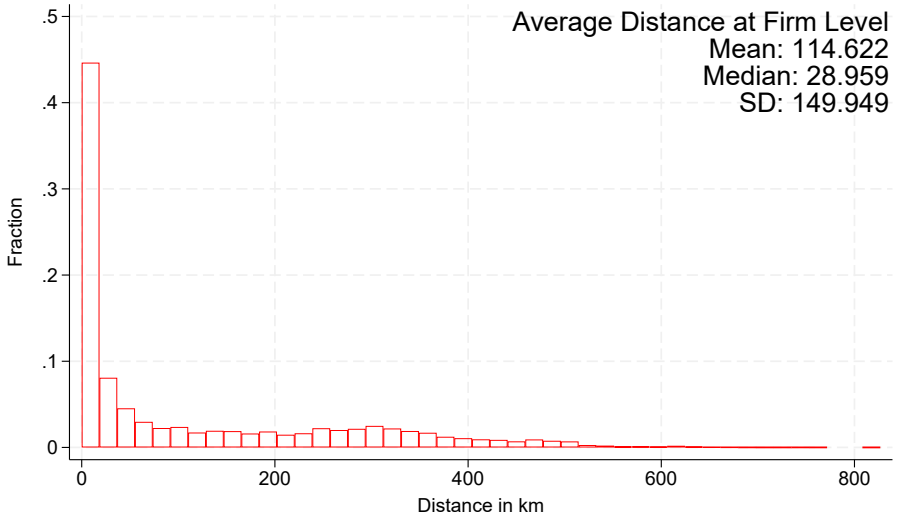

*Notes:* The figure shows regression results (coefficient estimates with 95% CI) of establishment mean wages on establishment size within 20 bins along the AKM distribution in Panels (a), (c) and (e) as well as mean wages in Panels (b), (d) and (f). Classification into the 20 bins is based on the AKM/wage value of a randomly drawn establishment within firms. Each dot represents a single regression controlling for 2-digit industry times labor market region FEs. Blue dots in addition control for firm FE.

**Figure A.12:** Distances between Establishments within MEFs

**(a)** Distance between Establishments




**(b)** Average Distance within Firms



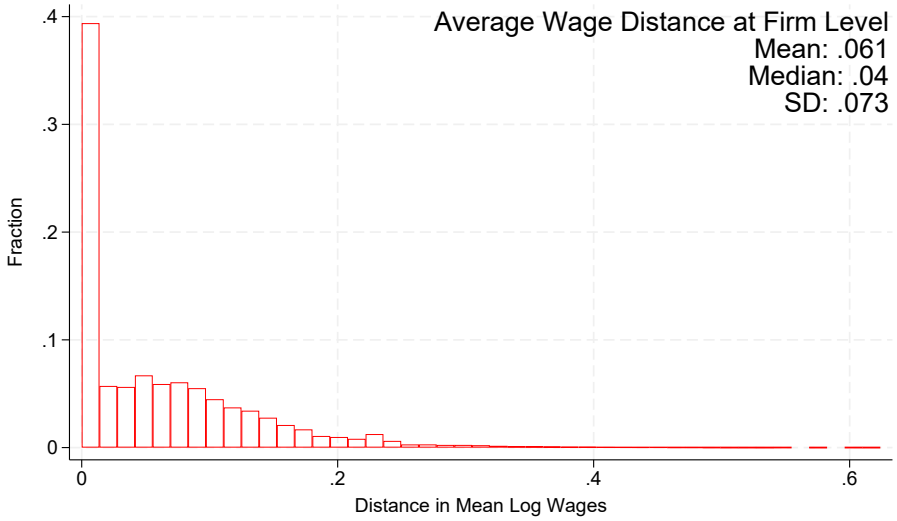

*Notes:* The figure shows histograms of distances between all possible unique combinations of distances in km between establishments within firms in Panel (a) and average distances at the firm level for multi-establishment (MEF) firms.

**Figure A.13:** Local Wage Distances between Establishments within MEFs

**(a)** Distance between Establishments



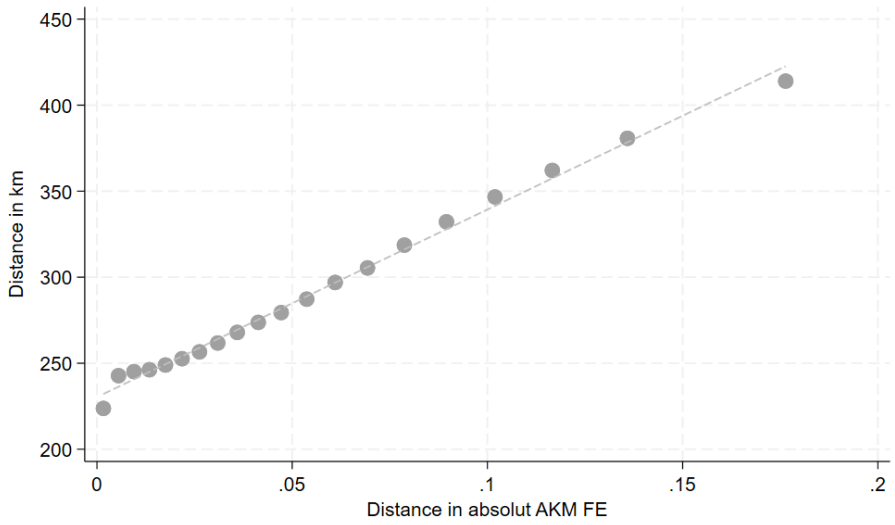

**(b)** Average Distance within Firms



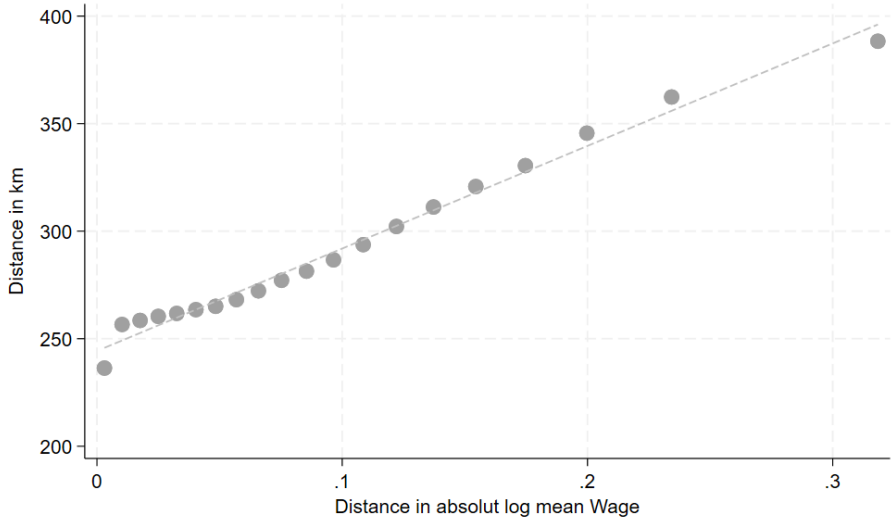

*Notes:* The figure shows histograms of distances between all possible unique combinations of distances in absolute mean log wages between establishments within firms in Panel (a) and average mean log wage distances at the firm level for multi-establishment (MEF) firms.

**Figure A.14:** Distances in Local Wages vs Distances in km within MEFs

**(a)** Local Average AKM FE




**(b)** Local Average Wage




*Notes:* The figure shows scatter plots of distances between establishments within the same firms in km (based on the centroid of the municipality) and local municipal wage and AKM distances between these establishments located in different municipalities. Local wages and AKM are estimated based on all establishments.