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Labor Market Tightness and the Reversal of Inequality Trends in Germany*

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Germany experienced a sharp rise in wage inequality over the two decades leading up to the Great Recession. However, a remarkable trend reversal occurred in 2010—well before the introduction of the minimum wage in 2015—when wages at the bottom of the distribution began to grow more rapidly than those higher up. This paper attributes the reversal to an increasingly tight labor market after the Great Recession, supported by strong domestic demand, and operating through several interrelated and mutually reinforcing channels. Consistent with this hypothesis, job-to-job transition rates and between-job wage growth rose markedly after the recession, especially for workers at the lower rungs of the job ladder. Concurrently, workers increasingly moved from low-paying to higher-paying firms, compressing the worker-weighted distribution of firm wage premia. Tighter labor markets also reduced assortative matching between workers and firms, lowered the skill premium, and weakened firms' monopsony power. *JEL Codes: J23, J31, J42.*

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I. Introduction

Wage inequality in Germany rose sharply throughout the early 1990s and 2000s (e.g., Fitzenberger 1999; Dustmann, Ludsteck, and Schönberg 2009; Card, Heining, and Kline 2013). This increase accelerated during the first decade of the 2000s: by 2008, the gap between the median and the 10th percentile had widened by nine percentage points compared to 2000. Yet this long-run rise in inequality stopped abruptly after the Great Recession. Beginning around 2010, well before the federal minimum wage was introduced in 2015, wage growth at the bottom of the wage distribution began to outpace that at the middle and the top. By 2017, inequality in the lower half of the distribution had fallen back to its early 2000s level. The decline in bottom-half wage inequality continued through the pandemic until (at least) 2023, the most recent year with available data.

This paper argues that the key driver of this reversal was a pronounced tightening of the German labor market after the Great Recession. While unemployment had been declining since the mid-2000s, labor market tightness—measured by the ratio of vacancies to unemployed workers—rose sharply after 2010 and more than tripled by 2019. This development was partly driven by a significant expansion in private consumption, concentrated in low-skill-intensive sectors. We show that this shift toward a tighter labor market explains both the timing and the shape of the inequality reversal: wage compression primarily occurred in the lower half of the distribution and predates major institutional changes such as the minimum wage. Our central contribution is to demonstrate that rising labor market tightness can lead to substantial wage compression even in the absence of changes to wage-setting institutions.

Our analysis is guided by a job-ladder view of the labor market. Drawing on a framework that combines a job ladder model (e.g., Burdett and Mortensen 1998) and a labor market characterized by monopsonistic competition (e.g., Manning 2003), we argue that tighter

labor markets reduce wage inequality—specifically in the bottom half of the distribution—through several interrelated and mutually reinforcing channels: greater job-to-job mobility among workers at the lower rungs of the job ladder, lower dispersion in firm wage premia, weaker assortative matching between workers and firms, and a narrower skill premium. We show that all these mechanisms were simultaneously at work in Germany after the Great Recession.

Exploiting variation in labor market tightness across commuting zones, we first show that tighter labor markets are associated with faster wage growth and higher job-to-job mobility, with particularly large effects for workers in the bottom wage quartile and for those employed in low-paying firms.

Concurrently, comparing the pre- and post-recession periods (2003-2010 versus 2010-2017), we find that job-to-job mobility increased markedly in the post-recession period, when labor markets tightened substantially. This increase was concentrated among workers below the 40th percentile of the wage distribution and among those employed in low-paying firms. Although both between- and within-job wage growth were higher after the Great Recession, the increase was far more pronounced for workers who changed jobs. These job switchers, disproportionately drawn from the lower tail of the wage distribution, also experienced substantially larger gains in firm wage premia as they moved up the firm wage ladder[1]

We further document a sharp contraction of the worker-weighted dispersion of firm wage premia after the Great Recession, reversing the strong rise observed in the 1990s and early 2000s (see Card, Heining, and Kline 2013). Before the Great Recession, incumbent workers fell down the firm wage ladder on average, and job creation was concentrated in low-paying firms, driven in part by domestic outsourcing. After 2010, by contrast, workers

[1] We measure the "firm wage premium" using the firm fixed effect from an AKM-style wage regression.

increasingly moved up the firm wage ladder, and employment growth became more evenly distributed across firms.

In addition, before the recession, low-wage workers were particularly likely to move down the firm wage ladder, contributing to stronger assortative matching between workers and firms from 2003 to 2010. After the Great Recession, this pattern reversed—possibly because firms relaxed hiring standards as the labor market tightened—leading to a decline in the covariance and correlation between worker and firm wage premia from 2010 to 2017.

We next show that the skill premium rose throughout the 2000s but declined after the Great Recession, mirroring the reversal in wage inequality. We offer two interconnected explanations for this reversal. First, as labor markets tightened, low-skilled workers stopped moving down the firm wage ladder. Second, adapting the approach of Katz and Murphy (1992) to investigate between-industry demand shifts, we find that the trend toward skill-biased labor demand slowed markedly after the Great Recession, while the relative supply of high-skilled workers continued to rise. Employment growth shifted toward low-skill-intensive sectors, such as construction and consumer-facing services, while domestic outsourcing, a key force pushing low-skilled workers down the wage ladder before the recession, stalled. Data on job openings confirm a post-recession shift in relative labor demand toward workers without university education.

Finally, we examine whether firms' monopsony power declined as labor markets tightened after the Great Recession. Estimating job-to-job separation elasticities with respect to wages and firm pay premia, we find that these elasticities increased substantially after the Great Recession, from -0.904 to -1.343 in our preferred specification. This implies a sizeable decline in wage markdowns, from 36% to 27%, consistent with a weakening in firms' monopsony power.

Using variation in changes in labor market tightness across commuting zones between 2010 and 2017, we confirm a strong link between tightness and wage inequality. Wage inequality, particularly at the bottom half, declined considerably more in strongly tightening than in weakly tightening commuting zones. These areas also saw a greater compression of firm wage premia—especially in the lower half—and a more pronounced reduction in assortative matching between workers and firms. They also experienced a larger decline in the skill premium, an effect partly driven by improvements in firm wage premia for low-skilled workers.

What explains the sharp increase in labor market tightness after the Great Recession? We argue that a key driver was a shift from export-led to consumption-driven growth, fueled by excess household savings. German households entered the Great Recession with considerable savings and responded to the European Central Bank's rapid deposit facility interest rate cuts (from 3.25% in July 2008 to zero percent in July 2012) by sharply increasing consumption (European Central Bank 2026). As a result, while net exports accounted for around 40% of average annual real GDP growth between 2003 and 2010, private consumption accounted for nearly 40% of GDP growth between 2010 and 2017, up from around 25% before the recession. This shift was particularly pronounced in less knowledge-intensive consumer services. Additionally, construction—another sector that disproportionately employs low-skilled workers—accounted for more than 10% of GDP growth between 2010 and 2017 but contributed negatively to GDP growth between 2003 and 2010. Demographic forces reinforced these dynamics, but were not the main driver. Although retirements began to exceed labor market entry after 2010, net immigration more than offset this decline. The post-recession tightening of the German labor market, therefore, appears primarily demand-driven.

Our paper is closely related to Autor, Dube, and McGrew (2024), who document rapid wage growth at the bottom of the U.S. wage distribution after the COVID-19 pandemic and

attribute it to an exceptionally tight labor market. We show that a similar process began more than a decade earlier in Germany, triggered by demand-driven labor market tightening following the Great Recession. Our setting offers two important advantages. First, rich administrative data allow us to test additional implications of job-ladder and monopsony models that cannot be examined in their setting, thus providing more insight into the channels through which tightness affects the wage distribution. Second, unlike the post-COVID period, which was shaped by multiple overlapping macroeconomic and policy shocks, including high inflation, the 2010–2017 period in Germany was characterized by relative macroeconomic stability and low inflation. This provides a cleaner environment for isolating the role of labor market tightness in driving wage growth and compression, and for studying the underlying mechanisms in greater detail.

In contemporaneous research, Börschlein, Bossler, and Popp (2024) examine the significant rise in labor market tightness in Germany throughout the 2010s and show that regions with larger increases in tightness also experienced stronger wage growth, particularly at the lower end of the wage distribution. Compared to their work, we explicitly emphasize the link between labor market tightness and wage inequality, highlighting several interrelated channels, including worker reallocation and sorting, and a declining skill premium.

More broadly, we contribute to the literature on German wage inequality. While earlier papers focused on the rise in inequality up to 2010 (e.g., Dustmann, Ludsteck, and Schönberg 2009; Card, Heining, and Kline 2013; Dustmann et al. 2014; Goldschmidt and Schmieder 2017), some recent papers have noted the subsequent compression (e.g., Möller 2016; Brüll and Gathmann 2020; Drechsel-Grau et al. 2022).[2] We provide a unified explanation for this reversal, centered on the sharp tightening of the labor market after the Great Recession.

[2] Drawing on tax data that are not affected by top-coding, Drechsel-Grau et al. (2022) additionally show that upper-tail wage inequality continued to increase after the Great Recession, specifically at the very top, above the 90th percentile.

Several recent papers study the effects of the federal minimum wage introduced in 2015 (e.g., Biewen, Fitzenberger, and Rümmele 2022, Bossler and Schank 2023), as well as earlier sectoral minimum wages introduced between 2007 and 2014 (e.g., Möller 2012; Brüll and Gathmann 2020). While these policies helped reduce wage inequality at the very bottom of the distribution, below the 10^{th} percentile, the timing, scope, and magnitude of the observed reversal point to a different primary mechanism. The compression of wage inequality and the decline in the skill premium began around 2010, well before the introduction of the minimum wage, and extended across a wide range of industries, including those not covered by sectoral minimum wages. Moreover, real minimum wage increases remained modest until 2022, making it unlikely that minimum wages played a major role in driving wage compression between 2015 and 2022. These patterns suggest that rising labor market tightness, rather than minimum wage policy, was the dominant force behind the post-recession reversal in wage inequality.

II. Data

II.A. IAB Employment History

Our primary data source is the IAB Employment History (BeH, version 10_08_00), provided by the Institute for Employment Research (IAB). This longitudinal administrative dataset covers all private- and public-sector employees subject to social security contributions in Germany from 1975 to 2023. Civil servants and the self-employed are excluded. The data allow us to trace individuals' complete employment histories and daily wages across establishments and contain rich information on both worker and establishment characteristics, including education and industry affiliation.

We restrict the sample to job spells covering June 30 for men and women aged 21 to 60, retaining at most one spell per worker-year. We exclude apprenticeship spells and, unless

otherwise stated, focus on full-time employment spells. Appendix A1 provides additional details on sample construction. As is common in social security data, wages are top-coded at the social security contribution ceiling, affecting approximately 7% of jobs in a typical year. We impute censored wages using the two-step procedure proposed by Stüber, Dauth, and Eppelsheimer (2023), which builds on Dustmann, Ludsteck, and Schönberg (2009) and Card, Heining, and Kline (2013). All wages are deflated to 2015 prices using the German Consumer Price Index (Destatis 2025). Appendix A2 describes the imputation procedure in more detail and assesses the robustness of our results to alternative imputation procedures.

Although we have access to the universe of workers and establishments, we use a 2% random sample for the core empirical analysis to reduce the computational burden. Importantly, however, we estimate worker and establishment fixed effects using the AKM model (Abowd, Kramarz, and Margolis 1999) on the full population of workers and establishments. Following Card, Heining, and Kline (2013), we estimate the AKM model separately for two eight-year periods, 2003–2010 and 2010–2017. All analyses involving worker and firm fixed effects are restricted to the largest connected set of firms and workers within each period, as identified by worker mobility across establishments.[3] To reduce a potential bias arising from limited worker mobility across firms, we also implement the correction proposed by Kline, Saggio, and Sølvsten (2020); see Appendix A3 for details.

While we document trends in wage inequality over the full 2000-2023 period, our core analysis focuses on the two periods for which we estimate worker and establishment fixed effects: 2003-2010 and 2010-2017. These periods differ sharply in labor market tightness but are otherwise characterized by relatively stable macroeconomic conditions. This contrast makes them especially informative for isolating the relationship between labor market tightness

[3] This connected set includes 96% of workers and 75% of establishments in the period 2003–2010, and 97% and 75%, respectively, in 2010–2017; see Table A3.1 in the Online Appendix for details.

and wage inequality, and for studying the mechanisms linking the two. By contrast, the period after 2017 was shaped by a series of major shocks, notably the COVID-19 pandemic, Russia's full-scale invasion of Ukraine, high inflation, and large real minimum wage increases, which makes it less suitable for isolating the effects of labor market tightness; see Appendix B for details. [4]

II.B. Additional Data Sources

To examine aggregate and regional trends in labor market tightness, and their relationship to the evolution of wage inequality, we draw on data on registered unemployment and job vacancies from the Federal Employment Agency and the German Federal Statistical Office (Destatis). These data are available at the national level from 2000 onwards and, beginning in 2007, can be disaggregated to the county level.

To analyze trends in labor demand by skill requirements, we use the IAB Establishment Panel, a representative annual survey of establishments conducted since 1993 in West Germany and since 1996 in East Germany. The panel includes information about vacancies in the firm by education.

We further draw on data from the German Socio-Economic Panel to document trends in job and income satisfaction over time. To place the evolution of wage inequality in Germany in an international context, we compare trends in Germany with those in the United Kingdom, the United States, France, and Canada, drawing on data from the IFS Deaton Review Country Studies (Banks et al. 2024); see Appendix A4 for details. Finally, to characterize the broader macroeconomic environment before and after the Great Recession, we use national accounts data from Destatis; information on domestic consumption and activity in the construction sector from the INKAR database maintained by the German Federal Office for Building and

[4] For completeness, we report core findings for the 2017-2023 period in Appendix C3.

Regional Planning; and survey data from the Panel Study Labour Market and Social Security (PASS), maintained by the IAB. Appendix A5 provides further details.

III. Trends in Wage Inequality and the Macroeconomic Context

III.A. Trends in Wage Inequality and the Skill Premium

Panel A of Figure I shows the evolution of the variance of log wages—a common measure of overall wage inequality—in Germany for full-time men and women since 2000. The variance increased sharply throughout the 2000s but began to gradually decline around 2010. By 2023, it had fallen below its 2000 level.

Panel B of Figure I illustrates real wage growth at different parts of the wage distribution. Between 2000 and 2008, real wages at the 10th percentile fell by roughly 10 percent, median wages declined slightly, and wages at the 90th percentile increased by about 5 percent. Inequality, therefore, increased primarily in the lower half of the wage distribution rather than at the top.

Around 2010, this pattern reversed markedly. Wages at the bottom of the wage distribution began to grow faster than wages at higher percentiles, leading to a sustained compression of lower-tail inequality. Between 2010 and 2019, the gap between the 10th percentile and the median narrowed by roughly eight percentage points, while the gap between the median and the 90th percentile remained broadly stable.[5]

After 2019, real wages declined for workers at the 25th percentile and above, while wages at the 10th percentile continued to rise. As a result, the compression of wage inequality in the lower half of the distribution persisted and intensified in the post-COVID-19 period.

[5] To further illustrate this point, Appendix Figure C1.1 plots the evolution of the P50–P10, P90–P50, and P90–P10 log wage gaps.

Panel C highlights the magnitude of this turnaround by comparing wage growth along the wage distribution in three sub-periods: 2003-2010, 2010-2017, and 2017-2023. During the first period, real wages declined at percentiles below the 75th percentile, with the largest losses concentrated at the bottom. In contrast, between 2010 and 2017, real wages increased throughout the entire distribution, with disproportionately large gains at lower percentiles. From 2017 to 2023, wage growth remained positive at the very bottom of the distribution but turned negative further up.

In Appendix C1, we demonstrate that the shifts in the wage structure illustrated above are not driven solely by changes in observed worker characteristics, industry composition, or selection into employment, drawing on the methods developed by DiNardo, Fortin, and Lemieux (1996) and Olivetti and Petrongolo (2008). While these factors account for part of the rise in bottom-half wage inequality during 2003-2010, they explain little of the pronounced compression that followed between 2010 and 2017. Appendix Figures C1.2 and C1.3 further demonstrate that wage inequality evolved similarly for men and women, and natives and immigrants.

To place the German experience in a broader context, Figure II compares changes in wage inequality across the U.S., Canada, the U.K., and France, using data from the IFS Deaton Review Country Studies (Banks et al. 2024). Germany stands out for the magnitude of the increase in bottom-half wage inequality between 2003 and 2010, measured as the gap between the 50^{th} and 10^{th} percentiles of the log wage distribution. This increase was substantially larger than in other countries, including the U.S. After the Great Recession, however, bottom-half wage inequality declined not only in Germany but also in Canada, the U.K., and the U.S. In all three countries, this compression persisted and, in some cases, even intensified, during the 2017-2022 period; see Appendix A4 for more details.

Returning to Germany, Figure III links these shifts in the wage structure to changes in workers' well-being, drawing on data from the German Socio-Economic Panel. The figure reports satisfaction with work and household income, both measured on a scale from zero to 10. Panel A shows that average satisfaction declined steadily through the early and mid-2000s, before turning upward around 2008 or 2009. Panel B documents a parallel reversal in dispersion: while the standard deviations of work- and income satisfaction remained broadly stable until about 2010, they declined thereafter, closely tracking the compression in wage inequality over the same period. An important exception occurred in 2022, when average household income satisfaction fell sharply while its dispersion rose, coinciding with the surge in inflation.

Figure IV documents a closely related reversal in the wage premium of high-skilled workers relative to low-skilled workers.[6] The skill premium rose from roughly 40% to 43% between 2003 and 2010, but then declined by about 5 percentage points between 2010 and 2019.[7] This decline continued, and, if anything, intensified in the years immediately following the COVID-19 pandemic. Notably, this reversal in the skill premium does not reflect a change in the relative supply of high-skilled workers, which increased roughly linearly throughout the two decades.[8]

III.B. The Role of the Minimum Wage

The introduction of the statutory minimum wage in January 2015 was neither the initial nor the primary driver for the compression in bottom-half wages after the Great Recession and up to

[6] High-skilled workers either hold a university degree or have completed an apprenticeship combined with a high school leaving certificate. Low-skilled workers lack these qualifications or have missing education information.

[7] We report the skill premium from 2003 onward, as the share of censored observations sharply declined starting in that year. This decline was due to a reform that recalibrated the way ceilings for social security contributions were calculated.

[8] See Appendix A6 for a precise definition of labor supply. The series exhibits a break in 2011, reflecting a change in reporting procedures in the BeH data.

2021—except at the very bottom of the wage distribution, below the 10th percentile. At its introduction, the minimum wage was set at around the 7th percentile of the full-time wage distribution (Burauel et al. 2018; Dustmann et al. 2022). Although the nominal minimum wage was raised several times, it remained broadly constant in real terms and declined slightly relative to the median wage until 2021; see Appendix C2, specifically Appendix Figure C2.1, for details. In contrast, in 2022, the minimum wage was sharply increased from 9.50 EUR to 12.00 EUR, marking the first substantial real-terms increase and the first increase relative to the median wage since its introduction.

Figure V plots the evolution of the gaps between the median and the 5th, 10th, 15th, and 20th percentiles, normalized to zero in 2000. The figure illustrates that the 2015 introduction of the minimum wage clearly contributed to compressing wages at the very bottom of the distribution (see also Bossler and Schank 2023). Notably, the median-5th percentile gap shrank sharply and discontinuously by roughly 6 percentage points between June 2014 and June 2015. Importantly, however, this gap had already been narrowing since around 2010, well before the minimum wage was introduced, and continued to do so afterward.[9] Moreover, no comparable discontinuity is observed at higher percentiles where the minimum wage was not binding: the 50-10, 50-15, and 50-20 log wage gaps declined smoothly between 2015 and 2021, a period during which the real minimum wage changed little.

Similar to the 2015 introduction, the sharp 2022 increase in the minimum wage led to a pronounced, discontinuous reduction in the median-5th-percentile gap. Unlike in 2015, however, this reform also affected higher parts of the wage distribution, including the 50-10 and 50-15 gaps. In our core analysis, we therefore focus on the period prior to 2022, which

[9] It is highly unlikely that the contraction in bottom-tail wage inequality between 2010 and 2014 is driven by the anticipation of the introduction of the minimum wage. The minimum wage was decided only in July 2014 and took effect in January 2015. Although some firms began increasing wages in late 2014, this affected only a small share of firms (7%; Bellmann et al. 2015).

provides a cleaner setting for isolating the relationship between labor market tightness and wage compression without the confounding influence of a large minimum wage hike.

These results indicate that the federal minimum wage was not the main driver, and certainly not the sole driver, of the wage compression observed after the Great Recession and through 2021. To further rule out the possibility that our main findings are driven by the 2015 minimum wage or by the Great Recession itself, we also present core results for two shorter 4-year windows: 2003-2007 and 2010-2014. The basic findings remain the same; see, for example, Appendix Figures C2.2 and C2.3. Appendix Figure C2.4 further demonstrates that earlier sector-specific minimum wages do not account for the post-recession reversal in wage inequality.[10] Specifically, excluding sectors in which sectoral minimum wages were introduced between 2000 and 2014 yields patterns that closely mirror those in Figure I.

III.C. Trends in Labor Market Tightness

The decade following the Great Recession saw an exceptional increase in labor market tightness. Panel A of Figure VI plots the unemployment rate and the vacancy-to-unemployment ratio (hereafter, labor market tightness) from 2000 onward. The early 2000s saw high unemployment, peaking at around 13 percent in 2005. Thereafter, unemployment fell sharply and, unlike in most other OECD countries, showed almost no increase during the Great Recession, largely reflecting the extensive use of the short-time work scheme (see e.g., Pissarides 2013). By 2019, the unemployment rate had fallen to around five percent, a level last observed in the early 1980s.

Employment dynamics mirror this pattern. As shown in Panel B of Figure VI, total employment (including part-time and marginal employment) declined throughout the early 2000s but rose strongly from 2005 onward, increasing by around 20% between 2005 and 2019.

[10] Around 14% of spells are excluded annually using this restriction.

This expansion was partly driven by immigration, with the employment share of immigrants rising by 7 percentage points over this period.[11] During the COVID-19 pandemic, unemployment increased only modestly despite severe lockdowns, as Germany again relied heavily on its short-time work scheme.

Despite the decline in unemployment and the expansion in employment beginning around 2005, labor market tightness remained roughly constant between 2000 and 2009. After the Great Recession, however, tightness increased dramatically, more than tripling between 2010 and 2019. Although tightness fell sharply during the COVID-19 pandemic, mainly because vacancy postings collapsed, labor markets quickly tightened again in subsequent years. In Section VI, we argue that the post-recession increase in labor market tightness was primarily driven by labor demand rather than by supply-side forces such as population aging.

The central hypothesis of this paper is that rising labor market tightness played a key role in the reversal of wage growth, wage inequality, and the skill premium in Germany after the Great Recession. The next section develops theoretical considerations linking tighter labor markets to higher wage growth and wage compression, emphasizing that workers at the lower end of the wage distribution and low-skilled workers may benefit the most.

IV. Labor Market Tightness and Wage Compression: Theoretical Considerations

We organize our analysis around a job-ladder framework in which the contact rates between firms and workers depend on labor market tightness, as in, for example, Burdett and Mortensen (1998) and Moscarini and Postel-Vinay (2012, 2018). In these models, tighter labor markets increase how often workers receive job offers: the probability of contact between job seekers

[11] We define immigrants as workers reported as holding non-German citizenship. To address inconsistencies in this variable over time, we classify any worker reported as having foreign citizenship in at least one observed year as an immigrant in all years. We compute immigrants' share relative to total employment subject to social security contributions.

and prospective employers increases and is concave in labor market tightness. As a result, job-to-job transitions rise as labor markets tighten.

Since workers typically move only when a new job offers a higher wage (or value) than their current one, wage growth from job-to-job transitions generally exceeds wage growth within jobs. Therefore, increased job-to-job mobility helps drive higher overall wage growth in tighter labor markets. However, this mechanism is inherently asymmetric along the job ladder. Workers higher up the job ladder are less likely to receive offers that dominate their current job, even in tight labor markets. By contrast, workers at the bottom face many opportunities for improvement. We therefore expect increases in labor market tightness to disproportionately raise job-to-job mobility and wage growth among workers at the lower end of the job ladder, leading to compression in the lower half of the wage distribution. Sections V.A and V.B examine these predictions.

An important component of a new job's wage is the wage premium the firm offers, and we would expect job-to-job movers to move up to higher-paying firms; see, for example, Haltiwanger et al. (2018) for empirical evidence on such a "firm wage ladder". Consequently, by increasing job-to-job mobility, tighter labor markets reallocate workers from lower-paying to higher-paying firms. This process compresses the distribution of worker-weighted firm wage premia, particularly in the lower half, as workers leave low-paying firms and move to firms paying wage premia closer to the average (see e.g., Cortes et al. 2023). We study how labor market tightness affects the distribution of firm wage premia in Section V.C.

Tight labor markets may also weaken assortative matching between workers and firms. If firms relax hiring standards in tighter labor markets to fill vacancies more quickly, as predicted by the models of Sedláček (2014) and Carrillo-Tudela, Gartner, and Kaas (2023), high-wage firms may increasingly hire workers who would not have matched with them in slack markets. This mechanism reduces the covariance between worker and firm fixed effects,

further compressing wages. We investigate how labor market tightness affects worker-firm sorting in Section V.C.

A reduction in hiring standards may also allow low-skilled workers to rise more quickly through the job or firm ladder than high-skilled workers during times of tight labor markets. In addition, a demand-driven tightening in labor markets might be accompanied by growth in sectors such as construction and consumer-facing services (retail and hospitality), which disproportionately employ low-skilled workers. Tighter labor markets may therefore raise demand for low-skilled workers relative to high-skilled workers. Both channels imply that labor market tightness may reduce the skill premium. We examine the relationship between labor market tightness and the skill premium in Section V.D and return to this issue in Section VI.

Finally, tighter labor markets may reduce firms' wage markdown by strengthening workers' outside options (see Autor, Dube, and McGrew 2024). While lower markdowns do not necessarily imply lower wage inequality, they indicate a shift in labor market power from firms to workers as labor markets tighten. In search models with on-the-job bargaining, such as those of Postel-Vinay and Robin (2002), workers hired from unemployment initially receive low wages, just high enough to make them prefer employment to unemployment, and firms capture the entire surplus of the match. However, subsequent outside offers trigger renegotiation, allowing workers to secure a growing share of the match surplus. As labor market tightness increases the arrival rate of outside offers, firms' markdowns from workers' marginal products decline.

A similar prediction arises in monopsony models, in which firms trade off higher wages and a higher probability of attracting or retaining a worker against lower per-worker profits. In these models, labor supply elasticities increase with workers' outside options, limiting firms' monopsony power (e.g., Card et al. 2018; Caldwell and Harmon 2019; Caldwell and Danieli

2024). We provide empirical evidence on the link between labor market tightness and firms' monopsony power in Section V.E.

V. Labor Market Tightness and Wage Compression: Empirical Evidence

V.A. Labor Market Tightness, Job Mobility, and Wage Growth: Evidence from Local Variation

To provide initial empirical evidence consistent with the mechanisms outlined above, we exploit variation in local labor market tightness across commuting zones. Our analysis focuses on 2010-2017, the years for which vacancy data are available at the commuting zone level. We restrict the sample to workers employed in two consecutive years and estimate regressions in which the outcome (e.g., an indicator variable of changing jobs between t and $t+1$ or wage growth between t and $t+1$) is regressed on log labor market tightness in the worker's commuting zone in period t. All specifications control for year fixed effects, workers' education, and two-digit industry fixed effects measured at baseline.

Panel A of Table I documents a positive relationship between labor market tightness and job mobility. Column 1 shows that a higher local labor market tightness is associated with higher mobility rates. Columns (2) to (3) allow the relationship to differ by workers' position in the baseline wage distribution and reveal a pronounced asymmetry. Labor market tightness is strongly associated with increased job mobility among workers in the bottom 25% of the wage distribution—those most likely to be at the lower end of the job ladder. A 10 percent increase in local labor market tightness (equivalent to an increase of 0.18 standard deviations) raises the probability of a job-to-job transition among bottom-quartile workers by about 0.3 percentage points, or 1.8 percent relative to the mean transition rate of 16.6 %. In contrast, local labor market tightness has little predictive power for job-to-job mobility among workers in the top quartile of the wage distribution.

Panel B links labor market tightness to annual individual wage growth between *t* and *t+1*. Wage growth is positively associated with labor market tightness for workers in both the bottom and top quartiles, but the relationship is stronger for workers in the bottom quartile of the baseline wage distribution.

In Panels C and D, we distinguish between within-job and between-job wage growth. While labor market tightness is similarly associated with within-job wage growth for low- and high-wage workers, its impact on between-job wage growth is concentrated among lower-wage workers. This difference operates through both higher firm wage premia (measured using AKM firm fixed effects) and residual wage gains net of changes in firm wage premia.

We obtain similar results when workers are grouped by the wage premium of their baseline firm rather than by their individual wage, thereby providing a more direct proxy for their positions on the firm's wage ladder. As shown in columns (4) and (5), higher labor market tightness increases job mobility and wage growth, especially between-job wage growth driven by moves to higher-paying firms, more strongly for workers initially employed at low-wage firms than for workers at high-wage firms.

These results provide direct empirical support for a job ladder mechanism: tighter labor markets increase job-to-job transitions and between-job wage growth, with particularly strong effects for workers at the bottom of the wage distribution or the firm wage ladder.

V.B. Job Mobility and Wage Growth Before and After the Great Recession

We next examine how job mobility and wage growth differed before and after the Great Recession. The pre-recession period (2003 to 2010) was characterized by rising wage inequality and roughly stable labor market tightness. We contrast this period with the post-recession years (2010 to 2017), which saw a decline in wage inequality alongside a rapidly tightening labor market.

Panel A of Figure VII plots the share of workers who switch firms between year *t* and *t+1*, conditional on being employed in both years, by their position in the baseline wage distribution. In both periods (2003-2010 and 2010-2017), job-to-job transitions are more common among lower-wage workers, consistent with a job ladder interpretation. However, overall mobility is substantially higher in the post-recession period, with the increase almost entirely concentrated among workers at the bottom of the wage distribution. Workers above the median are no more likely to switch jobs after the recession than before it.

Panel B contrasts between-job and within-job wage growth across the two periods. Three patterns stand out. First, in both periods, between-job wage growth is markedly higher for workers at the bottom of the wage distribution, while within-job wage growth is remarkably flat along the baseline wage distribution. Second, both components of wage growth are higher in the post-recession period. Third, the increase across periods is substantially larger for between-job wage growth.

These trends are robust to alternative period definitions. Focusing on 4-year windows before the Great Recession (2003-2007) and the introduction of the federal minimum wage (2010-2014) yields results that are very similar, suggesting that neither event is the primary driver of the observed changes (Appendix Figure C2.2).

Panel C of Figure VII examines movements along the firm wage ladder more directly by comparing changes in firm wage premia of job switchers. Improvements from job switching are substantially larger in the post-recession period, and positive gains are almost entirely concentrated among workers in the bottom half of the wage distribution. In the pre-recession period, job switchers above the 20th percentile of the wage distribution moved down the firm wage ladder on average, experiencing a decline in firm wage premia of up to 3 percent. Such downward moves became much less frequent after the recession.

So far, we have ranked workers according to their position in the wage distribution at baseline. Panels D and E repeat the analysis in Panels A and B but rank workers by the wage premium of their baseline firm, providing a closer proxy for their position on the firm wage ladder. The resulting patterns closely mirror those in Panels A and B.

Finally, Panel F compares the share of job switchers who move directly to another firm—defined as an employment interruption of fewer than 30 days—across periods. While workers at higher-paying firms are more likely to make direct job-to-job transitions in both periods, the incidence of direct moves rises markedly in the post-recession period, especially among workers at lower-paying firms.

These findings support the view that tightening of labor markets after the Great Recession led to higher job mobility and stronger between-job wage growth, particularly among workers at the bottom of the wage distribution and the firm wage ladder.

V.C. Worker Reallocation Before and After the Great Recession

As argued earlier, tighter labor markets may reallocate workers from lower-paying to higher-paying firms, thereby compressing the worker-weighted distribution of firm wage premia. This section examines the reallocation channel.

In a first step, Panel A of Table II extends the variance decomposition of Card, Heining, and Kline (2013) to the post-recession period. We decompose the variance of log wages into worker, firm, and residual components separately for the 2003-2010 and 2010-2017 periods. Card, Heining, and Kline (2013) document that the worker-weighted variance of firm wage premia increased steadily throughout four consecutive 7-year windows (85-91, 90-96, 96-02, 02-09), accounting for roughly one-third of the rise in overall wage inequality. Our findings reveal a clear reversal of this trend after the Great Recession. The worker-weighted variance

of firm wage premia declined from 0.051 in 2003-2010 to 0.043 in 2010-2017, and the share of residual wage variance attributable to firm effects fell from 22% to 17%.

Notably, this reversal occurred even though the pooled variance of residual log wages was higher in 2010–2017 (0.252) than in 2003–2010 (0.231). This pattern arises because the increase in wage dispersion between 2003 and 2010 was larger than its decline between 2010 and 2017 (see also Panel A of Figure I). The higher overall variance also helps explain why both the variance of worker fixed effects and the covariance between worker and firm fixed effects are larger in the post-recession period.

Changes in the worker-weighted distribution of firm wage premia can arise through two distinct channels: changes in firms' pay premia themselves, or the reallocation of workers at the tails of the pay distribution toward firms paying premia closer to the mean. To isolate the reallocation channel, we next focus on changes in the worker-weighted distribution of firm wage premia within the 2003-2010 and 2010-2017 periods. Because wage premia are fixed for firms within periods, any changes in their mean or dispersion must reflect selective firm entry and exit or worker reallocation across continuing firms. Appendix D clarifies the link between across-period and within-period changes in the distribution of firm wage premia.

Between 2003 and 2010, average firm wage premia declined by about 2.6 percent (Panel B, Table II), indicating a shift of workers toward lower-paying firms. At the same time, dispersion increased: the standard deviation of firm wage premia rose by 0.018 (8%), with particularly strong widening in the lower half of the distribution. The gap between the 50th and 10th percentiles increased by 0.035, or 11%. As a result, in 2010, relatively more workers were employed in firms paying low or high premia, and fewer at firms paying near the mean.

The post-recession period presents a stark contrast. Between 2010 and 2017, the standard deviation of firm wage premia fell by 0.008 (around 4%), reflecting a reallocation of

workers toward firms paying premia closer to the mean. This compression was concentrated in the lower half of the firm wage premium distribution; dispersion at the top changed little.

Figure VIII illustrates these divergent reallocation patterns more directly. The figure groups workers into deciles based on their baseline firm wage premia (2003 in Panels A, C, and E; 2010 in Panels B, D, and F) and plots changes in full-time employment over the subsequent seven years. While overall full-time employment remained relatively stable between 2003 and 2010 (as shown in Panel B of Figure VI), there were notable shifts in employment across deciles: full-time employment expanded sharply among firms in the bottom two deciles of the wage premium distribution and contracted among higher-paying firms.

This pattern reflects both selective worker entry and exit and movements up and down the firm wage ladder among incumbent workers (i.e., workers employed in both 2003 and 2010). In Panel A of Figure VIII, dark bars capture net employment changes due to worker entry and exit, while light bars capture movements of incumbent workers. Incumbent workers, on average, moved down the firm wage ladder during this period, becoming more likely to work in low-paying firms in 2010 than in 2003 (except in the 10% of firms paying the highest wage premia). At the same time, net worker entry was concentrated almost entirely among the 10% lowest paying firms, reinforcing the shift toward the bottom of the firm wage distribution.

The post-recession period looks markedly different. Between 2010 and 2017, full-time employment grew by roughly 8 percent. Incumbent workers moved up the firm wage ladder on average, becoming less likely to work at the 10% lowest-paying firms and more likely to work at higher-paying firms. In addition, net worker entry was positive across nearly the entire distribution of firm wage premia, except for the two top deciles.[12]

[12] These results are robust to excluding the Great Recession years (2008-2010) as well as the years following the introduction of the minimum wage (2015-2017), suggesting that neither event drives the divergent trends in worker reallocation (see Appendix Figure C2.3).

Panels C and D of Figure VIII decompose employment changes into contributions from continuing firms and firms' entry and exit. Before the recession, firm entry and exit accounted for more than half of employment growth among the lowest-paying firms. After the recession, in contrast, employment growth was driven primarily by expansion among continuing firms.

Panels E and F examine sectoral patterns of job creation and destruction. From 2003 to 2010, more than half of net job losses among firms in the top three deciles of the wage premium distribution occurred in manufacturing, while less knowledge-intensive business services (LKBS), often associated with outsourcing (e.g., temporary workers and security services), accounted for more than half of net job creation in the bottom two deciles. This pattern is consistent with widespread outsourcing from manufacturing during this period (see also Section V.D and Panel B of Figure IX). In contrast, between 2010 and 2017, job creation was more broadly distributed across sectors, including manufacturing, knowledge-intensive services (KS; e.g., consulting and finance), and less knowledge-intensive business services.

Finally, Panel C of Table II examines changes in worker-firm sorting within each period. Because firm and worker fixed effects are held constant within periods, changes in the covariance between the two reflect only the differential reallocation of workers across firms (see Appendix D for details). Between 2003 and 2010, low-wage workers with a worker fixed effect below the median and low-skilled workers experienced substantially larger declines in average firm wage premia than high-wage and high-skilled workers: 4.6 versus 0.6 percent for low-wage versus high-wage workers and 3.5 versus 1.2 percent for low-skilled versus high-skilled workers. Thus, the shift toward low-wage firms was more pronounced among low-wage (low-skilled) than among high-wage (high-skilled) workers. Correspondingly, the covariance and correlation between worker and firm fixed effects increased, indicating a stronger assortative matching of workers and firms during this period.

By contrast, between 2010 and 2017, changes in firm wage premia were similar across worker groups. If anything, average firm premia increased slightly for low-wage workers and declined slightly for their higher-wage counterparts. Moreover, the covariance and correlation between worker and firm fixed effects decreased slightly.[13]

These results support the hypothesis that the tightening of the labor market after the Great Recession reduced dispersion in firm wage premia by facilitating worker reallocation from low- to higher-paying firms. They also suggest that tighter labor markets dampen the forces that generate strong assortative matching, consistent with firms relaxing hiring standards to fill vacancies more quickly.

V.D. The Skill Premium Before and After the Great Recession

Figure IV documents a clear reversal in the skill premium: it rose by approximately 3 percentage points between 2003 and 2010, but declined by about 5 percentage points between 2010 and 2017. In this section, we present evidence that the tightening of the labor market after the Great Recession contributed importantly to this reversal.

One mechanism through which tighter labor markets can reduce the skill premium is differential mobility along the job ladder. If firms relax hiring standards when labor markets tighten, low-skilled workers may move up the job ladder more quickly than high-skilled workers. Consistent with this mechanism, between 2003 and 2010, low-skilled workers experienced substantially larger declines in average firm wage premia than high-skilled workers (3.5 versus 1.2 percent, Panel C of Table II). This disproportionate reallocation of low-skilled workers towards lower-wage firms can account for over three-quarters ((3.5 - 1.2) / 3)

[13] This decline in the covariance between worker and firm fixed effects within the 2010-2017 period contrasts with the increase in the covariance across the 2003-2010 and 2010-2017 periods, as shown in Panel A of Table II. Appendix D reconciles these two findings. The appendix shows that an increase in the across-period covariance periods could be driven by an increase in the dispersion of worker effects, whereas any changes in the covariance within periods must be driven by a reallocation of workers to firms.

of the 3-percentage-point increase in the skill premia during this period. In contrast, between 2010 and 2017, average firm wage premia declined equally for high-skilled and low-skilled workers. Hence, low-skilled workers stopped falling down the firm ladder relative to high-skilled workers.[14]

A second mechanism operates through shifts in demand for low-skilled labor relative to high-skilled labor. Specifically, a demand-driven tightening in labor markets might be accompanied by growth in sectors such as construction and consumer-facing services (retail and hospitality), which disproportionately employ low-skilled workers (see Appendix Table C4.1).

Figure IX provides evidence consistent with this channel. Panel A decomposes employment growth in the periods 2003-2010 and 2010-2017 into contributions from seven broad sectors. In the pre-recession period, employment in manufacturing declined, while it increased sharply in less knowledge-intensive business services (LKBS), a pattern consistent with widespread domestic outsourcing (Goldschmidt and Schmieder 2017). Because manufacturing firms pay substantially higher wage premia than LKBS firms (Helm, Kügler, and Schönberg 2025; see also Appendix Table C4.1), these sectoral shifts contributed to workers reallocating to lower-paying firms. As shown in Appendix Figure C4.1, changes in broad sectoral composition (as opposed to worker reallocation across firms within broad sectors) account for 18% and 17% of employment growth in the first and second decile of the firm premium distribution decile during this period, respectively, and 25% of employment losses in the ninth decile.

[14] Table II shows that the overall average AKM firm fixed effect remained stable between 2010 and 2017, despite declines in the mean firm effects for both low- and high-skilled workers. This pattern can be explained by a compositional shift: the share of high-skilled workers—who tend to match with firms that pay higher wage premia—increased from 28% to 36% during this period.

After the Great Recession, the sectoral patterns changed markedly. Between 2010 and 2017, the contribution of less knowledge-intensive business services to employment growth declined substantially, indicating a slowdown in outsourcing. Instead, employment expanded across all major sectors, including less knowledge-intensive consumer-facing services such as hospitality and retail, as well as construction and knowledge-intensive services. Since all sectors contributed roughly equally to employment growth, sectoral shifts played only a minor role in explaining differences in employment growth across the firm wage-premia distribution in the post-recession period (see Appendix Figure C4.1).

Panel B of Figure IX provides direct evidence on outsourcing dynamics. The share of full-time workers employed in temporary agencies or in cleaning, security, and logistics (the measure of outsourcing used by Goldschmidt and Schmieder (2017)) rose sharply between 2000 and 2008, a period during which many job-to-job movers experienced real wage losses (see Figure VII). This trend stalled after 2011, coinciding with a tightening labor market.

To quantify how sectoral shifts affect relative labor demand, we compute changes in demand for low- and high-skilled workers using the approach by Katz and Murphy (1992). Specifically, we construct between-industry demand shifts for skill group $k \in \{L, H\}$ as:

$$\Delta D_{kt} = \sum_{j} \left(\frac{E_{jk0}}{E_{k0}}\right)\left(\frac{\Delta E_{jt}}{E_{j0}}\right) \times 100,$$

where E_{j0} denotes total efficiency-unit employment in (two-digit) industry j in the base year zero, and E_{jk0}/E_{k0} denotes skill-specific employment shares of the industry.

Panel C of Figure IX shows that between-industry shifts favored high-skilled workers both before and after the Great Recession. However, the pace of skilled-biased demand growth slowed markedly after the Great Recession, whereas the relative supply of skilled workers continued to rise at a roughly linear rate (see Figure IV). This deceleration in relative demand, therefore, contributed to the reversal of the skill premium after the Great Recession.

Finally, Panel D of Figure IX provides additional evidence from vacancy data. Using the IAB Establishment Panel, the figure plots vacancies by required education level, indexed to 2003.[15] While vacancies requiring university education grew faster than other vacancies before the Great Recession, the opposite pattern emerged afterward.

These results suggest that tighter labor markets after the Great Recession contributed to the reduction in the skill premium through two reinforcing channels: first, unlike in the pre-recession period, low-skilled workers no longer experienced downward mobility along the firm wage ladder; and second, relative demand for high-skilled labor slowed down relative to earlier periods.

V.E. Firms' Wage-Setting Power Before and After the Great Recession

We next examine whether firms' monopsony power declined as labor markets tightened after the Great Recession, potentially contributing to faster within-firm wage growth. To do so, we focus on workers employed for two consecutive years and estimate linear probability models relating job-to-job mobility between periods t and $t+1$ to workers' log wages in period t. All specifications control for year fixed effects, workers' skill levels, and (two-digit) industry affiliation at baseline. We estimate these models separately for the pre- and the post-recession periods.

In a perfectly competitive labor market, even small wage differences induce workers to move, implying that job-to-job separations are highly sensitive to wages. A more negative relationship between wages and job mobility therefore indicates a higher labor supply elasticity to the firm and lower markdowns from workers' marginal products. Accordingly, a stronger wage–mobility relationship in the post-recession period would be consistent with declining

[15] Firms in the IAB Establishment Panel have been surveyed annually about open positions requiring and not requiring a university degree from 2003 onwards.

monopsony power as labor markets tightened. Column (1) of Table III shows exactly this pattern: wages are more strongly negatively associated with job-to-job mobility after the Great Recession, suggesting that firms' labor supply elasticities increased and monopsony power weakened.

Because workers' wages reflect both firm pay policies and worker-specific characteristics that may independently affect mobility, this specification likely overstates firms' monopsony power.[16] In column (2), we therefore follow Bassier, Dube, and Naidu (2022) and replace workers' wages with firm wage premia, measured by AKM firm fixed effects, and purged of time-invariant worker characteristics. They thus provide a cleaner measure of firm-specific pay policies. To address concerns that estimated firm effects may be noisy, we instrument the firm wage premium with an indicator of whether the firm lies in the bottom or top half of the firm wage premium distribution (column (3); see, e.g., Wald, 1940, or Johnston, 1984).

Using (instrumented) firm wage premia yields more negative coefficients in both periods, aligning with the findings of Bassier, Dube, and Naidu (2022). Importantly, the sensitivity of job-to-job mobility to firm pay remains substantially larger after the Great Recession. Using column (3) as a benchmark, the estimated coefficients of -0.081 and -0.125, combined with average job-to-job transition rates of 8.9% and 9.3% in the two periods, imply that firms' labor supply elasticity increased from 1.81 before the Great Recession to 2.69 afterward.[17] This increase translates into a decline in firms' markdown from workers' marginal

[16] For example, if workers with high worker fixed effects are both more likely to move from job-to-job and to sort into firms paying high wage premia, the coefficients in column (1) will understate the labor supply elasticity to the firm.

[17] Following Manning (2003), we compute the labor supply elasticity to the firm as the sum of recruitment and (absolute) separation elasticity, assuming that the two are equal. Firm markdowns are then computed as $1-1/(1+1/e)$, where e denotes the labor supply elasticity to the firm. We acknowledge that these calculations rely on strong assumptions, including that firms are in a steady state–a condition that might be violated particularly during the 2010–2017 period when labor markets experienced significant tightening. For a detailed discussion of the assumptions needed to infer markdowns from job separation elasticities, see Kline

products from 36% to 27%.[18] Overall, the evidence supports the hypothesis that tighter labor markets after the Great Recession reduced firms' monopsony power and wage markdowns.

V.F. Labor Market Tightness and Wage Inequality: Evidence from Local Variation

The analysis so far highlights three mechanisms through which tighter labor markets may reduce wage inequality: (i) increased job mobility reallocates workers from lower- to higher-paying firms, compressing the distribution of firm wage premia; (ii) tighter labor markets weaken assortative matching between high-wage workers and high-wage firms, reducing the covariance between worker and firm fixed effects; and (iii) labor market tightening may lower the overall skill premium. In this section, we provide more direct evidence on the relationship between wage inequality and labor market tightness, as well as the channels underlying this link, by exploiting cross-commuting-zone variation in changes in labor market tightness between 2010 and 2017.

Panel A of Figure X plots residualized changes in bottom-half wage inequality against residualized changes in log local labor market tightness across commuting zones, with circle sizes proportional to commuting zone employment. It shows a strong negative relationship between changes in labor market tightness and changes in wage inequality at the commuting zone level. Commuting zones that experienced larger increases in tightness also saw more substantial declines in the 50-10 wage gap. Quantitatively, a one-log point increase in local labor market tightness between 2010 and 2017 is associated with a 5.8 percentage-point reduction in the 50-10 wage gap. Over this period, the national 50-10 wage gap fell by roughly

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(2025) or Caldwell, Dube, and Naidu (2026). Our estimates are also close to the median European estimate reported by Sokolova and Sorensen (2021).

[18] The increase in labor supply elasticities after the Great Recession is robust to excluding both the Great Recession years and the period following the introduction of the federal minimum wage (see Appendix Table C2.1). Results are also similar when we use all job separations, including transitions into unemployment or non-employment, as the outcome variable (see Appendix Table C5.1). An alternative instrumentation strategy based on a split-sample AKM estimation also yields similar findings; see Appendix Table C5.2.

six percentage points, while labor market tightness increased by 0.944 log points. This straightforward accounting exercise suggests that rising labor market tightness can account for nearly the entire decline in bottom-half wage inequality observed after the Great Recession.[19]

Panel B shows that the relationship between changes in labor market tightness and upper-tail wage inequality is considerably weaker. This asymmetry reinforces the conclusion that a tighter labor market primarily compresses wages at the lower end of the distribution.

Table IV presents additional evidence by examining how changes in labor market tightness relate to the key contributors of wage inequality—the dispersion of firm wage premia, the degree of sorting of high-wage workers into high-wage firms, and the skill premium. We divide commuting zones into two groups based on whether their increase in labor market tightness between 2010 and 2017 was above the 66th or below the 33rd percentiles of the employment-weighted distribution of regional tightness changes. Commuting zones in the middle tercile are excluded in this exercise. Panel A confirms that commuting zones with larger increases in labor market tightness experienced substantially larger declines in wage inequality, particularly in the lower half of the wage distribution.

Panel B shows that the dispersion of firm wage premia also declined more in strongly tightening commuting zones. Moreover, average firm wage premia rose for low-wage workers in strongly tightening commuting zones but declined in weakly tightening ones. In contrast, firm wage premia for high-wage workers declined in all commuting zones (Panel C). These patterns point to a weakening of worker-firm sorting in response to labor market tightening. Consistent with this interpretation, the covariance and correlation between worker and firm

[19] This calculation extrapolates from regional-level variation to aggregate changes and should therefore be interpreted as a quantitative accounting exercise rather than as a causal decomposition of the aggregate decline.

fixed effects declined more in strongly tightening commuting zones than in weakly tightening ones.[20]

Finally, Panel D shows that the skill premium fell more substantially in commuting zones with stronger increases in labor market tightness. Part of this difference reflects larger improvements in firm wage premia for low-skilled workers relative to high-skilled workers in these areas. Quantitatively, differential changes in firm premia account for about 26% ((0.011 - 0.006) / 0.019) of the larger decline in the skill premium in strongly tightening commuting zones.

The evidence in Figure X and Table IV supports the view that rising labor market tightness after the Great Recession played a central role in reducing bottom-half wage inequality. This effect appears to operate through multiple, mutually reinforcing channels: worker reallocation towards higher-paying firms, reduced assortative matching between workers and firms, and a decline in the skill premium.

VI. Causes of Increases in Labor Market Tightness

What explains the increase in labor market tightness and the shift in relative labor demand towards low-skilled workers after the Great Recession? One important factor is a fundamental shift in the German economy after the Great Recession, from export-led to consumption-driven growth. Unlike the U.S., Germany experienced neither a pre-crisis housing boom nor large household exposure to the subprime mortgage crisis. As a result, German households did not suffer the same sharp deterioration of wealth. At the same time, the Great Recession had only a limited impact on the German labor market, and unemployment rose little (see Figure VI, Panel A). Moreover, German households entered the Great Recession with considerably high

[20] Note that the covariance between AKM worker and firm fixed effects can decline even if their correlation increases, as long as the standard deviation of either component decreases sufficiently. This seemingly counterintuitive pattern appears in column 1 of Table IV and can be explained by a reduction in the standard deviation of firm fixed effects.

savings. Between 2000 and 2008, Germany's average saving rate was 10.4%, compared to 4.0% in the U.S.[21]

The European Central Bank sharply reduced its deposit facility rate from 3.25% in October 2008 to 0.25% by April 2009 (European Central Bank 2026). The rate remained at historically low levels throughout the 2010s, reaching zero percent for the first time in July 2012 and turning negative from June 2014 to July 2022. As the opportunity cost of consumption fell, German households began to dissave and raise consumption. The saving rate declined markedly in the years immediately after the Great Recession and rose again only in 2014, one year after average wages had already begun to grow (see Appendix Figure C6.1).

National accounts data tell a similar story. Private consumption excluding housing expenditure grew by only 0.6% per year on average between 2003 and 2010, but by 1.7% per year between 2010 and 2017 (Figure XI, Panel B). At the same time, the composition of real GDP shifted substantially. Net exports accounted for nearly 40% of real GDP growth between 2003 and 2010 but only around 16% between 2010 and 2017 (Figure XI, Panel A). After the Great Recession, private consumption became the main driver of growth, accounting for nearly 40% of total GDP growth between 2010 and 2017. Additionally, construction—a sector that disproportionately employs low-skilled labor—accounted for more than 10% of GDP growth in this period, while contributing negatively between 2003 and 2010.

Panel B further illustrates a clear shift in the composition of consumption. Between 2010 and 2017, roughly one-third (31%) of the annual consumption growth came from categories associated with less knowledge-intensive consumer services (LKCS) and low-skilled jobs, such as accommodation and hospitality, recreation, and personal care. By contrast, between 2003 and 2010, almost all of the growth in private consumption came from other

[21] For data on Germany's average saving rate, see Destatis (2026a). For the comparable U.S. data, see U.S. Bureau of Economic Analysis (2026).

categories, such as food and clothing. Consequently, higher consumer spending and shifting spending patterns, along with increased construction investment, likely contributed to the rise in relative labor demand for low-skilled workers after the Great Recession.

Panels C and D of Figure XI reinforce this interpretation using additional administrative and survey data from Destatis and PASS. Panel C shows a sharp rise in private consumption overall, especially in hospitality services, beginning around 2010. It also documents a significant rise in gross value added in construction over the same period. Panel D shows that overnight stays in hotels and other tourist accommodations, the share of families dining out at least once a month, and the number of residential building permits all increased noticeably throughout the post-recession period.

These findings suggest that the increase in labor market tightness was at least partly demand-driven and fueled by heightened consumer demand for less knowledge-intensive services and construction. Because these sectors rely disproportionately on low-skilled labor, the evidence in Figure XI also helps explain the slowdown in relative demand growth for high-skilled workers.[22]

A second possible explanation for rising labor market tightness is demographic change and population aging. We explore this possibility in Table V. The table first compares the annual numbers of potential labor market retirees (defined as 60-year-old residents) and potential labor market entrants (defined as 20-year-old residents) before and after the Great Recession. In the earlier period, the two were broadly similar. In the later period, however, potential retirees exceeded potential entrants, as baby-boomer cohorts began to retire. However, increased net international migration of 21-59-year-olds more than offset this excess

[22] Supporting this hypothesis, Appendix Table C7.1 shows that local indicators for demand for construction (such as residential building permits) and low-knowledge services (such as the share of families dining out at least once per month) predict local labor market tightness, vacancies in construction and low-knowledge consumer-facing sectors, and employment in these sectors.

retirement outflow. There is, therefore, little evidence that the increase in labor market tightness after the Great Recession was supply-driven.

Overall, the evidence points to a post-recession increase in labor market tightness that was driven mainly by labor demand, with demographic factors playing at most a secondary role during our main sample period.

VII. Discussion and Conclusion

This paper argues that the dramatic reversal in German wage inequality after the Great Recession was driven by a tightening of the labor market, itself triggered by an unusually strong rise in domestic demand fuelled by excess household savings.

We document five main findings. First, job-to-job transitions and between-job wage growth increased after the Great Recession, especially among workers at the bottom of the wage distribution and those employed in low-paying firms. Second, this increased upward job mobility compressed the distribution of worker-weighted firm wage premia, particularly in the lower half, as workers moved from low-paying firms to firms offering wage premia closer to the mean. Third, assortative matching between workers and firms declined, consistent with firms lowering hiring standards in tighter labor markets. Fourth, the skill premium fell after the Great Recession through two reinforcing channels: faster relative upward mobility of low-skilled workers along the firm ladder, and stronger relative demand for low-skilled workers, driven by increased consumer demand in less knowledge-intensive consumer services and construction. Fifth, tighter labor markets reduced firms' monopsony power and lowered markdowns from workers' marginal products. Evidence exploiting cross-commuting zone variation in changes in labor market tightness during the post-recession period further supports all five mechanisms.

An important question is whether the compression of lower-tail wage inequality since 2010 is likely to persist. Over the decade following the Great Recession, the increase in labor

market tightness appears to have been primarily demand-driven. Looking ahead, however, demographic change and population aging may generate a more supply-driven increase in labor market tightness, especially over the next 5-10 years. Between 2025 and 2035, the number of potential retirees is projected to exceed the number of potential entrants by nearly 400,000 per year, compared with roughly 190,000 over 2010-2017 and a negative 45,000 over 2003-2010.[23] Since similar demographic pressures are affecting many advanced economies (see e.g., Kotschy and Bloom 2023), it will be interesting to understand whether a supply-driven tightening of the labor market has effects on job switching, within- and between-job wage growth, worker reallocation, and wage inequality similar to those generated by the demand-driven tightening observed in Germany after the Great Recession.

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[23] These are own calculations based on Destatis (2026b). The average number of people born in Germany per year between 1965 and 1975 (who will turn 60 between 2025 and 2035) is 1,058,170, while the average number of people born in Germany per year between 2005 and 2015 (who will turn 20 between 2025 and 2035) is 685,433.

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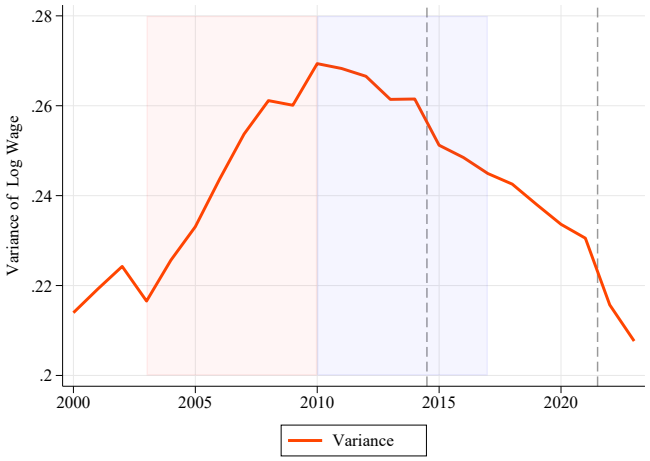
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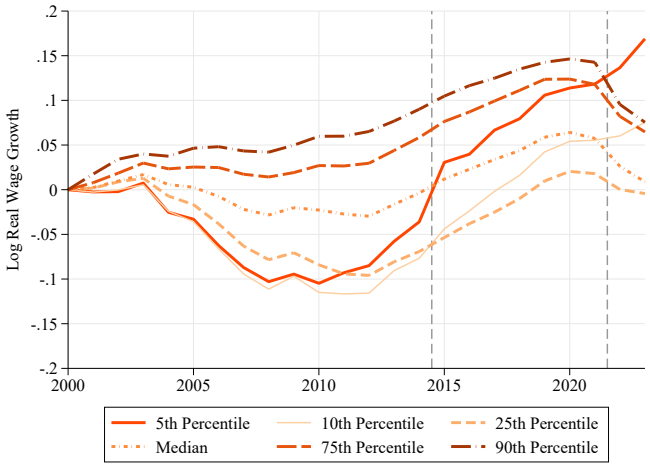
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(A) The Evolution of the Variance of Log Wages



(B) Wage Growth Across Percentiles



(C) Wage Growth Across Percentiles

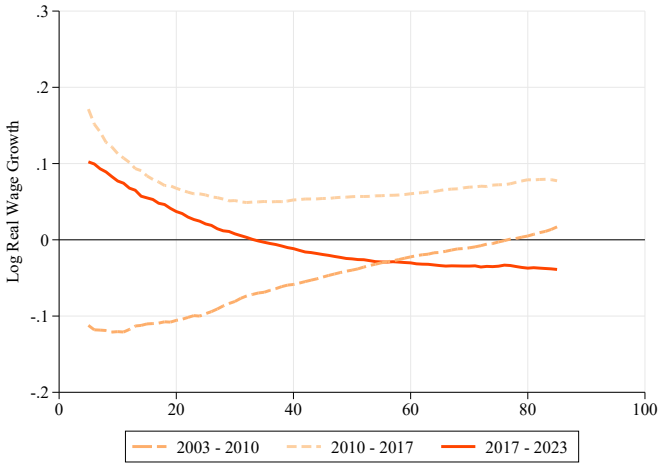
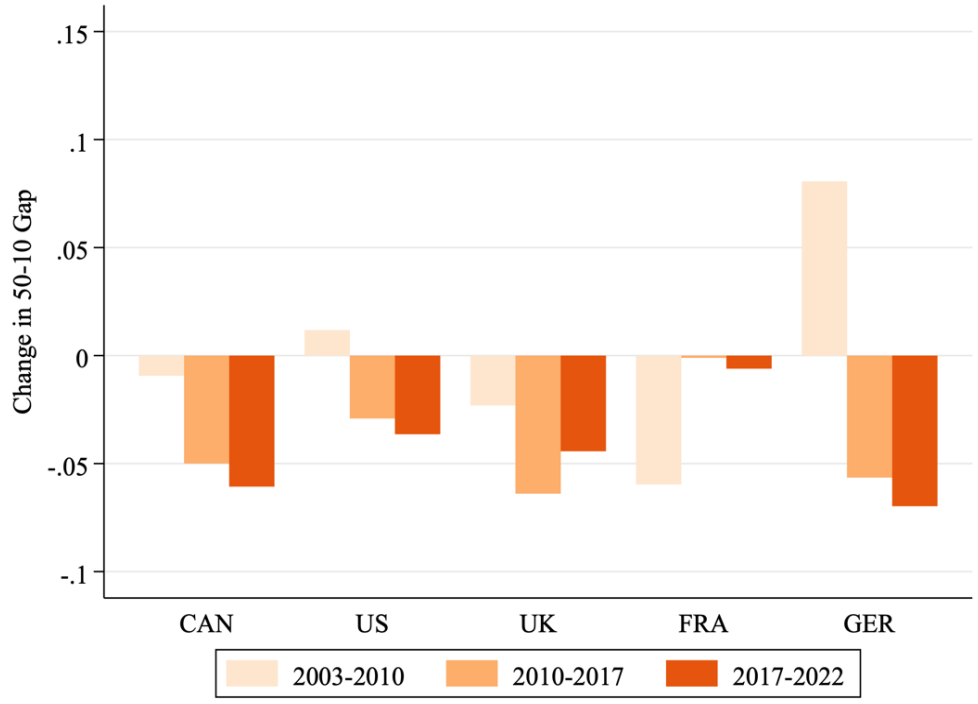


FIGURE I

Wage Inequality in Germany

Panel A shows the evolution of the variance of log wages between 2000 and 2023. Panel B depicts the evolution of (log) real wage growth for selected percentiles of the wage distribution over the same period. Panel C displays (log) real wage growth along the wage distribution separately for three periods, 2003-2010, 2010-2017, and 2017-2023. The shaded regions in Panel A indicate the two main periods analyzed in the paper: 2003-2010, a period of largely unchanged labor market tightness (red shading), and 2010-2017, a period of increasing labor market tightness (blue shading). The vertical lines in Panels A and B indicate the introduction of the federal minimum wage in 2015 and its first major increase in 2022. Source: IAB Employee History (BeH), version 10_08_00.

(A) 50-10 Log Wage Gaps



(B) 90-50 Log Wage Gaps

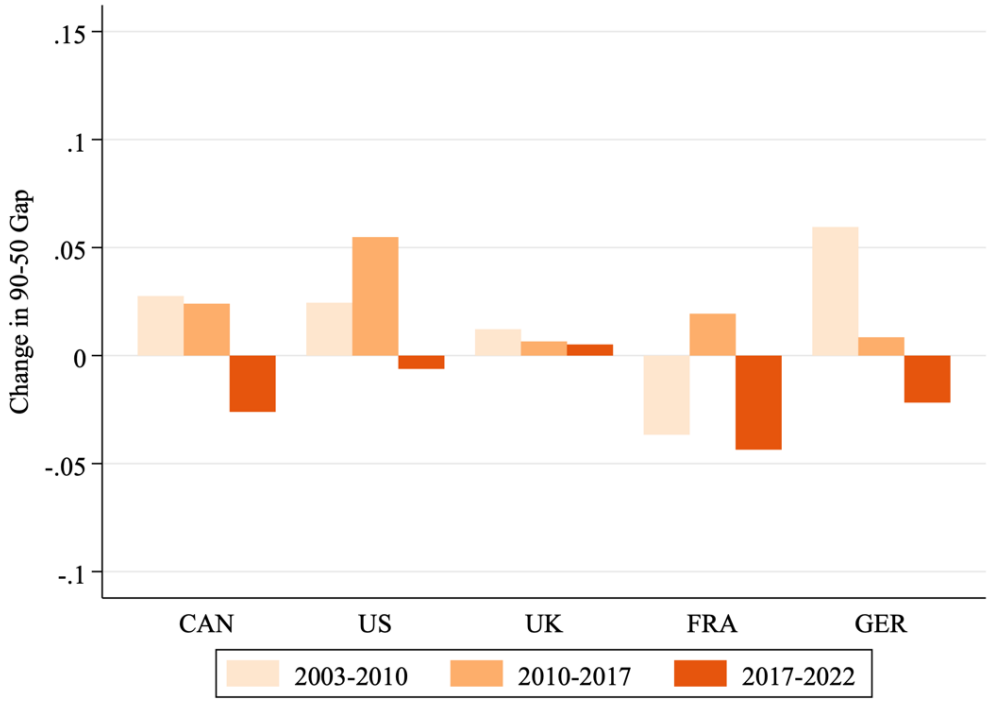


FIGURE II

Germany in the International Context: Changes in Bottom- and Top-Half Wage Inequality Across Selected Countries

The figure shows changes in bottom-half (Panel A) and top-half (Panel B) wage inequality across 5 countries for three periods, 2003-2010, 2010-2017, and 2017-2022. For the UK, the final period covers 2017 and 2021, as data for 2022 were not available. Bottom- and top-half wage inequality are measured by the 50-10 gaps and 90-50 gaps in log wages. See Appendix A4 for details. Sources: IFS Deaton Review Country Studies and IAB Employee History (BeH), version 10_08_00.

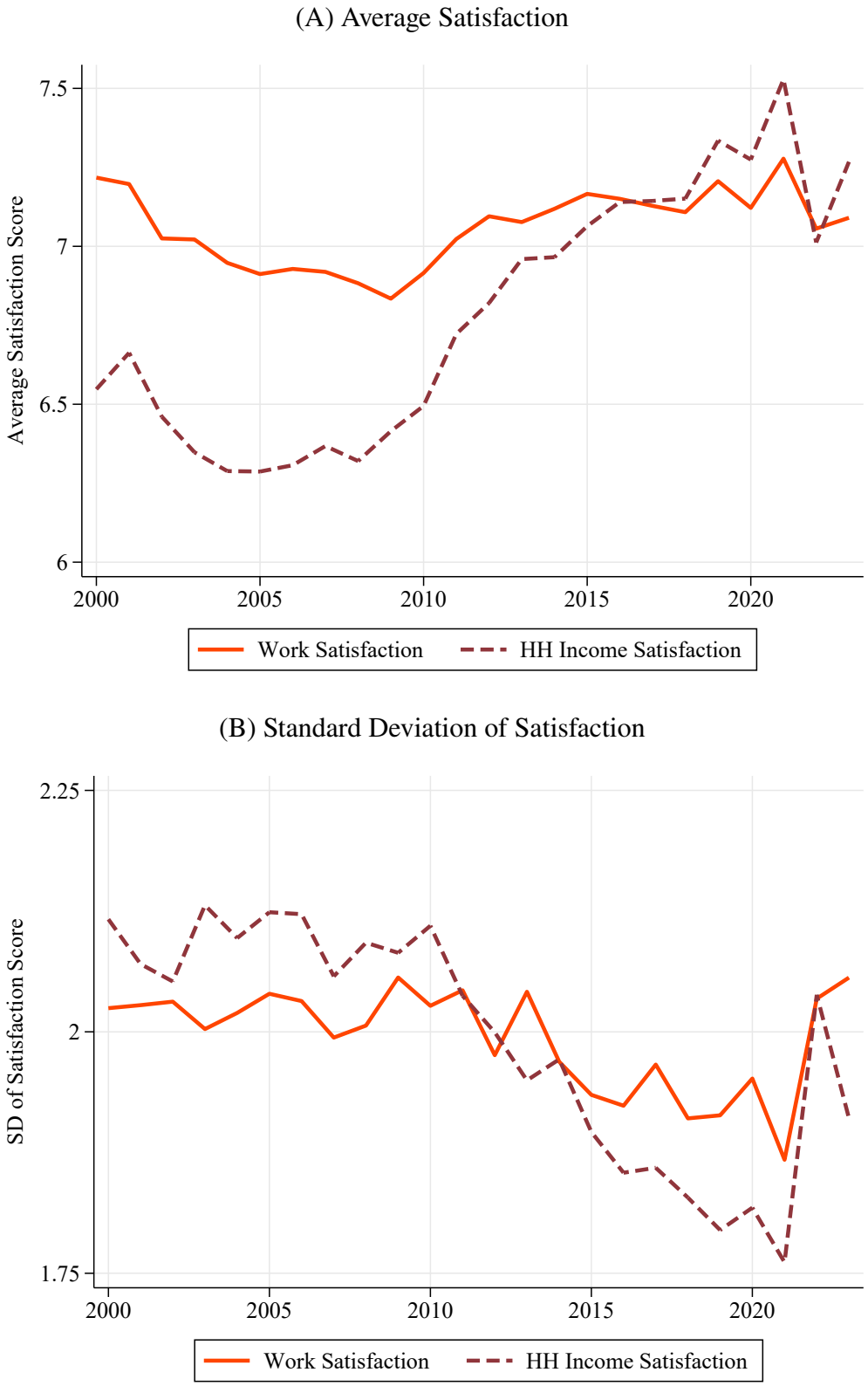


FIGURE III
Satisaction with Work and Household Income

The figure displays trends in self-reported work satisfaction and income satisfaction in Germany from 2000 to 2023, measured on a Likert scale ranging from 0 to 10. Panel A reports mean levels, while Panel B reports standard deviations for both variables. The sample is restricted to full-time workers aged 21 to 60 in private households with positive labor income. All estimates apply survey weights to ensure population representativeness. Source: German Socio-Economic Panel (SOEP).

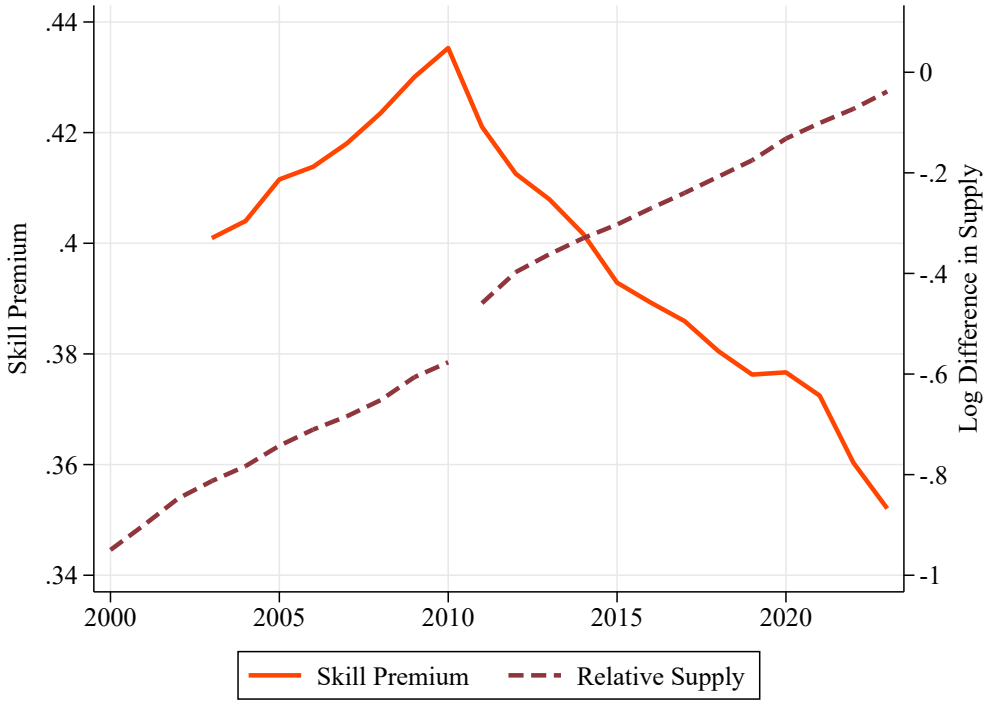


FIGURE IV
The Skill Premium

The figure plots the skill premium (left-hand axis) and the relative labor supply of high-skilled workers (right-hand axis) over time. The skill premium is estimated from a regression of (log) wages on skill and a third-order polynomial in age. Premiums are measured annually for workers at age 40. The relative labor supply of high-skilled workers is computed as the log difference between the labor supply of high- and low-skilled workers, with labor supply measured in efficiency units and part-time and marginal employment spells weighted downward (see Appendix A6 for details). The discontinuous jump in relative labor supply in 2010 reflects a change in the education reporting procedure in the data. High-skilled workers hold a university degree or have completed an apprenticeship and obtained a high school leaving qualification (Abitur). Workers without such qualifications or with missing education information are classified as low-skilled. Source: IAB Employee History (BeH), version 10_08_00.

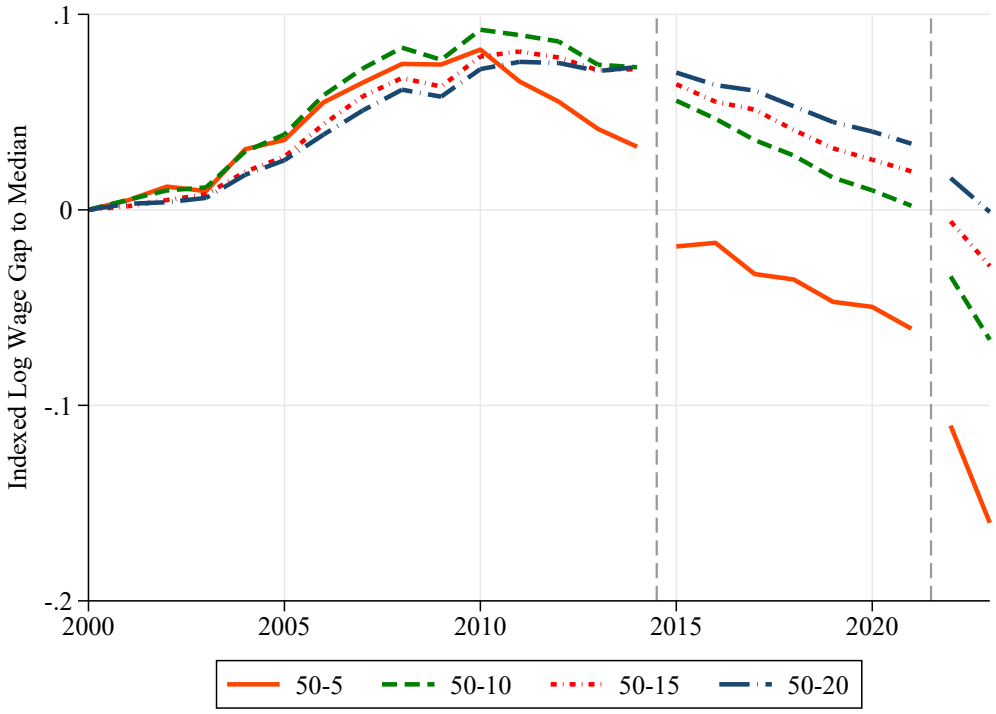


FIGURE V

Trends in Bottom-Half Wage Inequality and the Federal Minimum Wage

The figure shows the evolution of various log wage gaps relative to the median, indexed to 0 in 2000. The vertical lines indicate the introduction of the federal minimum wage in 2015 and its first major increase in 2022. Source: IAB Employee History (BeH), version 10_08_00.

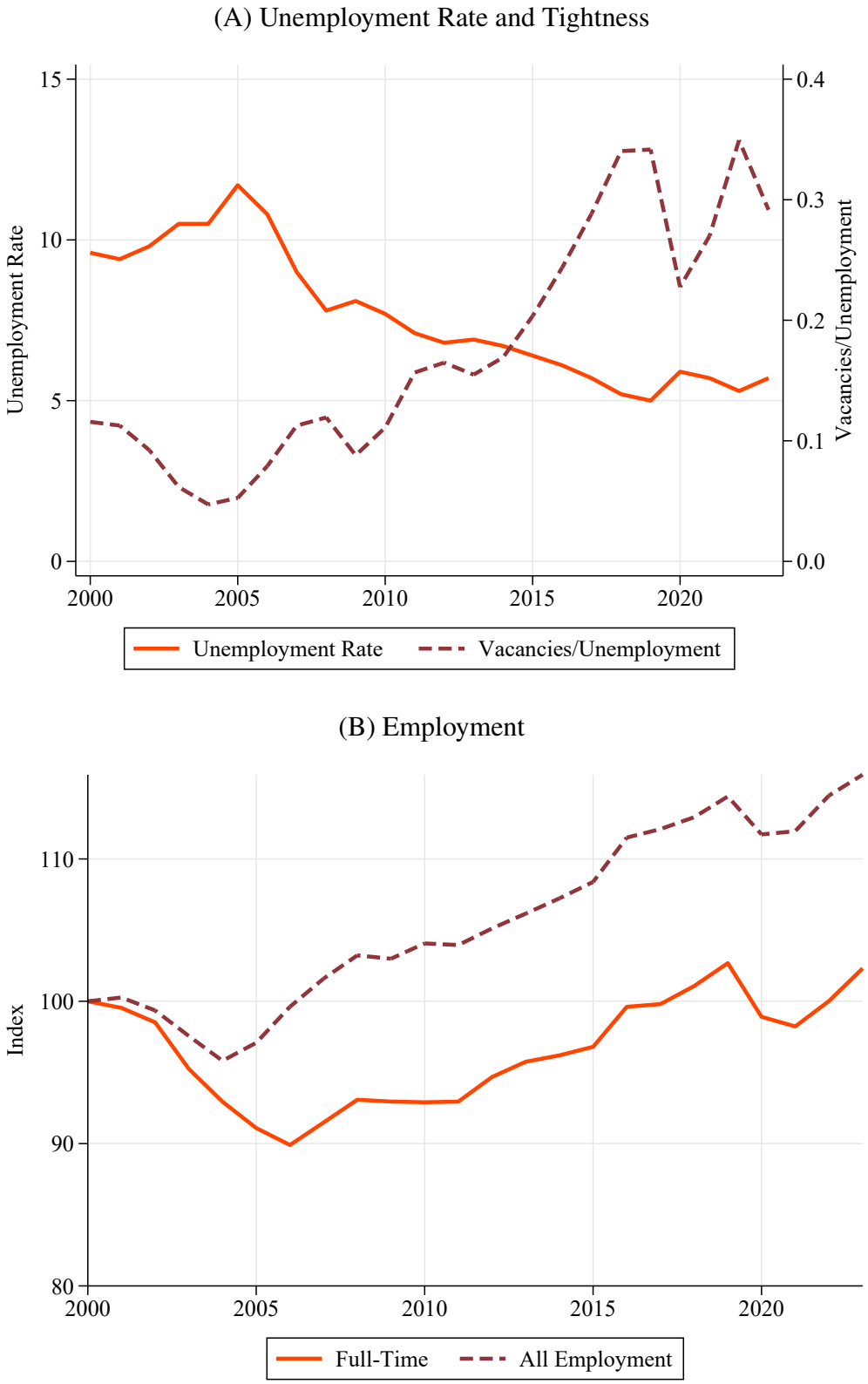
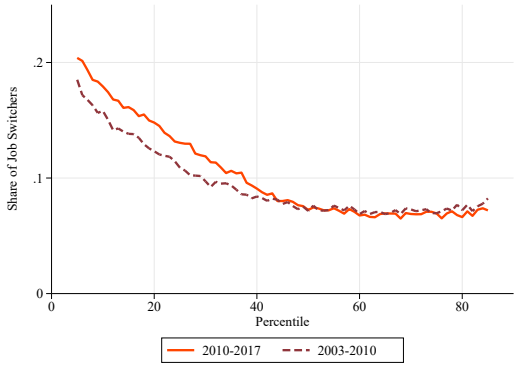


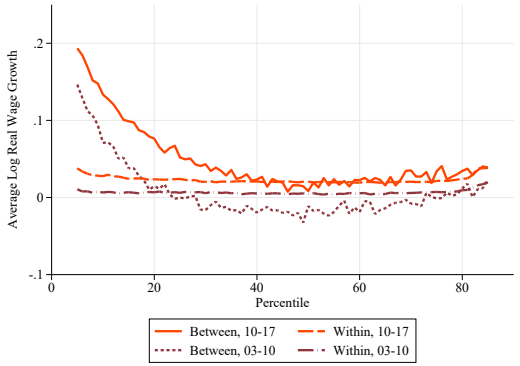
FIGURE VI
(Un)employment and Labor Market Tightness

Panel A depicts the unemployment rate (based on registered unemployment; left-hand axis) and labor market tightness (i.e., the number of registered vacancies divided by the number of registered unemployed workers; right-hand axis). Panel B shows growth in total and full-time employment among men and women relative to 2000. Source: (A) Federal Employment Agency (BA) data on vacancies (Table "Arbeitsmarkt in Zahlen: Arbeitsstellen im Zeitverlauf, December 2023") and unemployment (Table "Arbeitslosigkeit im Zeitverlauf: Entwicklung der Arbeitslosigkeit, July 2024") and (B) Federal Statistical Office (Destatis) data on employment (Table "Core of persons in employment by type of employment, results of the microcensus").

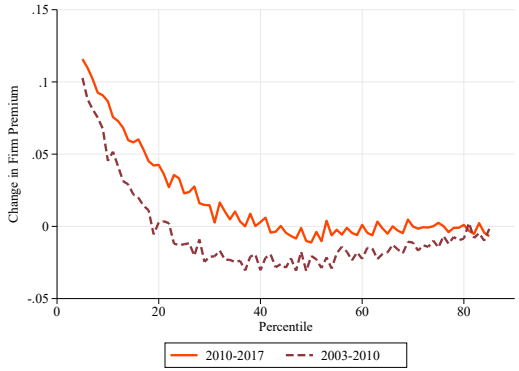
(A) Job Switching Along the Wage Distribution



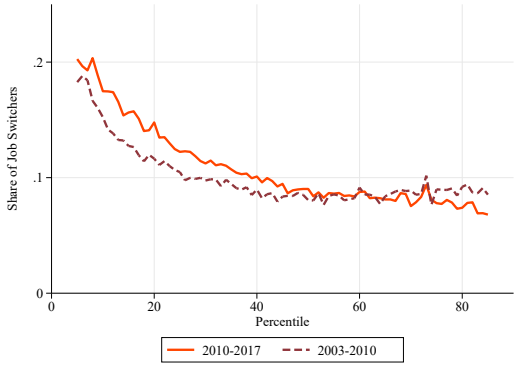
(B) Wage Growth Along the Wage Distribution



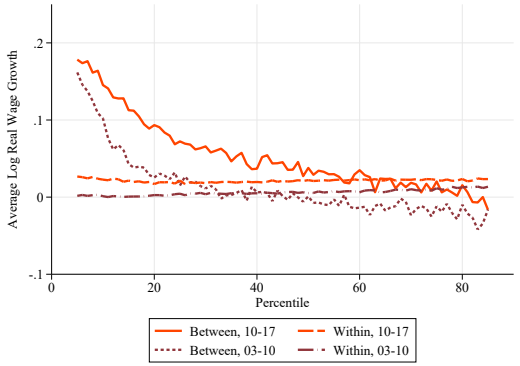
(C) Changes in the Firm Wage Premium Along the Wage Distribution



(D) Job Switching Along the Firm Wage Premium Distribution



(E) Wage Growth Along the Firm Wage Premium Distribution



(F) Share of Direct Switches Along the Firm Wage Premium Distribution

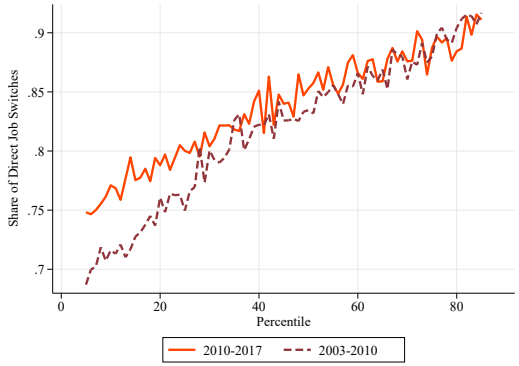


FIGURE VII

Prevalence of and Gains from Job Switching: 2003-2010 (Unchanged Labor Market Tightness) versus 2010-2017 (Increasing Labor Market Tightness)

Panel A shows the share of workers who switch jobs year-on-year along the baseline wage distribution, averaged across the periods 2003-2010 and 2010-2017. Panel B shows annual (log) wage growth along the baseline wage distribution, separately for workers who switch to a new firm and workers who remain employed with the same employer, averaged across the periods 2003-2010 and 2010-2017. Panel C shows the change in the firm wage premium (i.e., the firm fixed effect) for workers who switch firms along the baseline wage distribution, averaged across the periods 2003-2010 and 2010-2017. Panels D and E repeat the exercise but also display annual job-to-job switching rates and annual between- and within-job wage growth along the baseline distribution of firm wage premia. Panel F shows the share of workers who switch jobs directly (i.e., with an employment interruption of less than 30 days) along the baseline distribution of firm wage premia. In all panels, the sample is restricted to workers who are employed in two consecutive years. Source: IAB Employee History (BeH), version 10_08_00.

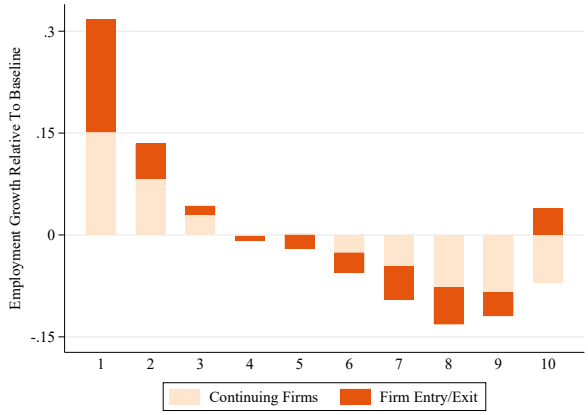
(A) Worker Margin, 2003-2010 (Unchanged Tightness)



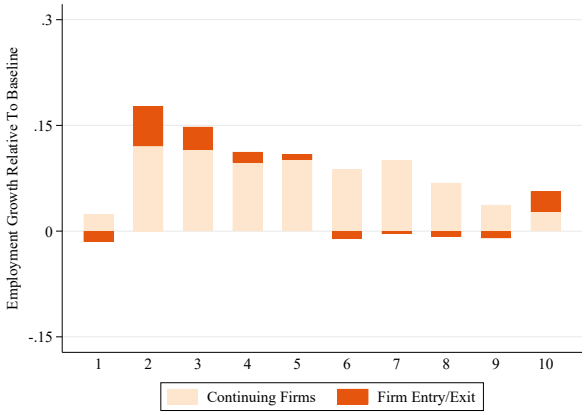
(B) Worker Margin, 2010-2017 (Increasing Tightness)



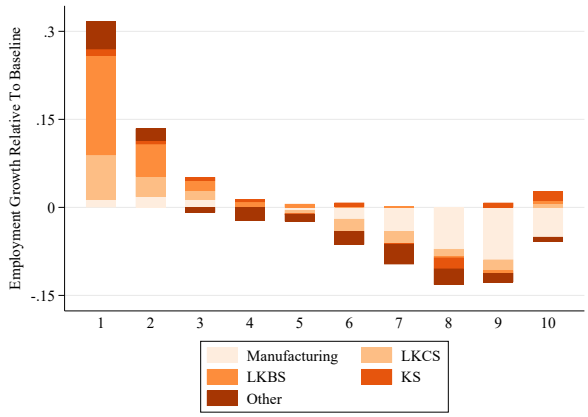
(C) Firm Margin, 2003-2010 (Unchanged Tightness)



(D) Firm Margin, 2010-2017 (Increasing Tightness)



(E) Industry Composition, 2003-2010 (Unchanged Tightness)



(F) Industry Composition, 2010-2017 (Increasing Tightness)

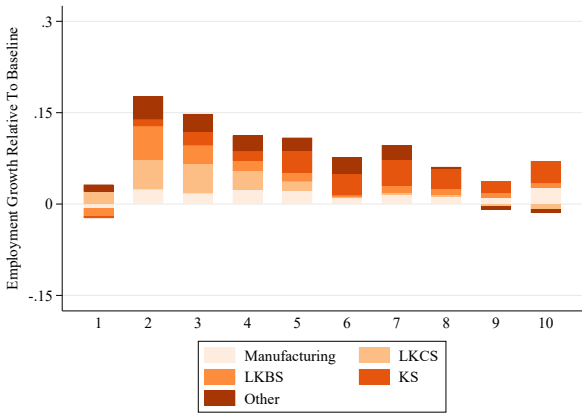


FIGURE VIII
Employment Growth by Firm Wage Premium Bins: 2003-2010 vs 2010-2017

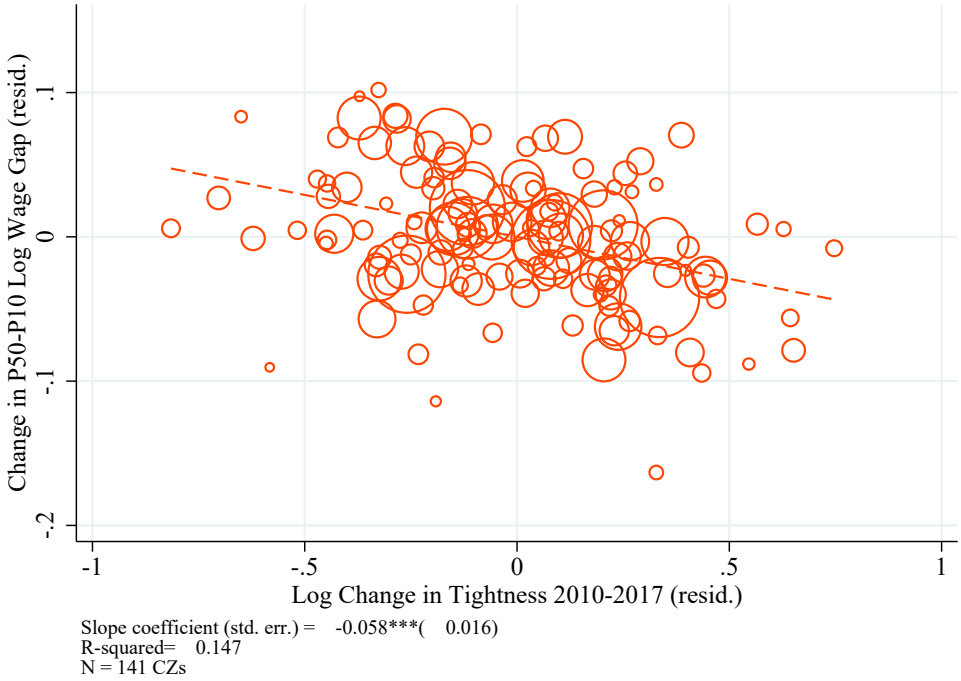
The figure shows full-time employment growth across ten firm wage premium bins for the periods 2003-2010 (A, C, and E) and 2010-2017 (B, D and F). Bins are calculated to be equally-sized at baseline. In Panels A and B, employment growth in each bin is further divided into growth from incumbent workers observed in full-time employment in both the baseline and the end year (Firm Wage Ladder) and growth from joiners and leavers. In Panels C and D, employment growth is divided into employment growth due to continuing firms and entering and exiting firms. In Panels E and F, employment growth is decomposed into 5 broad sectors: Manufacturing, Less Knowledge-Intensive Consumer Services (LKCS), Less Knowledge-Intensive Business Services (LKBS), Knowledge-Intensive Services (KS), and "Other", comprising the Primary Sector, Construction, and Less Knowledge-Intensive Public Services. IAB Employee History (BeH), version 10_08_00.



Figure IX
Employment Growth by Industry, Outsourcing, and Shifts in Labor Demand by Skill

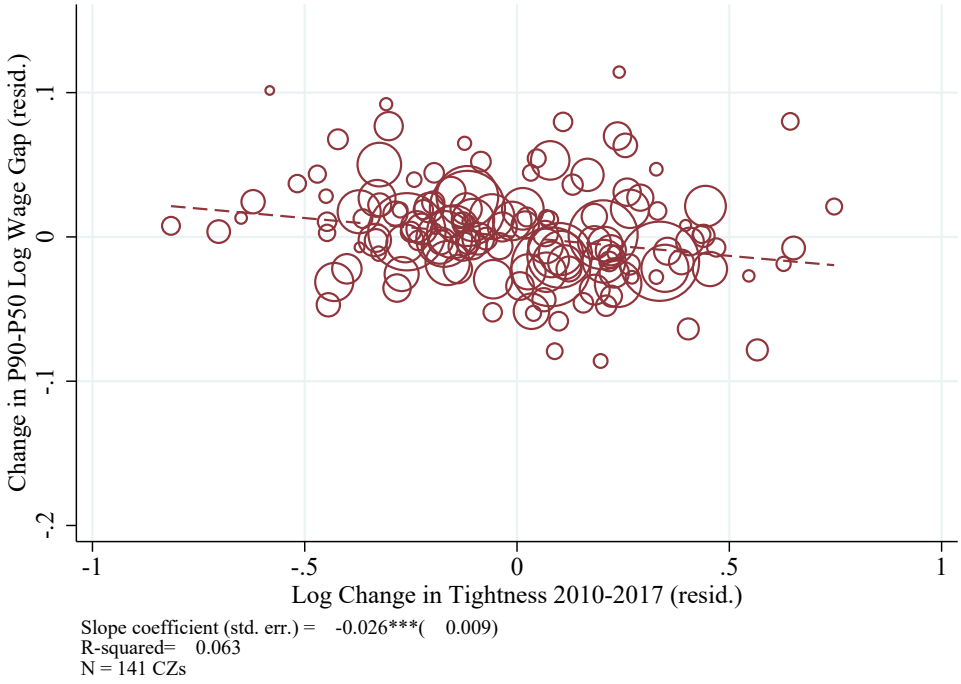
Panel A decomposes growth in full-time employment over the periods 2003–2010 and 2010–2017 into contributions from seven broad sectors: the primary sector, manufacturing, construction, less knowledge-intensive services, and knowledge-intensive services (KS). Less knowledge-intensive services are further divided into consumer services (LKCS, e.g., hospitality and retail), business services (LKBS, e.g., cleaning), and public services (LKPS, e.g., care services). Panel B shows the share of full-time workers employed in temporary agency, cleaning, security, or logistics (TCSL) firms from 2000 to 2019, mirroring the domestic outsourcing measure used by Goldschmidt and Schmieder (2017). Panel C displays between-industry demand shifts for high-skilled relative to low-skilled workers from 2000 to 2019, following Katz and Murphy (1992), and includes a linear prediction of these shifts based on 2000–2010. Panel D plots the evolution of vacancies by required education level (university versus no university) from 2003 to 2019, indexed to 100 in 2003. These data are only available from 2003 onwards. Sources: IAB Employee History (BeH), version 10_08_00 (Panels A, B, and C), and the IAB Establishment Panel (Panel D).

(A) Bottom-Half Wage Inequality (50-10)



Slope coefficient (std. err.) = -0.058***(0.016)
R-squared= 0.147
N = 141 CZs

(B) Top-Half Wage Inequality (90-50)

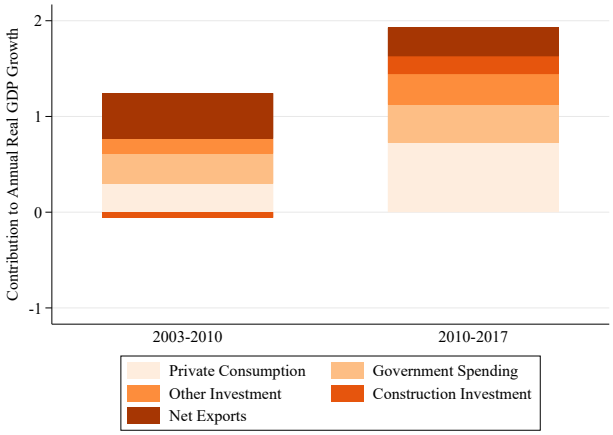


Slope coefficient (std. err.) = -0.026***(0.009)
R-squared= 0.063
N = 141 CZs

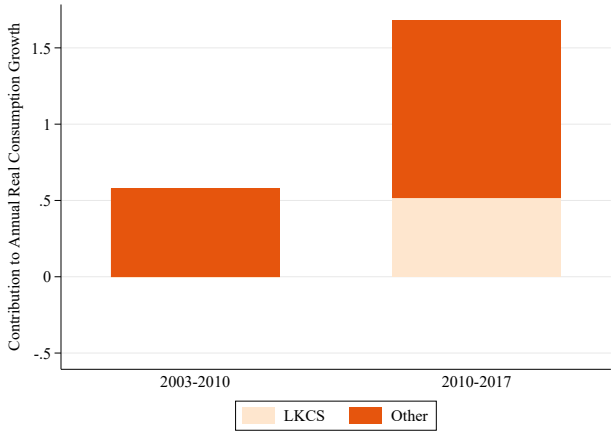
Figure X
Changes in Wage Inequality and Tightness at the Commuting Zone Level, 2010-2017

The figure displays the relationship between residualized changes in wage inequality and residualized changes in labor market tightness between 2010 and 2017 at the commuting zone (CZ) level. Each circle represents a CZ; circle diameters are proportional to the size of the CZ. Panel A plots changes in bottom-half wage inequality, measured as the 50-10 gap in log wages, while Panel B plots changes in top-half wage inequality, measured as the 90-50 gap in log wages. We obtain residualized changes in wage inequality and labor market tightness by regressing these changes on the CZ's baseline industry and skill employment shares, weighting by the CZ's baseline size. The dashed lines depict the predicted linear relationship between residualized changes in wage inequality and tightness. Estimated slope coefficients and heteroskedasticity-robust standard errors are reported below each panel. Sources: IAB Employee History (BeH), version 10_08_00, and administrative data on registered vacancies and unemployment of the German Federal Employment Agency.

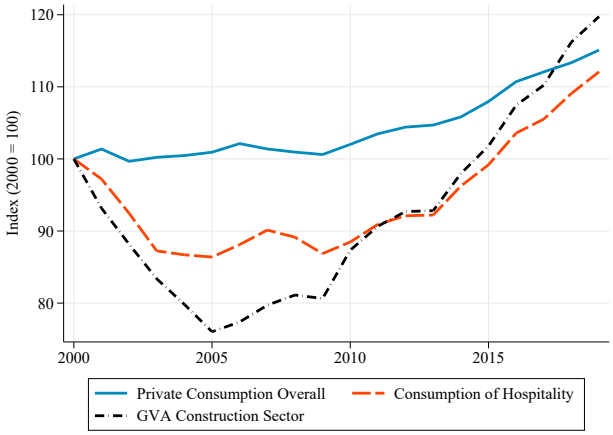
(A) Real GDP Growth



(B) Growth in Consumer Spending



(C) Growth in Private Consumption and Gross Value Added in Construction



(D) Growth in Overnight Stays, Share of Families Eating Out and Building Permits

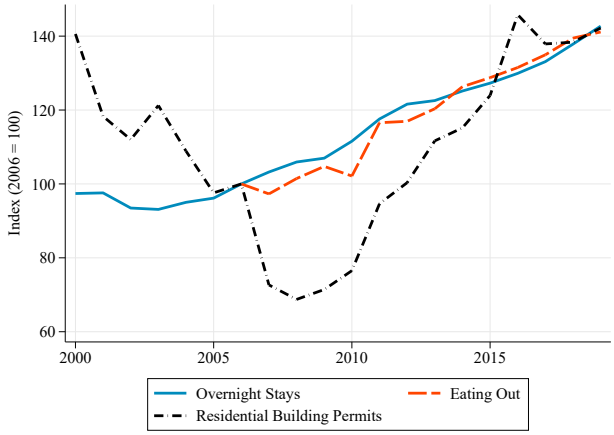


Figure XI
Annual Growth in GDP and Consumption Expenditure: 2003-2010 vs 2010-2017

Panel A decomposes annual real GDP growth over the periods 2003-2010 and 2010-2017 into five components: growth from private consumption, government spending, investment (construction and other), and net exports. Panel B displays annual growth rates in real household consumption expenditure excluding housing over the periods 2003-2010 and 2010-2017, and decomposes it into two components: expenditures associated with less knowledge-intensive consumer services and low-skilled jobs (Accommodation and Hospitality, Recreation, Personal Care, Repair and Maintenance of Vehicles, and Transport Services) and the remainder. Panel C shows the evolution of private consumption, both overall and of hospitality services in particular, as well as the gross value added in the construction sector. Panel D shows the evolution of three indicators associated with increased labor demand for low-skilled workers: overnight stays in hotels or other tourist accommodation, the share of families who eat out at least once per month, and the number of residential building permits. Sources: Panels A and B: Federal Statistical Office (Destatis), data on real GDP (Table 81000-029 "National accounts - Growth contributions to price-adjusted GDP"), and household final consumption expenditure (Table 81000-0120 "National accounts - Final consumption expenditure of households"). Panel C: Destatis (Files: "Volkswirtschaftliche Gesamtrechnungen. Private Kosumausgaben und Verfügbares Einkommen" and "Volkswirtschaftliche Gesamtrechnungen der Länder. Reihe 2, Kreisergebnisse Band 1"). Panel D: Administrative data from the INKAR database, maintained by the Federal Office for Building and Regional Planning, and survey data from the Panel Study Labor Market and Social Security (PASS), maintained by the IAB.

TABLE I

Associations of Local Labor Market Tightness with Job Switching and Wage Growth

	Overall	By Wage		By Firm Pay Premium	
		Bottom 25%	Top 25%	Bottom 25%	Top 25%
	(1)	(2)	(3)	(4)	(5)
Panel A: Job Switching					
	0.003*	0.030***	-0.003	0.025***	-0.004
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Panel B: Log Wage Growth					
	0.002***	0.013***	0.004***	0.009***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Number of Observations	2,287,312	580,983	568,393	563,309	554,887
Panel C: Within-Job Wage Growth					
	0.001**	0.004***	0.004***	-0.001	0.003***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Number of Observations	2,053,334	484,814	526,389	471,427	517,699
Panel D: Between-Job Wage Growth					
Overall	0.004*	0.035***	0.009**	0.037***	0.016***
	(0.002)	(0.003)	(0.004)	(0.003)	(0.005)
Change in Firm Wage Premium	-0.000	0.011***	0.001	0.035***	0.010***
	(0.003)	(0.002)	(0.002)	(0.003)	(0.004)
Residual	0.004***	0.024***	0.007*	0.001	0.006*
	(0.001)	(0.004)	(0.004)	(0.002)	(0.003)
Number of Observations	233,978	96,168	42,003	91,880	37,185
SD Log Labor Market Tightness			0.533		

Notes. The table shows results from individual-level linear regressions of the probability to switch employers between year t and t+1 (Panel A), (log) wage growth (Panel B), within-job (log) wage growth (Panel C), and between-job (log) wage growth (Panel D) on log local labor market tightness in year t, measured as the number of registered vacancies divided by the number of registered unemployed workers in the commuting zone. In Panel D, between-job log wage growth is further decomposed into the change in AKM firm premia and a residual wage component. All regressions control for worker skill (low- vs. high-skilled), two-digit industry fixed effects, and year fixed effects. Standard errors are clustered at the commuting zone level and reported in parentheses. Statistical significance levels are denoted by *** 1%, ** 5%, and * 10%. Column (1) reports regression results for all workers. Columns (2)-(3) report results separately for workers who fall in the bottom or top quartile of the wage distribution in year t. Columns (4) and (5) instead split workers into two groups based on whether the wage premium of their baseline firm is in the bottom or top quartile of the firm wage premium distribution. Estimates refer to workers employed in the base years 2010-2016 (t) and the respective consecutive year (t+1). Sources: IAB Employee History (BeH), version 10_08_00, and administrative data on registered vacancies and unemployment of the German Federal Employment Agency.

TABLE II

Disperision of Firm Wage Premia and Worker Sorting Across and Within Periods

Panel A: Across-Period Comparison

	2003-2010 (Unchanged LMT)		2010-2017 (Increasing LMT)	
	Component (1)	Share (2)	Component (3)	Share (4)
Variance of Log Wages	0.238	1.000	0.254	1.000
Variance of Residual Log Wages	0.231	0.971	0.252	0.992
Variance Decomposition (Residual Log Wages):				
Variance worker FE	0.130	0.546	0.144	0.567
Variance Firm FE	0.051	0.214	0.043	0.169
Variance Residual	0.012	0.050	0.013	0.051
2 times Covariance	0.040	0.168	0.053	0.209

Panel B: Within-Period Comparison: Firm Wage Premia

	2003-2010 (Unchanged LMT) (1)	2010-2017 (Increasing LMT) (2)
Change in:		
Mean	-0.026***	0.000***
	(0.000)	(0.000)
Standard Deviation	0.018	-0.008
50-10	0.035	-0.014
90-50	0.018	0.002
90-10	0.053	-0.012

Panel C: Within-Period Comparison: Sorting

	2003-2010 (Unchanged LMT) (1)	2010-2017 (Increasing LMT) (2)
Change in:		
Mean Firm Effect of Low-Wage Workers	-0.046***	0.002***
	(0.001)	(0.001)
Mean Firm Effect of High-Wage Workers	-0.006***	-0.002***
	(0.000)	(0.000)
Mean Firm Effect of Low-Skilled Workers	-0.035***	-0.006***
	(0.000)	(0.000)
Mean Firm Effect of High-Skilled Workers	-0.012***	-0.005***
	(0.001)	(0.001)
Covariance Worker and Firm Fixed Effects	0.006	-0.004
Correlation	0.070	-0.011

Notes. Panel A reports results from an across-period variance decomposition of residual (log) wages based on the estimation of an AKM model, following Card et al. (2013). Residual log wages are obtained after controlling for a third-order polynomial in age and year fixed effects, both fully interacted with education. The table reports the variance components of worker and firm fixed effects and their shares of the total variance for two periods, 2003–2010 and 2010–2017. Panel B reports within-period changes in the mean and dispersion of firm fixed effects (standard deviation, 50-10, 90-50, 90-10) between 2003 and 2010 and between 2010 and 2017. Panel C reports within-period changes in worker sorting between 2003 and 2010 and between 2010 and 2017, contrasting the within-period change in firm wage premia for low-wage and high-wage workers (AKM worker fixed effects below or above the median) and low-skilled and high-skilled workers. The bottom rows report within-period changes in the covariance and correlation between worker and firm fixed effects. Standard errors for the mean changes reported in Panels B and C are clustered at the individual level and reported in parentheses. Statistical significance levels are denoted by *** 1%, ** 5%, and * 10%. Sources: IAB Employee History (BeH), version 10_08_00.

TABLE III

The Separations Elasticity and Markdowns: 2003-2010 vs. 2010-2017

Panel A: 2003-2010 (Unchanged LMT)

	Own Wage	Firm Wage Premium	Firm Wage Premium (IV)
	(1)	(2)	(3)
Coeff	-0.029***	-0.055***	-0.081***
S.E.	(0.001)	(0.002)	(0.002)
Average Separation Share	0.087	0.089	0.089
Sep Elasticity	-0.335	-0.621	-0.904
Supply Easticity	0.670	1.243	1.808
Markdown	0.599	0.446	0.356
No. of observations	2,559,061	2,472,923	2,472,923

Panel B: 2010-2017 (Increasing LMT)

	Own Wage	Firm Wage Premium	Firm Wage Premium (IV)
	(1)	(2)	(3)
Coeff	-0.041***	-0.094***	-0.125***
S.E.	(0.001)	(0.002)	(0.002)
Average Separation Share	0.091	0.093	0.093
Sep Elasticity	-0.453	-1.005	-1.343
Supply Easticity	0.907	2.010	2.686
Markdown	0.524	0.332	0.271
No. of observations	2,562,295	2,493,334	2,493,334

Notes. The table contrasts the job separation elasticities and implied markdowns in two periods characterized by unchanged and increasing labor market tightness: 2003-2010 (Panel A, unchanged LMT) and 2010-2017 (Panel B, increasing LMT). The first two rows report coefficient estimates and standard errors from individual-level linear probability regressions of the probability of switching employers between year t and t+1 on alternative wage measures in year t. Column (1) uses the worker's own (log) wage, column (2) uses the AKM firm wage premium, and column (3) reports results from an instrumental variables (IV) regression in which the firm wage premium is instrumented with a dummy variable indicating whether the premium falls into the lower or upper half of the firm pay premium distribution. In all regressions, the sample is restricted to workers who are employed in two consecutive years. All specifications control for worker skill (low- versus high-skilled), two-digit industry fixed effects, and year fixed effects. Standard errors are clustered at the firm level and reported in parentheses. Statistical significance levels are denoted by *** 1%, ** 5%, and * 10%. The table also reports the mean annual job-to-job separation rate in the respective sample period ("Average Separation Share"). Separation elasticities are calculated by dividing the estimated regression coefficients by the average share of separations. Following Manning (2003) and assuming that the firm is in steady state, the implied labor supply elasticities to the firm (e) is computed as minus two times the separation elasticity. The markdown is computed using the formula: MD=1-1/(1+1/e). Sources: IAB Employee History (BeH), version 10_08_00.

TABLE IV

Changes in Wage Inequality in Weakly Versus Strongly Tightening Commuting Zones

	Weakly Tightening Regions (1)	Strongly Tightening Regions (2)	Difference (3)	Standard Error (4)
Panel A: Overall Wage Inequality				
Change in:				
Standard Deviation	-0.015	-0.035	-0.020***	(0.005)
50-10	-0.023	-0.072	-0.049***	(0.011)
90-50	0.012	-0.006	-0.017**	(0.007)
90-10	-0.011	-0.077	-0.066***	(0.015)
Panel B: Dispersion of Firm Fixed Effects				
Change in:				
Standard Deviation	-0.005	-0.011	-0.006***	(0.002)
50-10	-0.005	-0.015	-0.010**	(0.005)
90-50	0.009	-0.004	-0.013***	(0.003)
90-10	0.004	-0.018	-0.023***	(0.007)
Panel C: Worker Sorting				
Change in:				
Mean firm wage premium, low-wage workers	-0.008	0.010	0.019***	(0.004)
Mean firm wage premium, high-wage workers	-0.004	-0.003	0.002	(0.002)
Covariance Worker and Firm Fixed Effects	-0.001	-0.005	-0.003***	(0.001)
Correlation	0.002	-0.025	-0.027***	(0.010)
Panel D: Skill Premium				
Skill Premium	-0.041	-0.060	-0.019***	(0.006)
Mean firm wage premium, low-skilled workers	-0.007	0.004	0.011***	(0.002)
Mean firm wage premium, high-skilled workers	-0.009	-0.004	0.006**	(0.002)

Notes. The table compares changes in wage inequality (Panel A), dispersion in firm fixed effects (Panel B), worker sorting (Panel C), and the skill premium and average firm wage premia by skill group (Panel D) across weakly and strongly tightening commuting zones (CZ) between 2010 and 2017. Weakly tightening CZs (35) are defined as those in the bottom tercile of the employment-weighted distribution of changes in labor market tightness across CZs over this period, while strongly tightening CZs (67) are those in the top tercile. CZs in the middle tercile (39) are excluded in this exercise. Changes in log labor market tightness average 0.614 in the bottom tercile and 1.296 in the top tercile. Firm fixed effects are estimated as described in Online Appendix A3. The skill premium is estimated separately for each CZ from regressions of log daily wages on a skill indicator and a third-order polynomial in age; premiums are evaluated at age 40. High-skilled workers hold a university degree or have completed an apprenticeship and obtained a high school leaving qualification (Abitur). Workers without such qualifications or with missing education information are classified as lower-skilled. All measures are computed annually. Standard errors, reported in parentheses, are robust to heteroskedasticity. Statistical significance levels are denoted by *** 1%, ** 5%, and * 10%. Source: IAB Employee History (BeH), version 10_08_00.

TABLE V
Demographic Change and Net Migration

	2003-2010 (unchanged LMT) (1)	2010-2017 (increasing LMT) (2)
Individuals Aged 60	922,466	1,076,089
Individuals Aged 20	967,372	886,592
Ratio	0.95	1.21
Net Migration	32,099	305,405
Ratio (Including Net Migration)	0.92	0.90

Notes. The table shows the number of residents who turn 60 (potential labor market leavers) and 20 (potential labor market entrants) per year, averaged over the periods 2003–2010 and 2010–2017 characterized by unchanged and increasing labor market tightness, respectively. The table also displays the difference in the number of individuals (including German citizens) aged between 21 and 59 who entered and left Germany during the year, averaged over the periods 2003–2010 and 2010–2017 (Net Migration). The table further displays the ratio between potential labor market leavers and entrants, excluding and including net migration. Sources: Federal Statistical Office (Destatis) data on population by age (Columns (1) and (2), based on Table 12411-0005 "Population"), and net migration figures (Table 12711-0006 "Migration between Germany and foreign countries").

Online Appendix — Not for Publication

Labor Market Tightness and the Reversal of Inequality Trends in Germany

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September 2026

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Appendix A Data Appendix

A1 General Preparation Steps

When constructing our sample, we exclude spells with missing location information (about 0.2% of spells) and drop apprenticeship spells, as apprenticeship wages are regulated. Full-time spells with wages below the marginal part-time threshold are reclassified as marginal part-time from 1999 onwards (when such spells are recorded) and dropped prior to that year. A change in reporting practices in 2011 resulted in missing values for the part-time indicator. We address this issue using the imputation procedure of Ludsteck and Thomsen (2016). The change also increased the recorded level of part-time employment, likely due to firms' prior misreporting of some part-time spells as full-time. Following Fitzenberger and Seidlitz (2020), we calculate re-weighting factors for all pre-2012 spells, corresponding to the probability that a spell recorded as full-time is indeed a full-time spell and not a misreported part-time spell. We then apply these weights throughout the empirical analysis for all years preceding 2012.

A2 Wage Imputation

Wages in the IAB Employee History are right-censored at the social security contribution ceiling, affecting about 7% of observations annually. We slightly expand the set of censored observations by lowering the censoring threshold by €4 (in 2015 prices). Table A2.1 reports the share of imputed wages under our baseline procedure (column 1) and under the alternative procedure proposed by Drechsler and Ludsteck (2025), which imputes only wages exactly at or above the statutory ceiling.

To recover a smooth upper tail of the wage distribution, we impute wages above the expanded threshold. Our baseline imputation follows standard practice (Dustmann et al., 2009; Card et al., 2013) and is codified in recent data-preparation guidelines (Stüber et al., 2023). The procedure consists of three steps. First, we estimate Tobit models for full-time workers' daily wages by year, gender, education, and region (former East versus West Germany), controlling flexibly for age and tenure (age, age squared, an indicator for age above 40, interactions of this indicator with age and age squared, tenure, and tenure squared). Predicted values from these models, augmented by a normally distributed error term, provide an initial approximation of wages above the censoring threshold. Second, we construct leave-one-out (LOO) mean wages for workers and establishments using this initial wage approximation. Establishment LOO means are computed as the average wage of all workers employed in the establishment in all

years, excluding the focal year. Worker LOO means are computed as the average wage of the worker, excluding the focal year. These variables proxy for time-invariant components of worker and establishment productivity and are highly predictive of contemporaneous wages. Third, we re-estimate the Tobit model including the LOO worker and establishment means as additional regressors, along with indicator variables for workers and establishments with only a single observation, for which the respective LOO mean is undefined. Final imputed wages are drawn from the predictive distribution implied by this augmented model. Figure A2.1 illustrates the resulting wage distributions for five selected years. The spikes in the censored distributions correspond to the contribution ceilings in East and West Germany, with the latter being located higher up in the distribution.

Because our analysis focuses on the lower half of the wage distribution, our substantive conclusions are largely insensitive to the precise treatment of top-coding. Nevertheless, we assess robustness using the alternative imputation procedure developed by Drechsler and Ludsteck (2025). The authors propose an imputation framework designed to improve model fit near the censoring threshold. Their approach combines three candidate models. The first is a doubly censored Tobit model (similar to our baseline) that additionally censors the lower tail of the wage distribution to stabilize coefficient estimates. The second is a truncated quantile regression model with coefficients estimated near the censoring point. The third is an extension of the truncated quantile regression in which coefficients beyond the censoring threshold are extrapolated using weighted ridge regression. Each model incorporates rich controls, including leave-one-out means to approximate worker- and establishment-level fixed effects. For each censored observation, the authors generate imputations from all three models and select the imputed value that minimizes a local smoothness criterion, operationalized as the sum of absolute deviations of the estimated kernel density in a neighborhood around the censoring limit.

Figure A2.2 compares our baseline results on wage inequality trends with those obtained using the Drechsler–Ludsteck imputations. Panel A reproduces our main Figure I, while Panel B shows the corresponding estimates based on the alternative imputations. As expected, the figures are nearly identical. Wages below the 90th percentile are unaffected, and differences at the 90th percentile are minimal. Figure A2.3 reports analogous comparisons for the skill premium. While the level of the estimated skill premium is approximately 1–2 percentage points lower when using the Drechsler–Ludsteck imputations, the qualitative pattern, a rise up to around 2010 followed by a marked decline thereafter, is unchanged. Finally, Table A2.2 presents across-period AKM variance decompositions estimated using both imputation methods. Although the overall variance of log daily wages is lower under

the Drechsler–Ludsteck imputation, the decomposition results are very similar. In particular, our key finding, that the share of wage variance attributable to firm effects declined substantially during the 2010s, remains robust.

Table A2.1: Shares of Imputed Wages by Procedure and Year

	Own Imputation	Drechsler and Ludsteck (2025)
	(1)	(2)
2000	0.103	0.072
2001	0.108	0.077
2002	0.113	0.074
2003	0.080	0.057
2004	0.082	0.061
2005	0.085	0.062
2006	0.088	0.066
2007	0.093	0.071
2008	0.100	0.075
2009	0.097	0.072
2010	0.097	0.073
2011	0.102	0.077
2012	0.105	0.076
2013	0.103	0.077
2014	0.103	0.070
2015	0.103	0.077
2016	0.101	0.072
2017	0.099	0.070
2018	0.100	0.073
2019	0.097	0.073
2020	0.089	0.064
2021	0.088	0.070
2022	0.097	0.073
2023	0.097	0.073

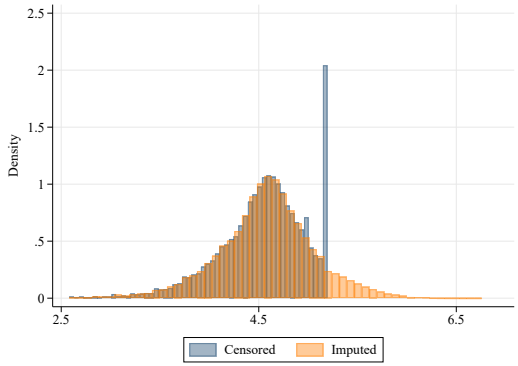
Notes: Column (1) reports the shares of top-coded (and thus imputed) wage observations by year according to our imputation procedure, where the censoring limit is set €4 (2015 prices) below the official social security contribution ceiling. Column (2) reports the shares based on the imputation procedure of Drechsler and Ludsteck (2025), where the censoring limit is set exactly at the official contribution ceiling. *Source:* IAB Employee History (BeH), version 10_08_00.

Table A2.2: AKM-Style Wage Variance Decomposition, Across-Period Comparison, by Imputation Procedure

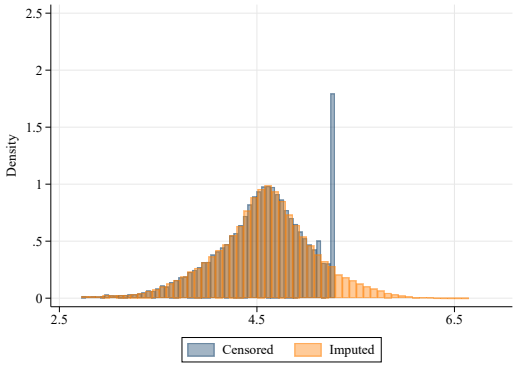
	2003–2010		2010–2017	
	(1) Component	(2) Share	(3) Component	(4) Share
Panel A: Using Own Wage Imputation				
Variance of Log Wages	0.238	1.000	0.254	1.000
Variance of Residual Log Wages	0.231	0.971	0.252	0.992
Variance Decomposition (Residual Log Wages):				
Variance worker FE	0.129	0.542	0.144	0.567
Variance firm FE	0.052	0.218	0.043	0.169
Variance residual	0.012	0.050	0.013	0.051
2 × covariance	0.040	0.168	0.053	0.209
Panel B: Using Wage Imputation by Drechsler and Ludsteck (2025)				
Variance of Log Wages	0.227	1.000	0.240	1.000
Variance of Residual Log Wages	0.220	0.969	0.238	0.992
Variance Decomposition (Residual Log Wages):				
Variance worker FE	0.129	0.568	0.144	0.600
Variance firm FE	0.052	0.229	0.043	0.179
Variance residual	0.011	0.048	0.012	0.050
2 × covariance	0.040	0.176	0.053	0.221

Notes: This table replicates the across-period AKM wage variance decomposition reported in Table II, Panel A, using two alternative wage imputation procedures. Results in Panel A are based on our baseline imputation, while results in Panel B are based on the imputation procedure proposed by Drechsler and Ludsteck (2025). For each period, the table reports the variance of log daily wages, the variance of residual log wages, and the decomposition of the residual variance into the variance of worker fixed effects, the variance of firm fixed effects, the residual variance, and twice the covariance between worker and firm effects. Shares are reported relative to the variance of residual log wages. *Source:* IAB Employee History (BeH), version 10_08_00.

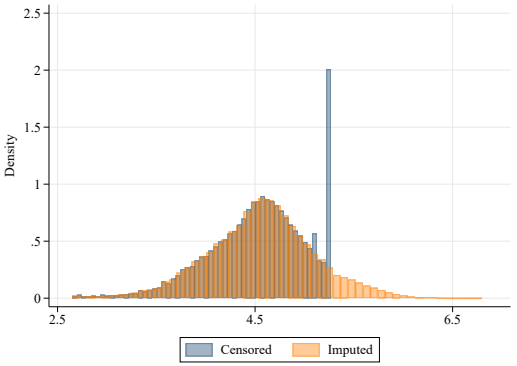
Figure A2.1: Distributions of Censored and Imputed Log Wages by Year



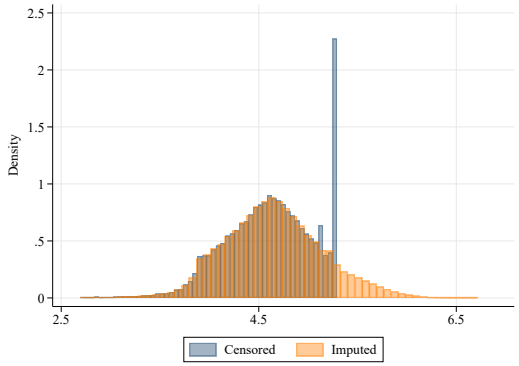
(a) 2000



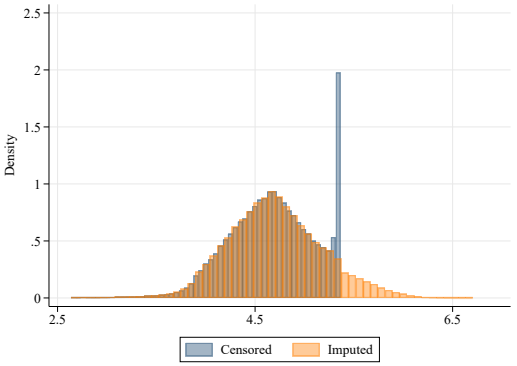
(b) 2005



(c) 2010



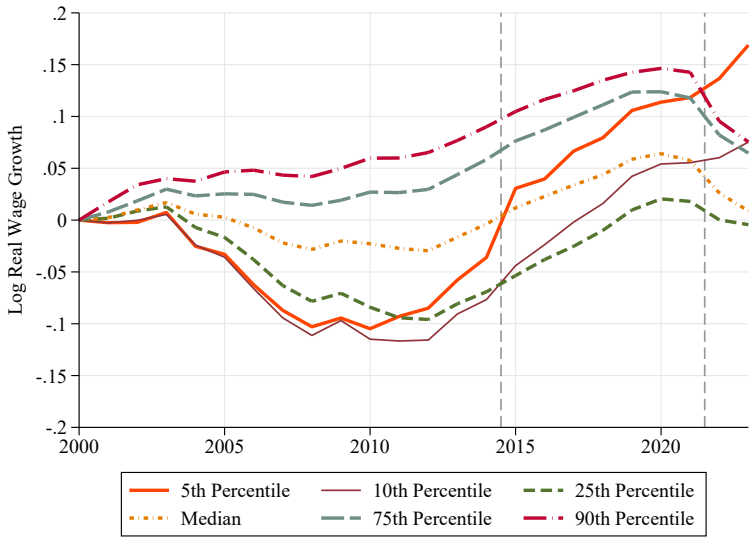
(d) 2015



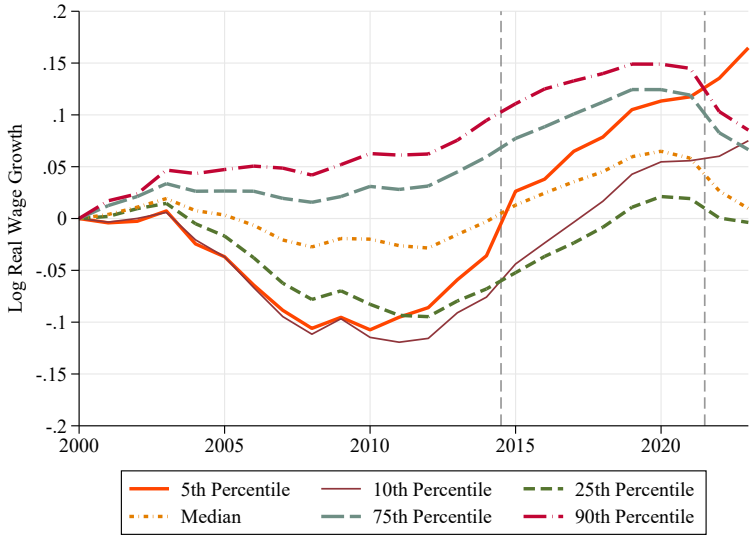
(e) 2020

Notes: The figure shows distributions of censored and imputed log daily wages for selected years based on our baseline imputation. *Source:* Own calculations based on IAB Employee History (BeH), version 10_08_00.

Figure A2.2: Evolution of Wage Inequality in Germany, by Imputation Procedure



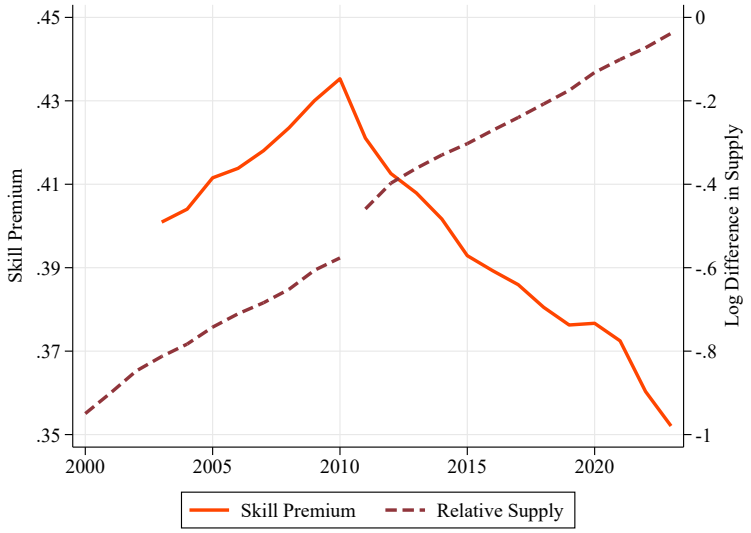
(a) Panel A: Own Imputation Procedure



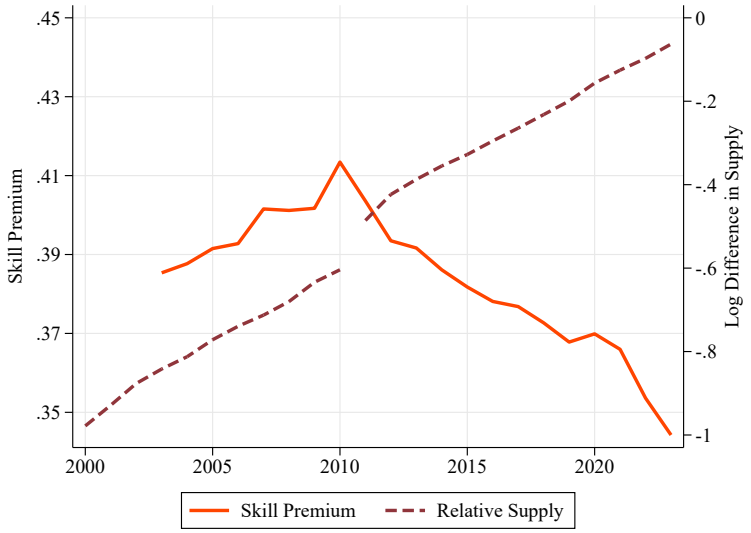
(b) Using the Imputation Procedure by Drechsler and Ludsteck (2025)

Notes: The figure replicates Figure I, comparing the evolution of wage inequality based on our baseline procedure (Panel A) with the evolution based on the imputation procedure proposed by Drechsler and Ludsteck (2025) (Panel B). *Source:* IAB Employee History (BeH), version 10_08_00.

Figure A2.3: Evolution of the Skill Premium, by Imputation Procedure



(a) Own Imputation Procedure



(b) Using the Imputation Procedure by Drechsler and Ludsteck (2025)

Notes: The figure replicates Figure IV, comparing the evolution of the skill premium based on our baseline imputation procedure (Panel A) with the evolution based on the imputation procedure proposed by Drechsler and Ludsteck (2025) (Panel B). *Source:* IAB Employee History (BeH), version 10_08_00.

A3 AKM and KSS Wage Decompositions

We estimate worker and firm wage fixed effects following Abowd et al. (1999) (hereafter AKM), and the associated wage variance decomposition following Card et al. (2013). The model includes as controls a third-order polynomial in age and year fixed effects, both fully interacted with education. Estimation is based on the universe of workers and firms in the BeH data, restricted to a connected set of firms within the relevant estimation window.

To reduce the concern that the estimated variance components may be biased due to limited worker mobility across firms, we complement the baseline results with a robustness check using the method proposed by Kline et al. (2020) (hereafter KSS). This approach requires estimation on a leave-one-out connected set of firms, defined as a set that remains connected after the removal of any single worker. To reduce the computational burden, we first residualize log wages with respect to controls described above, and then estimate the fixed effects and variance decompositions separately for 2003–2010 and 2010–2017, following the recommendations in the computational appendix of Kline et al. (2020).

Table A3.1 summarizes the underlying samples. Columns 1 and 4 report the number of observations and log wage moments for the full data. Columns 2 and 5 describe the connected sets used for the baseline AKM estimation, while columns 3 and 6 report the corresponding statistics for the leave-one-out connected sets required for the KSS estimation. The connected sets retain 93%-97% of workers but substantially fewer firms (75% in the connected sets and 51%–52% in the leave-one-out connected sets), reflecting limited worker mobility in small firms. Average wages increase markedly when moving from the full sample to the leave-one-out connected set, indicating positive selection of workers and firms, while wage dispersion declines as low-wage workers who are more likely to be employed at very small firms drop out.

The results of the AKM and KSS wage variance decompositions are reported in Table A3.2. Columns 1–4 present the AKM results based on the full data universe and closely mirror the corresponding estimates from the 2% sample shown in Table II. Columns 5–8 report findings based on the KSS decomposition. Changes over time are similar for the two methods. Specifically, both decompositions reveal a pronounced decline in the share of wage variance attributable to firm effects across the two periods.

However, there are notable differences in levels across methods. Specifically, in both periods, the firm component accounts for a smaller share of wage variance in the KSS decomposition, while the contribution of worker–firm sorting is substantially larger. This finding is consistent with evidence from other countries (Bonhomme et al., 2023).

Table A3.1: No. of Observations and Summary Statistics for the AKM and KSS Estimation Samples

	2003–2010			2010–2017			2017–2022		
	Full set	Connected set	Leave-one-out connected set	Full set	Connected set	Leave-one-out connected set	Full set	Connected set	Leave-one-out connected set
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: No. of observations									
Worker-years	141,182,796	136,843,362	132,215,073	147,865,752	143,861,514	139,800,800	115,778,822	112,013,087	108,453,052
Unique workers	27,096,315	26,026,156	25,215,905	28,766,350	27,768,452	27,058,037	27,694,724	26,665,927	25,923,331
Unique firms	2,650,352	1,991,471	1,338,056	2,491,288	1,868,514	1,293,615	2,186,749	1,574,600	1,078,902
Share workers retained		0.961	0.931		0.965	0.941		0.963	0.936
Share firms retained		0.751	0.505		0.750	0.519		0.720	0.493
Panel B: Log wage statistics									
Mean	4.586	4.646	4.658	4.614	4.636	4.647	4.685	4.734	4.745
Variance	0.247	0.241	0.236	0.264	0.253	0.253	0.241	0.235	0.232

Notes: The table reports, for each period, sample sizes and log wage moments in three samples: the full sample (columns 1, 4 and 7), the largest connected set of firms linked by worker mobility, corresponding to the samples used in the baseline AKM estimations (columns 2, 5 and 8). and the leave-one-out connected sets required for the KSS bias-corrected estimations (columns 3, 6 and 9). Shares of workers and firms retained are reported relative to the full set in each period. *Source:* IAB Employee History (BeH), version 10_08_00.

Table A3.2: AKM and KSS Wage Variance Decompositions Across Periods

	Standard AKM						KSS					
	2003–2010		2010–2017		2017–2022		2003–2010		2010–2017		2017–2022	
	Comp. (1)	Share (2)	Comp. (3)	Share (4)	Comp. (5)	Share (6)	Comp. (7)	Share (8)	Comp. (9)	Share (10)	Comp. (11)	Share (12)
Variance of Log Wages	0.241	1.000	0.257	1.000	0.235	1.000	0.236	1.000	0.253	1.000	0.232	1.000
Variance of Residual Log Wages	0.232	0.963	0.253	0.984	0.240	1.021	0.228	0.966	0.249	0.984	0.237	1.022
Decomposition:												
Variance worker FE	0.127	0.527	0.144	0.560	0.154	0.655	0.112	0.475	0.130	0.514	0.142	0.612
Variance firm FE	0.050	0.207	0.043	0.167	0.030	0.128	0.042	0.178	0.036	0.142	0.024	0.103
Variance residual	0.012	0.050	0.013	0.051	0.011	0.047	0.022	0.093	0.023	0.091	0.021	0.091
2 × covariance(worker FE, firm FE)	0.043	0.178	0.053	0.206	0.044	0.187	0.052	0.220	0.059	0.233	0.050	0.216
Correlation worker FE and firm FE	0.272		0.339		0.328		0.314		0.377		0.371	

Notes: This table reports AKM-style wage variance decompositions estimated on the universe of social security records for the periods 2003–2010, 2010–2017 and 2017–2022. Columns 1–6 present results from the standard AKM decomposition estimated on workers in the largest connected sets of firms. Columns 7–12 report bias-corrected decompositions based on the method of Kline et al. (2020), estimated on workers in leave-one-out connected sets of firms. Log wages are residualized prior to estimation with respect to age (modeled as a third-order polynomial) and year effects, both fully interacted with education, following the specification in Card et al. (2013) and the procedure recommended in the computational appendix to Kline et al. (2020). Reported shares are expressed relative to the total variance of log wages, including the contribution of the control variables. *Source:* Own calculations based on the IAB Employee History (BeH), version 10_08_00.

A4 IFS Deaton Review Country Studies

To compare inequality trends internationally, we use data from the IFS Deaton Review Country Studies. This broader project aims to analyze trends in various aspects of inequality within a consistent framework across countries (Banks et al., 2024). We focus on four countries: the United States, Canada, the United Kingdom, and France. These countries were chosen for their similar stages of development, relatively large populations, and the availability of relevant data. For example, data on individual earnings for Spain are available only from 2006 (see Anghel et al. (2024)), while data for Italy are available only biannually (see Checchi et al. (2023)).

Below, we summarize the data sources and wage measures used for each country.

- Data for the United States come from Hardy et al. (2024), who utilize the Current Population Survey (CPS) Annual Social and Economic Supplement (ASEC). The wage measure is hourly wages, and the sample includes employees aged 25 to 60.
- Data for Canada come from Foley et al. (2024), who utilize the Canadian Labor Force Survey. The wage measure is hourly wages, and the sample includes employees aged 25 to 59.
- Data for the United Kingdom come from Cribb (2024), who use the Family Resources Survey for the period 1994–2021. The wage measure is hourly wages, and the sample includes employees aged 25 to 60 with strictly positive hourly wages, trimming the top and bottom 1% of the gender-specific distribution. Data are available only through 2021.
- Data for France come from Bozio et al. (2023), who utilize data from the French Labor Force Survey. The wage measure is net hourly wages, and the sample includes employees aged 25 to 60 with strictly positive wages.

We extract the data points from Figure 12 in each paper, which report the 90:10 and 50:10 wage ratios over time. We take logs of these ratios to construct 90-10 and 50-10 log wage gaps, and infer the 90-50 gap as the difference between the 90-10 and the 50-10 gap. We then report changes in these measures over 2003-2010, 2010-2017, and 2017-2022 (2017-2021 for the United Kingdom).

A5 Additional Data Sources

Registered Vacancies (Federal Employment Agency): *Arbeitsmarkt in Zahlen: Arbeitsstellen im Zeitverlauf.* Federal Employment Agency webpage, accessed December 1, 2023. Used in Figure VI.

Unemployment (Federal Employment Agency): *Arbeitslosigkeit im Zeitverlauf: Entwicklung der Arbeitslosenquote.* Federal Employment Agency webpage, accessed July 30, 2024. Used in Figure VI.

Employment (Destatis): *Core of persons in employment by type of employment, results of the microcensus.* Destatis webpage, accessed September 13, 2024. Used in Figure VI.

Real GDP Growth (Destatis): Table 81000-029, *National accounts: Growth contributions to price-adjusted GDP.*Destatis webpage, accessed September 15, 2024. Used in Figure XI.

Household Consumption Expenditures (Destatis): Table 81000-0120, *Final consumption expenditure of households (nominal and price-adjusted).* Destatis webpage, accessed September 13, 2024. Used in Figure XI.

Population by Age (Destatis): Table 12411-0005, *Population: Germany, reference date, age.* Destatis webpage, accessed September 15, 2024. Used in Table V.

Births by Year (Destatis): Table 12612-0001, *Population: Germany, year, sex.* Destatis webpage, accessed September 13, 2024. Used in Table V.

Migration Flows (Destatis): Table 12711-0006, *Migration between Germany and foreign countries: Germany, years, nationality, sex, age.* Destatis webpage, accessed September 15, 2024. Used in Table V.

Household Savings Ratio (Destatis): Table 81000-0009, *Disposable income and saving of households.* Destatis webpage, accessed September 15, 2024. Used in Figure C6.

A6 Labor Supply Measurement

We measure labor supply in efficiency units. To construct these, we first calculate the annual mean real wage by gender, skill, and age (8 groups). The efficiency weight for each group is then the mean real wage in that group, divided by the mean real wage of low-skilled male workers aged 31–35. We then compute the labor supply of each skill group in a given year as the number of days worked in the year, multiplied by (a) the respective efficiency weight and (b) a part-time weight, summed up over all workers in the skill group. The part-time weight equals 1 for full-time spells, 2/3 for part-time spells, and 1/3 for marginal employment spells (i.e., spells with very low weekly working hours).

Appendix B The Macroeconomic Environment and Policies After 2017

While we present descriptive evidence on the evolution of wage inequality and the skill premium through 2023, our core empirical analysis focuses on 2003–2010 and 2010–2017. The period 2017–2023 is characterized by major macroeconomic and policy shocks, many of which are related to the COVID-19 pandemic, which complicates the identification of the effects of labor market tightness on the wage distribution. By contrast, the 2010–2017 period was characterized by a relatively stable macroeconomic environment and low inflation, allowing for a clearer interpretation of the relationship between labor market tightness and wage inequality.

Key developments during 2017–2023 include:

1. **Pandemic-related government support.** In response to COVID-19, Germany relied heavily on its short-time work program (Kurzarbeit), with approximately six million employees in 600,000 establishments participating at its peak (Kagerl and Kruppe, 2024). Additional support included grants and loans to firms. These interventions, largely phased out by mid-2022, likely affected worker selection into employment, firm survival, and labor reallocation.
2. **Inflation and energy prices.** After a decade of low inflation, price pressures rose in 2021 amid global supply disruptions, as in many other countries. Russia's invasion of Ukraine in February 2022 and the subsequent reduction in gas imports from Russia led to a sharp surge in energy prices, further intensifying inflationary pressures.
3. **Inflation compensation payments.** Beginning in October 2022, employers were encouraged to provide tax-free lump-sum payments (Inflationsausgleichszahlungen) of up to EUR 3,000. By Q4 2023, approximately 75% of employers had made such payments, averaging EUR 2,671. As these payments are included in our wage measure and are lump-sum, they disproportionately increase log wages at the lower end of the wage distribution.
4. **Minimum wage increase.** On October 1, 2022, the German government increased the minimum wage from EUR 9.50 to EUR 12.00 (approximately 18% in real terms), representing the first substantial real increase since its introduction in 2015. As shown in Appendix C2, this policy likely contributed to the compression of lower-tail wage inequality during 2017–2023.

Appendix C Additional Findings and Robustness Checks

C1 The Evolution of Wage Inequality Over Time, the Role of Selection into Employment, Workforce Composition and Industry Structure

For completeness, Figure C1.1 plots the evolution of the 50–10, 90–50, and 90–10 log wage gaps (Panels (a) and (b)) over the period 2000–2023. The figure reinforces the central findings of the paper. Between 2000 and 2010, wage inequality increased almost equally in the lower and upper halves of the distribution. By contrast, the subsequent decline in wage inequality was driven almost entirely by compression in the lower half of the distribution, while upper-tail inequality remained broadly stable.

The trends in wage inequality could reflect changes in workforce composition, industry structure, or selection into employment, rather than changes in labor market tightness. We assess these alternative explanations by constructing counterfactual wage distributions that isolate each mechanism.

We implement two complementary approaches. First, we apply the re-weighting method of DiNardo et al. (1996) to evaluate how wage inequality would have evolved if workforce composition had remained constant over time. Specifically, we re-weight observations to hold the joint distribution of age, education, and nationality fixed at its level in the first year of each analysis period. We do not condition on gender, as the share of women among full-time employees remains stable (around 32%) between 2003 and 2017. We also perform an analogous reweighting that holds industry composition fixed (three-digit level).

Second, we address selection into employment along both observable and unobservable factors by creating an artificially balanced panel of workers. For each period, we consider all workers who were observed in full-time employment for at least one year and impute wages for the years they were not employed. Imputed wages are calculated by carrying the last observed wage forward or the first observed wage backward within the period, with adjustments for aggregate wage growth and returns to experience. This approach keeps the composition of workers in employment consistent within each period, thus capturing the broader impact of employment selection.

Table C1.1 summarizes the results. Panel A reports changes in wage inequality between 2003 and 2010, and Panel B reports changes between 2010 and 2017. Column 1 shows the observed change between the first and last year of the period, while columns 2 and 3 report changes under counterfactuals holding worker- and industry composition fixed. Column 4 reports results from the balanced panel, eliminating worker entry and exit.

Panel A shows a pronounced rise in wage inequality between 2003 and 2010, particularly in the bottom half of the wage distribution. The p50–p10 log wage gap increased by 0.081 log points. Holding worker characteristics fixed reduces this to 0.071 log points, and fixing industry composition yields a somewhat larger reduction. The balanced-panel counterfactual produces the largest attenuation, reducing the increase to 0.018 log points. This suggests that changes in selection into employment played an important role in amplifying bottom-half wage inequality during the 2000s. In contrast, top-half inequality is much less sensitive to adjustments for employment selection.

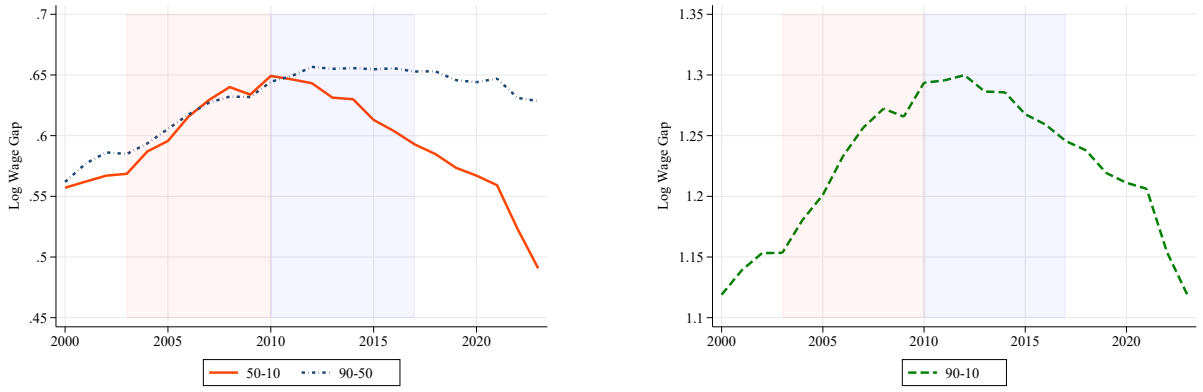
Panel B shows a substantial compression of the wage distribution between 2010 and 2017, driven almost entirely by gains at the bottom. The p50–p10 gap declines by 0.057 log points. Holding worker composition fixed amplifies this decline, while holding industry composition fixed yields a change very similar to the

observed one. The balanced-panel estimates closely track the observed compression. These findings indicate that changes in workforce composition or employment selection play little role in the post-2010 decline.

Overall, these findings suggest that compositional changes and employment selection contributed to rising bottom-half inequality between 2003 and 2010, but explain little of the pronounced compression thereafter. The post-2010 decline in wage inequality is therefore unlikely to be driven by these factors.

Consistent with this interpretation, Figure C1.2 replicates Figure I separately for men and women. Bottom-half wage inequality increased during the 2000s for both groups and began to decline following the Great Recession. Figure C1.3 presents the corresponding comparison for native workers (German nationals) and immigrant workers (non-German nationals). The same pattern emerges: bottom-half wage inequality widened during the 2000s for both groups, then declined as labor markets tightened after the Great Recession. The figures also show that, during the period of rising labor market tightness between 2010 and 2023, real wage growth at the bottom of the wage distribution was particularly strong among women and immigrant workers relative to men and native workers.

Figure C1.1: Evolution of Log Wage Gaps



(a) 50-10 and 90-50

(b) 90-10

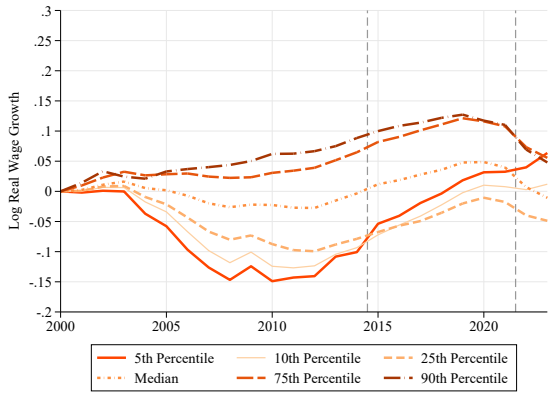
Notes: The figure shows the evolution of the p50–p10 and p90–p50 gaps in log wages (Panel (a)) and the p90–p10 gap (Panel (b)) for full-time employed men and women since 2000. The shaded regions indicate the two main periods analyzed in the paper: 2003–2010, a period of largely unchanged labor market tightness (red shading), and 2010–2017, a period of increasing labor market tightness (blue shading). *Source:* IAB Employee History (BeH), version 10_08_00.

Table C1.1: Counterfactual Changes in Wage Inequality

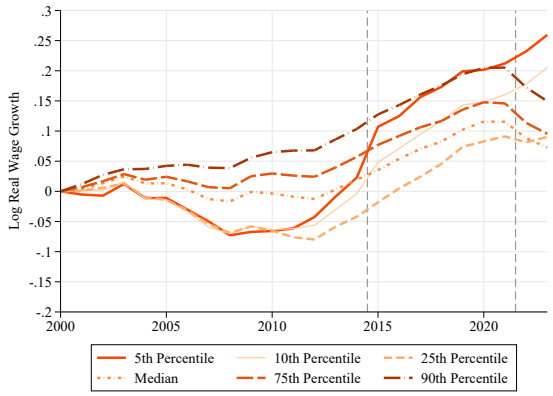
	Observed	DFL: Worker Composition	DFL: Industry Composition	Balanced Panel
	(1)	(2)	(3)	(4)
Panel A: 2003 vs. 2010				
Change in Variance	0.053	0.043	0.045	0.029
Change in 50–10 log wage gap	0.081	0.071	0.056	0.018
Change in 90–50 log wage gap	0.059	0.040	0.055	0.054
Change in 90–10 log wage gap	0.140	0.111	0.111	0.072
Panel B: 2010 vs. 2017				
Change in Variance	-0.024	-0.038	-0.028	-0.019
Change in 50–10 log wage gap	-0.057	-0.073	-0.057	-0.054
Change in 90–50 log wage gap	0.008	-0.011	0.003	-0.002
Change in 90–10 log wage gap	-0.048	-0.084	-0.054	-0.056

Notes: The table reports actual and counterfactual changes in cross-sectional wage inequality measures between 2003 and 2010 (Panel A) and between 2010 and 2017 (Panel B). Column 1 shows observed (actual) changes between the first and last year of each period. Column 2 adopts the re-weighting method of DiNardo et al. (1996) and reports a counterfactual change, holding the joint distribution of age, education, and nationality fixed at its baseline level. Column 3 reports counterfactual changes holding the 3-digit industry shares fixed at their baseline levels. Column 4 reports changes based on a balanced-panel counterfactual in which wages are imputed for non-employment years for all workers observed in full-time employment at least once during the period, thereby accounting for changing selection into employment. *Source:* IAB Employee History (BeH), version 10_08_00.

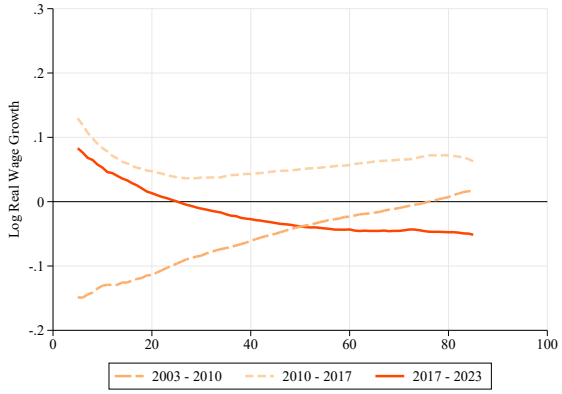
Figure C1.2: Evolution of Wage Inequality by Gender



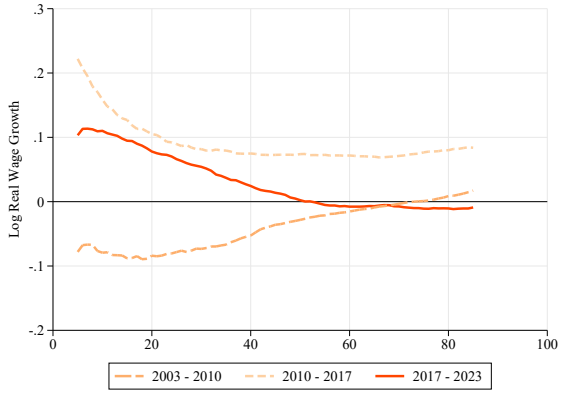
(a) Wage Growth Across Percentiles, Men Only



(b) Wage Growth Across Percentiles, Women Only



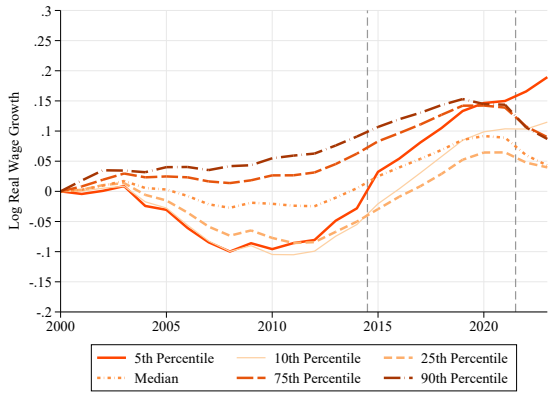
(c) Wage Growth Along the Distribution, Men Only



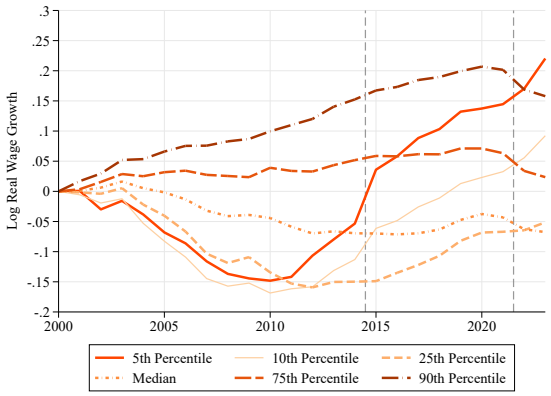
(d) Wage Growth Along the Distribution, Women Only

Notes: The figure replicates Panels B and C of Figure I separately for men and women. Panels (a) and (c) report wage growth across percentiles and changes in log wages along the wage distribution for men, while Panels (b) and (d) report the corresponding results for women. *Source:* IAB Employee History (BeH), version 10_08_00.

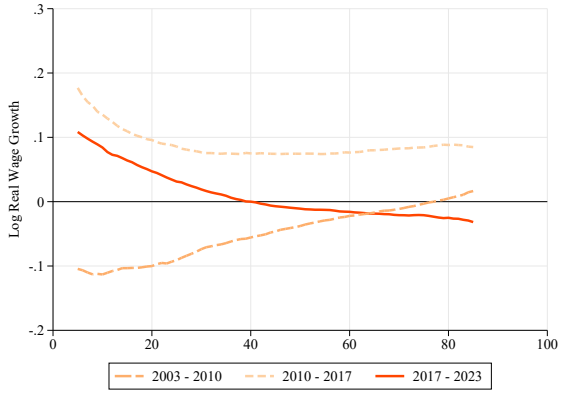
Figure C1.3: Evolution of Wage Inequality by Nationality



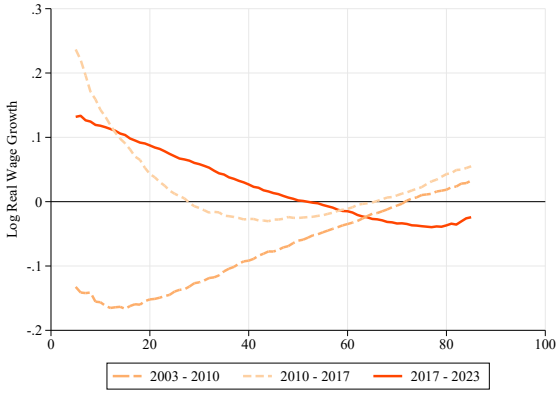
(a) Wage Growth Across Percentiles, Natives Only



(b) Wage Growth Across Percentiles, Immigrants Only



(c) Wage Growth Along the Distribution, Natives Only



(d) Wage Growth Along the Distribution, Immigrants Only

Notes: The figure replicates Panels B and C of Figure I separately for native workers (German nationals) and immigrant workers (non-German nationals). Panels (a) and (c) report wage growth across percentiles and changes in log wages along the wage distribution for native workers, while Panels (b) and (d) report the corresponding results for immigrant workers. *Source:* IAB Employee History (BeH), version 10_08_00.

C2 The Role of the Statutory and Sectoral Minimum Wages

Germany introduced a statutory minimum wage on January 1, 2015. Although this policy had an immediate impact at the very bottom of the wage distribution (Figure V), it alone cannot account for the pronounced decline in wage inequality observed during the 2010s. Instead, the sustained increase in labor market tightness, beginning well before 2015 and persisting throughout the decade, provides a more plausible explanation. This appendix presents supporting evidence for this interpretation.

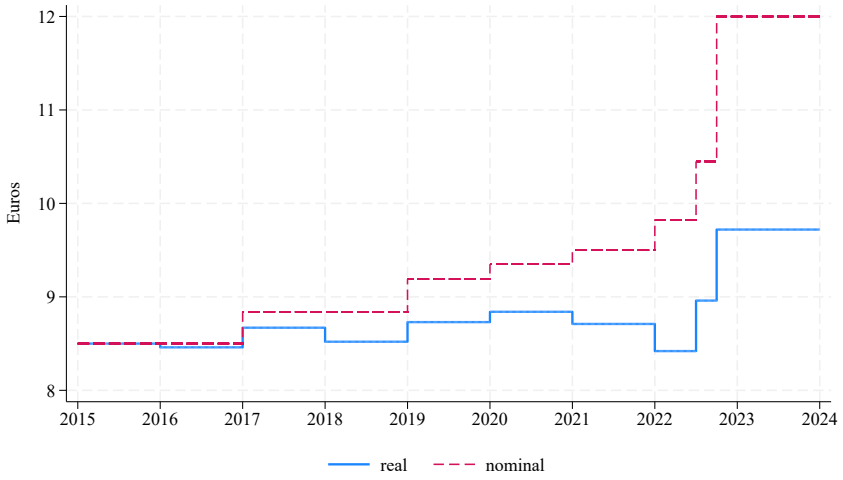
First, the continued compression at the bottom of the wage distribution after 2015 cannot be attributed to subsequent increases in the minimum wage. Panel A of Figure C2.1 shows that the real minimum wage remained largely flat until late 2022, when it rose sharply from €9.82 to €12. Panel B of the figure reinforces this point by plotting the evolution of the ratio of the real minimum wage to the median wage. The figure shows that the minimum wage did not keep up with median wages until the second half of 2022. In contrast, the 10th percentile of the wage distribution rose sharply relative to the median throughout the post-2015 period. This divergence suggests that forces beyond the statutory minimum wage drove the compression of the lower tail of the wage distribution.

To further rule out that our core findings are driven by the introduction of the minimum wage in 2015, we replicate key analyses of our paper for the pre-minimum-wage period. Specifically, we compare the years immediately preceding the introduction of the minimum wage, 2010–2014, to the period preceding the Great Recession, 2003–2007. Figure C2.2 (replicating Figure VII) shows that increased job switching and outsized between-job wage gains at the bottom of the distribution were already present well before 2015. Figure C2.3 (replicating Figure VIII) shows that the reallocation patterns driving changes in the wage distribution were also in place prior to the introduction of the minimum wage. Table C2.1 (replicating Table III) indicates that firms' monopsony power was markedly lower in the 2010–2014 period than in the 2003–2007 period.

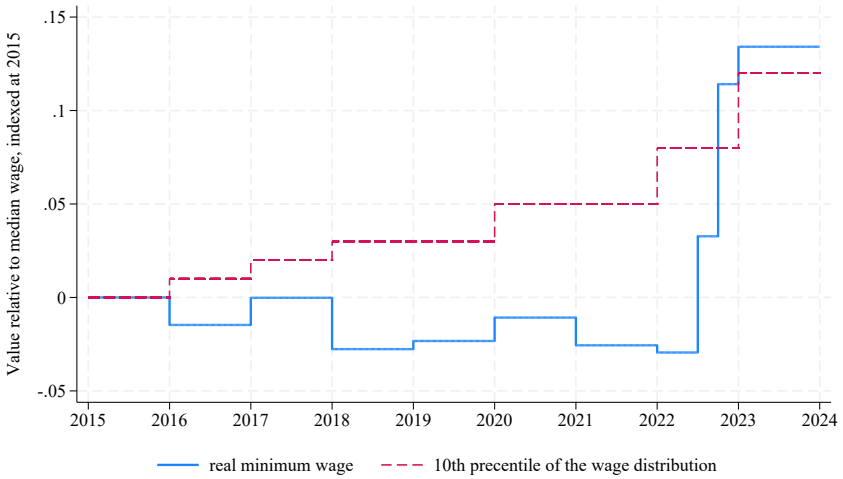
Together, these patterns indicate that the forces reshaping the wage structure predate the introduction of the minimum wage. These findings further emphasize that the differences in job switching, worker reallocation, and changes in firms' monopsony power between the pre- and post-recession periods did not originate solely from the Great Recession itself.

Finally, to assess the role of earlier sectoral minimum wages, Figure C2.4 replicates Figures I and V, excluding sectors in which a sectoral minimum wage was introduced between 2000 and 2014 (around 14% of spells). The resulting trends are nearly identical to those in the full sample, indicating that sectoral minimum wages are not driving the observed compression.

Figure C2.1: Evolution of the Minimum Wage



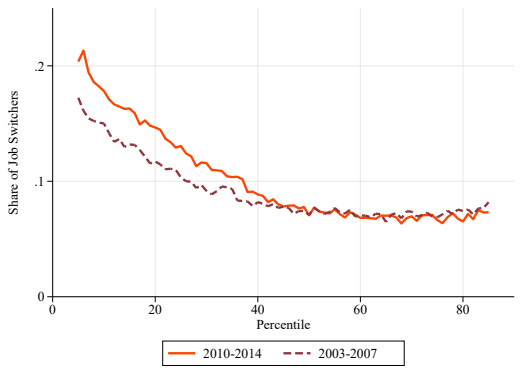
(a) Nominal and Real Statutory Minimum Wage in Germany



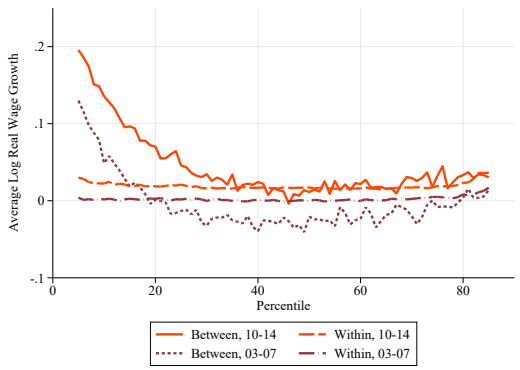
(b) Real Minimum Wage and Lower-Tail Wages Relative to the Median

Notes: Panel A plots the evolution of the statutory minimum wage in Germany from its introduction in 2015, shown in nominal terms and in real terms. Real values are expressed in constant 2015 prices using the Consumer Price Index. Panel B plots the evolution of the real statutory minimum wage and the 10th percentile of the daily wage distribution for full-time workers, both expressed relative to the median daily wage and indexed to 2015. The wage percentiles are computed from the IAB Employee History. *Sources:* Panel A: **?**. Panel B: IAB Employee History (BeH), version 10_08_00, and statutory minimum wage data from the **?**.

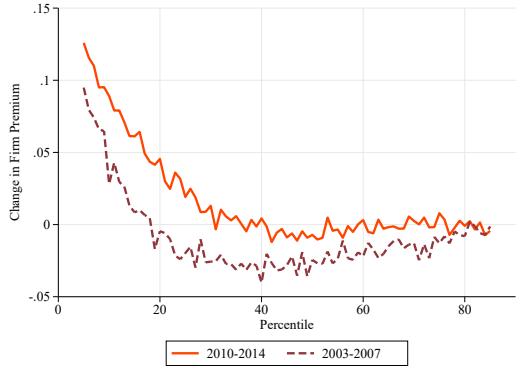
Figure C2.2: Replication of Figure VII (Excluding the Great Recession and the Period After the Introduction of the National Minimum Wage)



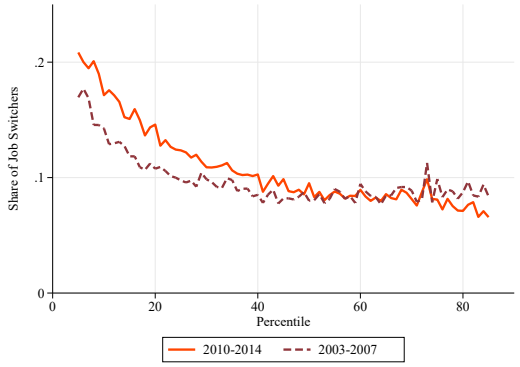
(a) Job Switching along the Wage Distribution



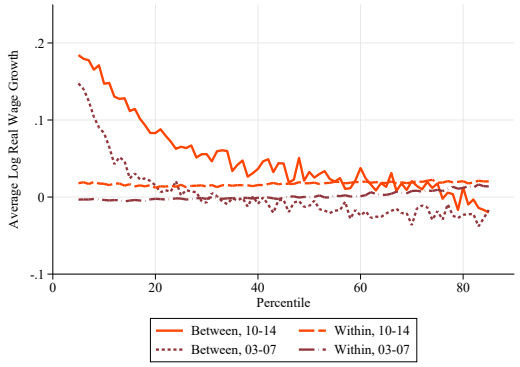
(b) Wage Growth along the Wage Distribution



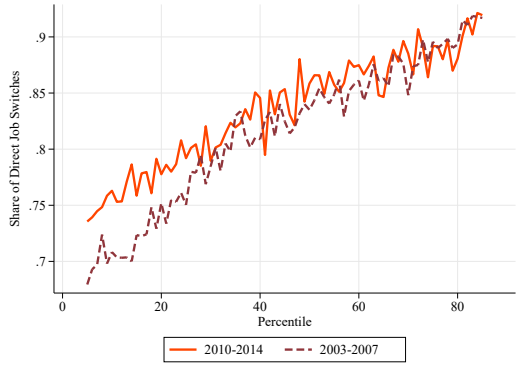
(c) Changes in the Firm Wage Premium along the Wage Distribution



(d) Job Switching along the Firm Wage Premium Distribution



(e) Wage Growth along the Firm Wage Premium Distribution



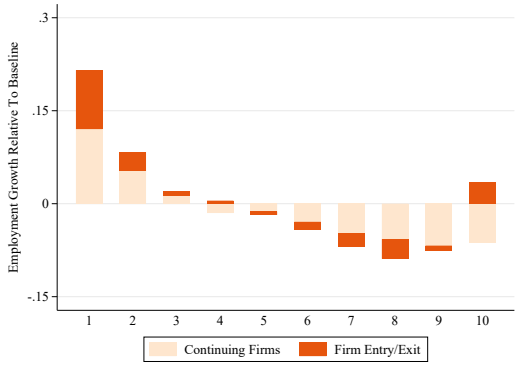
(f) Share of Direct Switches along the Firm Wage Premium Distribution

Notes: The figure repeats the analysis of Figure VII but excludes the years of the Great Recession (2008-2010) and the years after the introduction of the minimum wage (2015-2017) from the sample. *Source:* IAB Employee History (BeH), version 10_08_00.

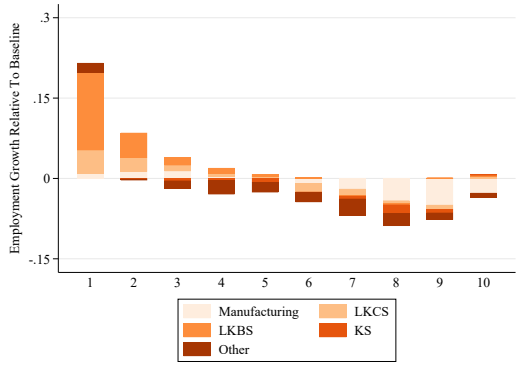
Figure C2.3: Replication of Figure VIII (Excluding the Great Recession and the Period After the Introduction of the National Minimum Wage)



(a) Worker Margin, 2003–2007 (Unchanged Labor Market Tightness)



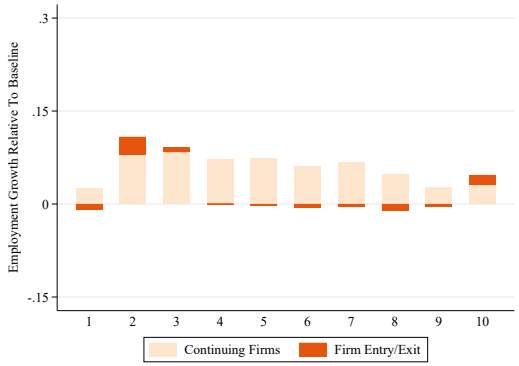
(b) Firm Margin, 2003–2007 (Unchanged Labor Market Tightness)



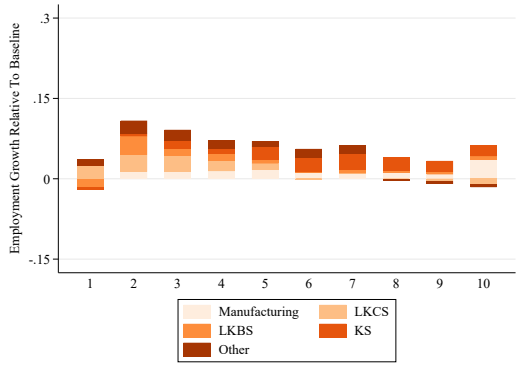
(c) Industry Composition, 2003–2007 (Unchanged Labor Market Tightness)



(d) Worker Margin, 2010–2014 (Increasing Labor Market Tightness)



(e) Firm Margin, 2010–2014 (Increasing Labor Market Tightness)



(f) Industry Composition, 2010–2014 (Increasing Labor Market Tightness)

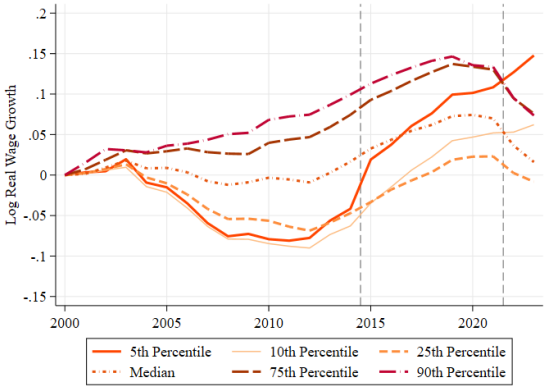
Notes: The figure repeats the analysis of Figure VIII but excludes the years of the Great Recession (2008–2010) and the years after the introduction of the minimum wage (2015–2017) from the sample. *Source:* IAB Employee History (BeH), version 10_08_00.

Table C2.1: The Separations Elasticity and Markdowns: 2003–2007 vs. 2010–2014

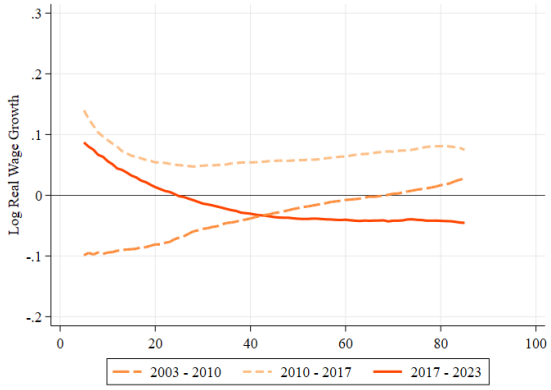
	(1) Own Wage	(2) Firm Wage Premium	(3) Firm Wage Premium (IV)
Panel A: 2003–2007			
Coeff	-0.024	-0.045	-0.068
S.E.	(0.001)	(0.002)	(0.002)
Average Separation Share	0.085	0.087	0.087
Separations Elasticity	-0.283	-0.518	-0.787
Supply Elasticity	0.566	1.037	1.575
Markdown	0.639	0.491	0.388
No. of observations	1,457,009	1,405,537	1,405,537
Panel B: 2010–2014			
Coeff	-0.040	-0.095	-0.125
S.E.	(0.001)	(0.002)	(0.003)
Average Separation Share	0.091	0.093	0.093
Separations Elasticity	-0.444	-1.025	-1.348
Supply Elasticity	0.888	2.050	2.696
Markdown	0.530	0.328	0.271
No. of observations	1,453,043	1,411,015	1,411,015

Notes: The table repeats the analysis of Table III but excludes the years of the Great Recession (2008-2010) and the years after the introduction of the minimum wage (2015-2017) from the sample. *Source:* IAB Employee History (BeH), version 10_08_00.

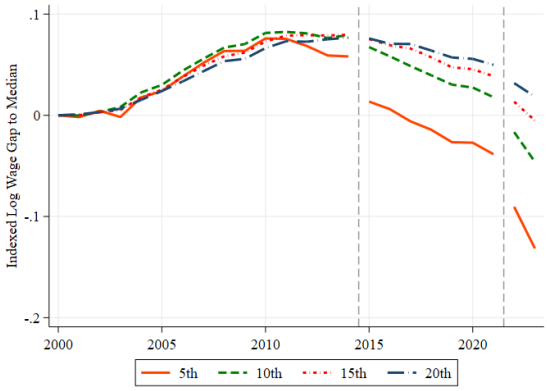
Figure C2.4: Evolution of Wage Inequality Excluding Industries Affected by a Sectoral Minimum Wage



(a) Wage Growth Across Percentiles



(b) Wage Growth Along the Distribution



(c) Impact of the Federal Minimum Wage

Notes: The figure repeats the analyses of Figures I (Panels B and C) and V (Panel C), disregarding 3-digit industries which introduced sectoral wage floors between 2000 and 2014, before the introduction of the federal minimum wage, from the sample (Building Completion, Industrial Cleaning, Sewage and Refuse Disposal, Social Care, Security and Investigation Activities, Labor Recruitment and Provision of Personnel, Building of Complete Construction, Cutting, Shaping and Finishing of Stone, Other Service Activities). *Source:* IAB Employee History (BeH), version 10_08_00.

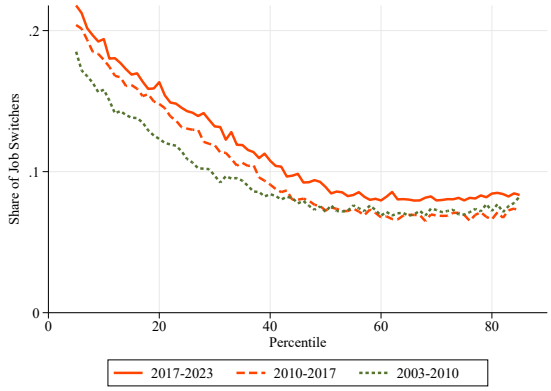
C3 Additional Results for the Period after 2017

This appendix extends selected analyses beyond 2017 through 2023. As discussed in Appendix B, this period was shaped by several major macroeconomic and policy shocks, which likely affected worker selection into employment, firm survival, and wage-setting behavior. Although labor markets continued to tighten after 2017 and wage inequality declined further, particularly at the lower end, the overlap of multiple shocks makes it difficult to isolate the role of labor market tightness.

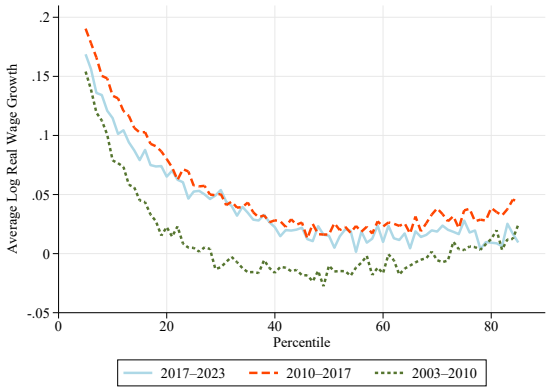
However, for completeness, we document the evolution of the main patterns highlighted in the paper beyond 2017. Job switching and between-job wage gains at the bottom of the wage distribution remained elevated (Figure C3.1, Panels A and B). At the same time, within-job real wage growth slowed relative to 2010–2017 and turned slightly negative in the upper-middle part of the distribution (Figure C3.1, Panel C). Low-wage workers continued to move up the job ladder, while low-wage firms continued to shrink or exit (Figure C3.2). Moreover, monopsonistic markdowns, inferred from wage–separation elasticities, continued to decline somewhat during 2017–2022 (Table C3.2).

Consistent with these patterns, the variance of AKM firm effects declined further, driven by a compression of firm pay premia at the bottom of the distribution, and worker–firm sorting weakened (Table C3.1). Extending Table II in the paper, Table C3.1 also reports the variance of $X\beta$ and its covariances with the worker and firm fixed effects. Here, $X\beta$ denotes the fitted contribution of a third-order polynomial in age and year fixed effects, both fully interacted with education. These variables are meant to approximate the contribution of aggregate wage growth to inequality (Card et al., 2013). The variance of $X\beta$ contributes positively to overall wage dispersion in all three periods. More interestingly, the covariance between $X\beta$ and worker fixed effects changes sign: it is positive during the relatively slack labor market of 2003–2010 but becomes negative as the labor market tightens. This pattern implies that aggregate wage growth increasingly favored low-wage workers (i.e., workers with lower worker fixed effects) during the tight labor market of 2010–2022, reinforcing our paper's central argument. The covariance between $X\beta$ and firm fixed effects remains small and changes little across periods. Note that due to the negative covariance between $X\beta$ and worker fixed effects, the variance of residual log wages is lower than the variance of overall log wages in the 2017-2022 period.

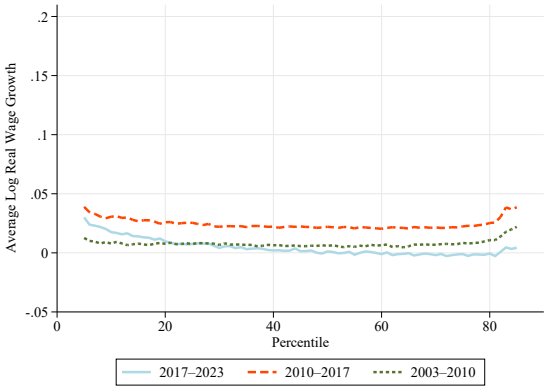
Figure C3.1: Extension of Figure VII to the 2017–2023 Period



(a) Job Switching Along the Wage Distribution



(b) Between-Job Wage Growth Along the Wage Distribution



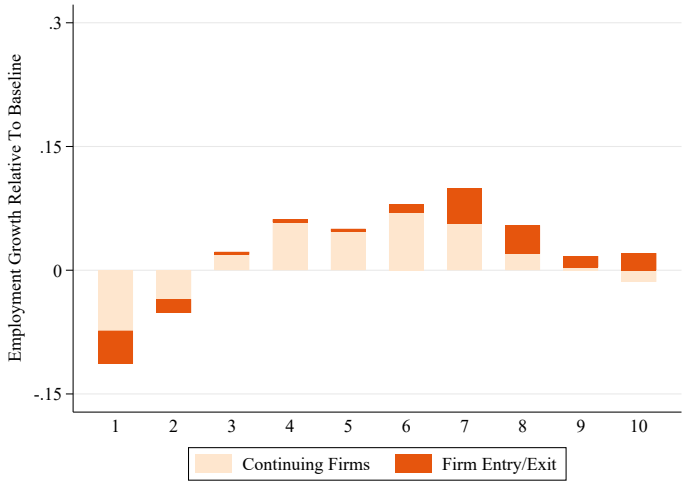
(c) Within-Job Wage Growth Along the Wage Distribution

Notes: The figure extends the analysis in Figure VII, Panels A to D, to the period 2017-2023. *Source:* IAB Employee History (BeH), version 10_08_00.

Figure C3.2: Extension of Figure VIII to the 2017-2023 Period



(a) Employment Growth by Firm Wage Premium Bins, 2017-2023, - Worker Margin



(b) Employment Growth by Firm Wage Premium Bins, 2017-2023, - Firm Margin

Notes: This figure extends the analysis in Figure VIII, Panels C and D, to the period 2017-2023. *Sources:* IAB Employee History (BeH), version 10_08_00.

Table C3.1: Extension of Table II

Panel A: Across-Period Comparison

	2003–2010 *(Unchanged LMT)*		2010–2017 *(Increasing LMT)*		2017–2022 *(Increasing LMT)*	
	Component	Share	Component	Share	Component	Share
	(1)	(2)	(3)	(4)	(5)	(6)
Variance of Log Wages	0.238	1.000	0.254	1.000	0.234	1.000
Variance of $X\beta$	0.004	0.017	0.007	0.028	0.005	0.021
$2 \times$ Cov(worker FE, $X\beta$)	0.001	0.004	-0.005	-0.020	-0.010	-0.043
$2 \times$ Cov(firm FE, $X\beta$)	0.002	0.008	0.001	0.004	-0.001	-0.004
Variance of Residual Log Wages (Net of $X\beta$)	0.231	0.971	0.252	0.992	0.240	1.026
Variance Decomposition (Residual Log Wages):						
Variance of Worker FE	0.130	0.546	0.144	0.567	0.155	0.662
Variance of Firm FE	0.051	0.214	0.043	0.169	0.029	0.124
Variance of the Residual	0.012	0.050	0.013	0.051	0.011	0.047
$2 \times$ Cov(worker FE, firm FE)	0.040	0.168	0.053	0.209	0.045	0.192

Panel B: Within-Period Comparison: Firm Wage Premia

	2003–2010	2010–2017	2017–2022
	(1)	(2)	(3)
Change in:			
Mean	-0.026***	0.000***	0.007***
	(0.000)	(0.000)	(0.000)
Standard Deviation	0.018	-0.008	-0.006
50–10	0.035	-0.014	-0.011
90–50	0.018	0.002	-0.006
90–10	0.053	-0.012	-0.017

Panel C: Within-Period Comparison: Sorting

	2003–2010	2010–2017	2017–2022
	(1)	(2)	(3)
Change in:			
Mean Firm Effect of Low-Wage Workers	-0.046***	0.002***	0.013***
	(0.001)	(0.001)	(0.000)
Mean Firm Effect of High-Wage Workers	-0.006***	-0.002***	0.000***
	(0.000)	(0.000)	(0.000)
Mean Firm Effect of Low-Skilled Workers	-0.035***	-0.006***	0.002***
	(0.000)	(0.000)	(0.000)
Mean Firm Effect of High-Skilled Workers	-0.012***	-0.005***	0.007***
	(0.001)	(0.001)	(0.000)
Covariance of Worker and Firm Fixed Effects	0.006	-0.004	-0.005
Correlation	0.070	-0.011	-0.031

Notes: This table extends the analysis in Table II. Panel A reports results from an across-period variance decomposition of log wages based on the estimation of an AKM model, following Card et al. (2013). The model controls for a third-order polynomial in age and year fixed effects, both fully interacted with education. The fitted values of these controls are denoted by $X\beta$ and are intended to capture aggregate wage growth. The table reports the variance of $X\beta$, its covariances with the worker and firm fixed effects, and the decomposition of residual log wages net of $X\beta$ for the periods 2003–2010, 2010–2017, and 2017–2022. Component shares are expressed relative to the total variance of log wages. Panel B reports within-period changes in the mean and dispersion of firm fixed effects between the first and last year of each period. Dispersion is measured by the standard deviation and the 50–10, 90–50, and 90–10 gaps in the distribution of firm fixed effects. Panel C reports within-period changes in worker sorting. The first four rows compare changes in mean firm wage premia for low- and high-wage workers, defined as workers with AKM worker fixed effects below and above the median, and for low- and high-skilled workers. The final two rows report changes in the covariance and correlation between worker and firm fixed effects. Standard errors for changes in means in Panels B and C are clustered at the individual level and reported in parentheses. Statistical significance is denoted by *** for the 1% level, ** for the 5% level, and * for the 10% level. *Source:* IAB Employee History (BeH), version 10_08_00.

Table C3.2: Extension of Table III to the 2017–2022 Period

	(1) Own Wage	(2) Firm Wage Premium	(3) Firm Wage Premium (IV)
Coeff	-0.049***	-0.116***	-0.154***
S.E.	(0.001)	(0.003)	(0.003)
Average Separation Share	0.101	0.104	0.104
Separations Elasticity	-0.483	-1.122	-1.484
Supply Elasticity	0.965	2.243	2.969
Markdown	0.509	0.308	0.252
No. of observations	2,282,653	2,210,423	2,210,423

Notes: This table extends the analysis in Table III to the period 2017–2022. *Source:* IAB Employee History (BeH), version 10_08_00.

C4 Differences Across Sectors and Sectoral Reallocation

C4.1 Average Firm Wage Premia and the Skill Share Across Broad Sectors

Table C4.1: Average Firm Wage Premia and the Skill Share Across Broad Sectors

	2003–2010		2010–2017	
	Mean Firm FE (1)	Skill Share (2)	Mean Firm FE (3)	Skill Share (4)
Primary Sector	-0.091	0.120	-0.103	0.152
Manufacturing	0.114	0.206	0.102	0.268
Construction	-0.022	0.097	-0.043	0.123
LKBS	-0.136	0.184	-0.120	0.238
LKPS	-0.036	0.284	-0.027	0.374
LKCS	-0.064	0.176	-0.086	0.233
KS	0.059	0.556	0.051	0.660

Notes: The table reports average AKM firm wage premia and the share of high-skilled workers across seven broad industry groups for two periods. LKBS denotes less knowledge-intensive business services, LKPS denotes less knowledge-intensive public services, LKCS denotes less knowledge-intensive consumer services, and KS denotes knowledge-intensive services. *Source:* IAB Employee History (BeH), version 10_08_00.

C4.2 Within-Between Industry Decomposition of Employment Growth Across Firm Wage Premium Deciles

To understand whether the employment reallocation across the firm wage premium distribution (Figure VIII) operates primarily within or between industries, we perform a shift-share decomposition of employment growth for 2003–2010 and 2010–2017. Firms are grouped into deciles based on their AKM firm fixed effects within each period. The decomposition attributes employment changes for each decile to aggregate growth, between-industry shifts, and residual within-industry reallocation.

Decomposition. For each period, firms are sorted into ten equal-sized bins (deciles) based on their AKM firm fixed effect, with $d \in \{1, \ldots, 10\}$ denoting the decile. Let $E_{d,s,t}$ denote aggregate employment in decile d, sector s (we distinguish seven broad sectors) and year t with t_0 and t_1 marking the start and end of the period, respectively.

Define total (g), sectoral (g_s), and decile-sector ($g_{d,s}$) growth rates as:

$$g = \frac{E_{t_1} - E_{t_0}}{E_{t_0}} = \frac{\sum_s \sum_d (E_{d,s,t_1} - E_{d,s,t_0})}{\sum_s \sum_d E_{d,s,t_0}}.$$

$$g_s = \frac{E_{s,t_1} - E_{s,t_0}}{E_{s,t_0}} = \frac{\sum_d (E_{d,s,t_1} - E_{d,s,t_0})}{\sum_d E_{d,s,t_0}}.$$

$$g_{d,s} = \frac{E_{d,s,t_1} - E_{d,s,t_0}}{E_{d,s,t_0}}.$$

In each decile and sector, the change in employment, $\Delta E_{d,s} = E_{d,s,t_1} - E_{d,s,t_0}$, can be written as:

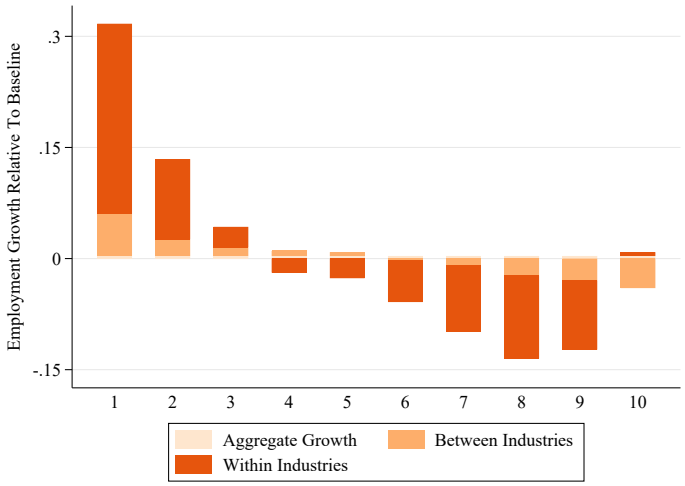
$$\Delta E_{d,s} = E_{d,s,t_0} \cdot g + E_{d,s,t_0} \cdot (g_s - g) + E_{d,s,t_0} \cdot (g_{d,s} - g_s).$$

Let total baseline employment in decile d be $E_{d,t_0} = \sum_s E_{d,s,t_0}$, and define industry shares at baseline within each decile as $\omega_{d,s,0} = \frac{E_{d,s,t_0}}{E_{d,t_0}}$. Summing over industries and normalizing by baseline employment yields the following decomposition:

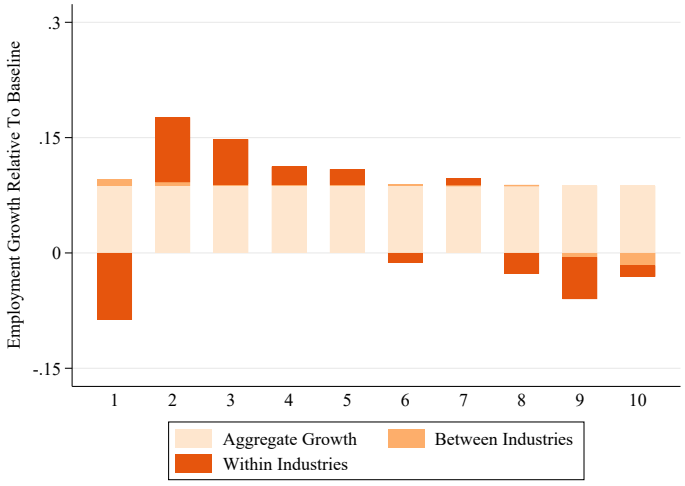
$$\frac{\Delta E_d}{E_{d,t_0}} = \underbrace{g}_{\text{aggregate employment growth}} + \underbrace{\sum_s \omega_{d,s,0}(g_s - g)}_{\text{between-industry component}} + \underbrace{\sum_s \omega_{d,s,0}(g_{d,s} - g_s)}_{\text{within-industry component}}. \tag{C4.1}$$

Results. Figure C4.1 decomposes the employment changes within each decile into the three components shown in Equation C4.1 separately for the periods 2003–2010 (Panel a) and 2010–2017 (Panel b). In the first period, aggregate growth plays a limited role. Between-industry shifts account for 18% and 17% of the employment growth in the bottom two deciles, respectively, and 25% of the decline in the second top decile. Hence, the reallocation of workers toward low-paying firms in this period is partly driven by broad sectoral shifts, such as the expansion of less knowledge-intensive business services (a sector with low firm wage premia) and the contraction in manufacturing (a sector with high firm wage premia). However, within-industry reallocation remains the dominant force. In the second period, aggregate growth contributes substantially to overall employment growth across all deciles, while the between-industry component is negligible.

Figure C4.1: Within-Between Industry Decomposition of Employment Growth Across Firm Wage Premium Deciles



(a) 2003-2010



(b) 2010-2017

Notes: The figure shows full-time employment growth across ten firm wage premium bins for the periods 2003-2010 (A) and 2010-2017 (B). Bins are calculated to be equal in size at baseline. Employment growth within each bin is decomposed based on the method described above into a common aggregate component, a between-industry component, and a within-industry component. *Sources:* IAB Employee History (BeH), version 10_08_00.

C5 The Separation Elasticity: Robustness Checks

Table C5.1: The Separations Elasticity and Markdowns: 2003–2010 vs. 2010–2017, All Separations (E-to-E and E-to-UE)

	(1) Own Wage	(2) Firm Wage Premium	(3) Firm Wage Premium (IV)
Panel A: 2003–2010			
Coeff	-0.135	-0.175	-0.228
S.E.	(0.001)	(0.002)	(0.003)
Average Separation Share	0.189	0.190	0.190
Separations Elasticity	-0.712	-0.925	-1.205
Supply Elasticity	1.425	1.849	2.409
Markdown	0.412	0.351	0.293
No. of observations	2,559,061	2,472,923	2,472,923
Panel B: 2010–2017			
Coeff	-0.150	-0.226	-0.284
S.E.	(0.001)	(0.003)	(0.003)
Average Separation Share	0.197	0.197	0.197
Separations Elasticity	-0.761	-1.148	-1.442
Supply Elasticity	1.523	2.296	2.884
Markdown	0.396	0.303	0.257
No. of observations	2,562,295	2,493,334	2,493,334

Notes: The table replicates the analysis in Table III but includes workers who are employed in period t but not in $t+1$ in the sample (all separations). *Source:* IAB Employee History (BeH), version 10_08_00.

Table C5.2: The Separation Elasticity and Markdowns: 2003–2010 vs. 2010–2017, Alternative Instrumentation Strategy

Panel A: 2003–2010 (Unchanged LMT)

	Full Set	Connected Set (Firms with One Mover)		Double-Connected Set (Firms with Two Movers)		
	Own Wage	Firm Wage Premium	Firm Wage Premium (IV = Top vs. Bottom Half)	Firm Wage Premium	Firm Wage Premium (IV = Top vs. Bottom Half)	Firm Wage Premium (IV = Split Sample AKM)
	(1)	(2)	(3)	(4)	(5)	(6)
Coeff.	-0.029***	-0.055***	-0.081***	-0.069***	-0.091***	-0.076***
S.E.	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Average Separation Share	0.087	0.089	0.089	0.089	0.089	0.089
Separation Elasticity	-0.335	-0.621	-0.904	-0.774	-1.015	-0.854
Supply Elasticity	0.670	1.243	1.808	1.548	2.030	1.709
Markdown	0.599	0.446	0.356	0.393	0.330	0.369
No. of Observations	2,559,061	2,472,923	2,472,923	2,349,141	2,349,141	2,349,141

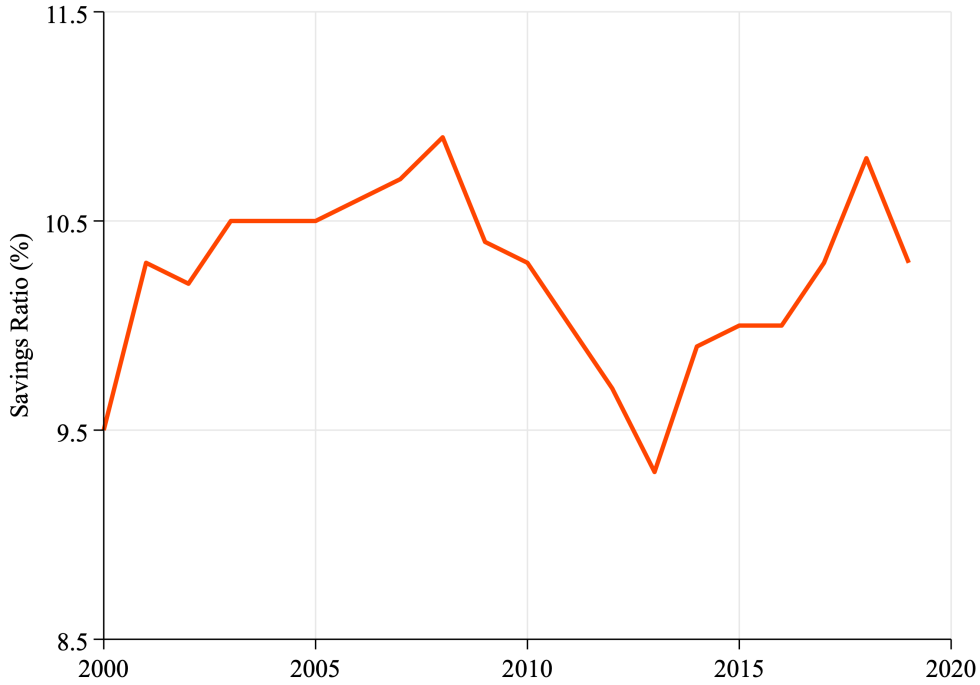
Panel B: 2010–2017 (Increasing LMT)

	Full Set	Connected Set (Firms with One Mover)		Double-Connected Set (Firms with Two Movers)		
	Own Wage	Firm Wage Premium	Firm Wage Premium (IV = Top vs. Bottom Half)	Firm Wage Premium	Firm Wage Premium (IV = Top vs. Bottom Half)	Firm Wage Premium (IV = Split Sample AKM)
	(1)	(2)	(3)	(4)	(5)	(6)
Coeff.	-0.041***	-0.094***	-0.125***	-0.115***	-0.143***	-0.124***
S.E.	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Average Separation Share	0.091	0.093	0.093	0.094	0.094	0.094
Separation Elasticity	-0.453	-1.005	-1.343	-1.232	-1.526	-1.327
Supply Elasticity	0.907	2.010	2.686	2.464	3.053	2.655
Markdown	0.524	0.332	0.271	0.289	0.247	0.274
No. of Observations	2,562,295	2,493,334	2,493,334	2,391,645	2,391,645	2,391,645

Notes: The table first replicates the analysis in Table III (columns 1–3) and then examines the robustness of the results to the alternative instrumentation strategy for firm wage premia proposed by Bassier et al. (2022), which we refer to as the "Split Sample AKM" approach (columns 4–6). To implement this approach, the analysis is restricted to a "double-connected set" of firms that employ at least two movers within the respective estimation window. Workers are then randomly partitioned into two subsamples while preserving the distribution of movers, and AKM firm wage premia are estimated separately in each subsample. Columns (4) and (5) replicate the baseline analysis on the resulting double-connected set. Column (4) uses the estimated firm wage premium directly, while column (5) instruments it with a dummy indicating whether the firm belongs to the top or bottom half of the firm wage premium distribution. Column (6) instead instruments the firm wage premium estimated in one subsample with the corresponding estimate from the other subsample. *Source:* IAB Employee History (BeH), version 10_08_00.

C6 Household Savings Ratio

Figure C6.1: Household Savings Ratio



Notes: The figure shows the evolution of the household savings ratio (i.e., savings as a share of disposable household income). *Source:* Federal Statistical Office (Destatis) data (Table 81000-0009 "National Accounts – Disposable Income, saving of household").

C7 Consumer Demand, Labor Market Tightness, and Vacancies: Evidence from Local Variation

Table C7.1: Associations of Tightness, Vacancies and Employment with Local Consumer Demand Measures

	Log Labor Market Tightness				Log Vacancies				Log Employment			
	All sectors				LKCS			Construction	LKCS			Construction
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Share of Families Eating Out	0.314***				0.069				0.062			
	(0.084)				(0.090)				(0.072)			
Overnight stays		0.130**				0.428***				0.305***		
		(0.063)				(0.040)				(0.042)		
Culture and Leisure Activities			0.295***				0.201*				0.166*	
			(0.110)				(0.105)				(0.086)	
Residential Building Permits				0.280***				0.361***				0.395***
				(0.059)				(0.050)				(0.047)
Adjusted R^2	0.315	0.277	0.287	0.342	0.720	0.815	0.724	0.709	0.805	0.826	0.808	0.777
No. of CZ-years	889	1128	889	1128	889	1128	889	1128	889	1128	889	1128
No. of CZs	141	141	141	141	141	141	141	141	141	141	141	141

Notes: This table reports results from OLS regressions estimating the associations between labor market indicators and consumption measures at the commuting zone (CZ) level. The dependent variables are log labor market tightness, log vacancies, and log employment. Vacancies and employment in columns (5) through (7) and (9) through (11) refer to the less knowledge-intensive consumer services (LKCS) sector; columns (8) and (12) refer to the construction sector. All specifications include controls for the total population size of the CZ and a dummy variable indicating whether the CZ is classified as urban or rural. Standard errors, reported in parentheses, are clustered at the CZ level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Data sources: Data on "Overnight stays" and "Residential Building Permits" are obtained from the INKAR database (BBSR). Data on the "Share of Families Eating Out" and "Culture and Leisure Activities" are derived from the Panel Study Labour Market and Social Security (PASS), maintained by the IAB. Data on employment are based on the IAB Employee History (BeH), version 10_08_00.

Appendix D Variance Decompositions Within and Across Periods

Panel A of Table II reports across-period changes in the dispersion of firm wage premia and the covariance between worker and firm fixed effects, comparing 2003–2010 and 2010–2017. Panels B and C instead report within-period changes, comparing the beginning and end of each period. This appendix clarifies how the across-period comparison in Panel A differs from the within-period comparisons in Panels B and C.

Dispersion of Firm Wage Premia

Consider first the dispersion of firm wage premia. The variances reported in Panel A are computed as employment-weighted averages over all firm-year observations within each period:

$$V\left(\hat{f}^{0310}\right) = \frac{1}{E_{0310}} \sum_{t=2003}^{2010} \sum_{j \in J_t} E_{j,t} \left(\hat{f}_j^{0310} - \bar{\hat{f}}^{0310}\right)^2,$$
$$V\left(\hat{f}^{1017}\right) = \frac{1}{E_{1017}} \sum_{t=2010}^{2017} \sum_{j \in J_t} E_{j,t} \left(\hat{f}_j^{1017} - \bar{\hat{f}}^{1017}\right)^2.$$

Here, $\hat{f}_j^{0310}$ and $\hat{f}_j^{1017}$ denote the firm fixed effects estimated over the 2003–2010 and 2010–2017 periods, respectively, and $\bar{\hat{f}}^{0310}$ and $\bar{\hat{f}}^{1017}$ denote their means over all firms and years. For example, for 2003–2010: $\bar{\hat{f}}^{0310} = \frac{1}{E_{0310}} \sum_{t=2003}^{2010} \sum_{j \in J_t} E_{j,t} \hat{f}_j^{0310}$. J_t denotes the set of firms operating in year t; $E_{j,t}$ denotes the number of workers that firm j employs at time t; and E_{0310} and E_{1017} denote the total number of worker-years in the 2003–2010 and 2010–2017 periods (e.g., $E_{0310} = \sum_{t=2003}^{2010} \sum_{j \in J_t} E_{j,t}$).

Differences between $V\left(\hat{f}^{0310}\right)$ and $V\left(\hat{f}^{1017}\right)$ reflect two distinct forces. First, the firm fixed effects may change across the two periods. For example, if high-wage firms reduce their wage premia, while low-wage firms increase them, the variance will decline across the two periods. Second, worker reallocation and selective firm entry/exit will alter employment weights across firms. For example, the variance will likewise decline if workers move from low-wage firms or high-wage firms to firms paying wage premia closer to the mean.

Panel B of Table II, which reports within-period changes in the dispersion of firm wage premia, isolates this reallocation effect. Since firm fixed effects are constant within periods, changes in the dispersion between the start and end of a period reflect changes in the allocation of workers across firms only.

The within-period changes in dispersion are computed as:

$$V_{2010}\left(\hat{f}^{0310}\right) - V_{2003}\left(\hat{f}^{0310}\right) = \frac{1}{E_{2010}} \sum_{j \in J_{2010}} E_{j,2010} \left(\hat{f}_j^{0310} - \bar{\hat{f}}_{2010}^{0310}\right)^2 - \frac{1}{E_{2003}} \sum_{j \in J_{2003}} E_{j,2003} \left(\hat{f}_j^{0310} - \bar{\hat{f}}_{2003}^{0310}\right)^2,$$
$$V_{2017}\left(\hat{f}^{1017}\right) - V_{2010}\left(\hat{f}^{1017}\right) = \frac{1}{E_{2017}} \sum_{j \in J_{2017}} E_{j,2017} \left(\hat{f}_j^{1017} - \bar{\hat{f}}_{2017}^{1017}\right)^2 - \frac{1}{E_{2010}} \sum_{j \in J_{2010}} E_{j,2010} \left(\hat{f}_j^{1017} - \bar{\hat{f}}_{2010}^{1017}\right)^2.$$

Covariance of Firm and Worker Fixed Effects

Consider next the covariance between worker and firm fixed effects. The covariances reported in Panel A of Table II are computed as:

$$\text{Cov}\left(\hat{f}^{0310}_{j(i,t)}, \hat{a}^{0310}_{i}\right) = \frac{1}{E_{0310}} \sum_{t=2003}^{2010} \sum_{i \in I_t} \left(\hat{f}^{0310}_{j(i,t)} - \bar{\hat{f}}^{0310}\right) \left(\hat{a}^{0310}_{i} - \bar{\hat{a}}^{0310}\right),$$

$$\text{Cov}\left(\hat{f}^{1017}_{j(i,t)}, \hat{a}^{1017}_{i}\right) = \frac{1}{E_{1017}} \sum_{t=2010}^{2017} \sum_{i \in I_t} \left(\hat{f}^{1017}_{j(i,t)} - \bar{\hat{f}}^{1017}\right) \left(\hat{a}^{1017}_{i} - \bar{\hat{a}}^{1017}\right).$$

Here, $\hat{a}^{0310}_{i}$ and $\hat{a}^{1017}_{i}$ are the worker fixed effects estimated over the 2003–2010 and 2010–2017 periods, respectively, and $\bar{\hat{a}}^{0310}$ and $\bar{\hat{a}}^{1017}$ denote their means, averaged over all firms and years (e.g., $\bar{\hat{a}}^{0310} = \frac{1}{E_{0310}} \sum_{t=2003}^{2010} \sum_{i \in I_t} \hat{a}^{0310}_{i}$). I_t denotes the set of workers employed in year t, and $\hat{f}^{0310}_{j(i,t)}$ and $\hat{f}^{1017}_{j(i,t)}$ are the firm fixed effects of firm j (at which worker i is employed in year t), estimated over the 2003–2010 and 2010–2017 periods.

Across-period changes in this covariance reflect three components: First, changes in the dispersion of worker fixed effects. For example, if worker fixed effects increase for high-wage workers relative to low-wage workers, the covariance will also increase, all else equal (provided that the covariance was positive in the base period). Second, changes in the dispersion of firm fixed effects. For example, all else equal, the covariance will increase if high-wage firms increase their wage premia by more than low-wage firms. And finally, changes in sorting, i.e., reallocation of workers across firms. For example, the covariance will decrease if low-wage workers are increasingly concentrated in high-wage firms, while holding worker and firm fixed effects constant.

Panel C isolates the sorting component by examining within-period changes in the covariances:

$$\begin{aligned}
&\text{Cov}\left(\hat{f}^{0310}_{j(i,2010)}, \hat{a}^{0310}_{i}\right) - \text{Cov}\left(\hat{f}^{0310}_{j(i,2003)}, \hat{a}^{0310}_{i}\right) \\
&= \frac{1}{E_{2010}} \sum_{i \in I_{2010}} \left(\hat{f}^{0310}_{j(i,2010)} - \bar{\hat{f}}^{0310}_{2010}\right) \left(\hat{a}^{0310}_{i} - \bar{\hat{a}}^{0310}_{2010}\right) - \frac{1}{E_{2003}} \sum_{i \in I_{2003}} \left(\hat{f}^{0310}_{j(i,2003)} - \bar{\hat{f}}^{0310}_{2003}\right) \left(\hat{a}^{0310}_{i} - \bar{\hat{a}}^{0310}_{2003}\right), \\
&\text{Cov}\left(\hat{f}^{1017}_{j(i,2017)}, \hat{a}^{1017}_{i}\right) - \text{Cov}\left(\hat{f}^{1017}_{j(i,2010)}, \hat{a}^{1017}_{i}\right) \\
&= \frac{1}{E_{2017}} \sum_{i \in I_{2017}} \left(\hat{f}^{1017}_{j(i,2017)} - \bar{\hat{f}}^{1017}_{2017}\right) \left(\hat{a}^{1017}_{i} - \bar{\hat{a}}^{1017}_{2017}\right) - \frac{1}{E_{2010}} \sum_{i \in I_{2010}} \left(\hat{f}^{1017}_{j(i,2010)} - \bar{\hat{f}}^{1017}_{2010}\right) \left(\hat{a}^{1017}_{i} - \bar{\hat{a}}^{1017}_{2010}\right).
\end{aligned}$$

Since worker and firm fixed effects are time-constant within periods, these within-period changes capture only worker reallocation. The results in Panel C of Table II suggest that sorting of high-wage workers into high-wage firms increased between 2003 and 2010, but weakened between 2010 and 2017.

Notably, in Panel A, the covariances are larger during 2010-2017 than during 2003-2010. This increase may occur even if assortative matching is weaker during 2010-2017 than during 2003-2010. For example, a greater dispersion in worker fixed effects (as documented in Panel A) can mechanically raise the covariance despite reduced assortative matching.

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