Immigration, Monopsony and the Distribution of Firm Pay

Michael Amior and Jan Stuhler*

April 2025

Abstract

We argue that the arrival of migrants with low reservation wages can strengthen the monopsony power of firms. Firms can exploit "cheap" migrant labor by offering lower wages, though at the cost of forgoing potential native hires who demand higher wages. This monopsonistic trade-off can lead to large negative effects on native employment that exceed those in competitive models, and which are concentrated among low-paying firms. A low-pay sector emerges that disproportionately relies on migrant labor; this workplace segregation does not preclude but rather reflects labor market competition between natives and migrants. To validate these predictions, we study changes in wage premia and employment across the firm pay distribution, during a large immigration wave in Germany. These adverse effects are not inevitable and may be mitigated through policies that limit firms' monopsony power over migrants.

Keywords: immigration, monopsony, firms

*Amior: Hebrew University, Centre for Economic Performance; michael.amior@mail.huji.ac.il. Stuhler: Universidad Carlos III de Madrid; jan.stuhler@uc3m.es. We are grateful for feedback from seminars at Tel Aviv, UCL, Stuttgart-Hohenheim, Migration and the Macroeconomy Workshop (Bocconi), MIT, IZA Migration Meeting (Boston), Warwick, Berkeley, CEPR Bank of Italy Workshop, Arizona State, Davis, UCLA, UBC, UT Austin, Javeriana, DICE, RWI-Cream workshop (Essen), University of Glasgow, EUI, ETH Zurich, Uppsala University, LISER, PSE LMU Munich, NBER Summer Institute, and King's Business School. Funding from the Israel Science Foundation under "The Labor Market Impact of Migration Under Monopsony" (grant no. 1548/18) and the Comunidad de Madrid and MICIU (RYC2019-027614-I, AM-EPUC3M11 and H2019/HUM-5891) is gratefully acknowledged. Matan Kolerman provided excellent research assistance. This paper was previously circulated as "Immigration and Monopsony: Evidence Across the Distribution of Firms", and it subsumes parts of an earlier unpublished paper: "The Impact of Migration in a Monopsonistic Labor Market: Theoretical Insights" (Amior, 2017).

1 Introduction

The labor market impact of immigration is traditionally interpreted in competitive frameworks, where workers earn their marginal product. The effects depend entirely on how immigration shifts the relative supply (and hence prices) of different factors of production, whether labor or capital. However, if firms have monopsony power (i.e. the ability to set wages below marginal products), the impact of immigration will depend additionally on the reservation wages of migrants. In this paper, we explore how this mechanism affects pay and employment across the distribution of firms, both theoretically and empirically. It has important implications for the design of effective policy, and can help reconcile conflicting results in the empirical literature.

Our basic insight is simple. Consider a distribution of firms offering different wages to productively identical workers, as in the frictional wage-posting models of Albrecht and Axell (1984) or Burdett and Mortensen (1998). In this environment, an influx of migrants with low reservation wages will allow some firms to reduce their wage offers in equilibrium, even if marginal products remain unchanged. If firms cannot wage discriminate between native and migrant employees, this low-pay strategy forces them to forgo potential native hires who demand higher wages. But this monopsonistic trade-off becomes profitable for more firms as immigration increases.

The character of these wage and employment effects differs markedly from the canonical competitive model. Under perfect competition, any distributional effects are tied to the marginal products of heterogeneous *workers*. But in our framework, the focus shifts to the distribution of *firms*. As more firms adjust their pay strategies, a low-pay sector emerges which disproportionately employs migrant labor. Notably, this workplace segregation does not preclude but rather *reflects* labor market competition between natives and migrants.

Our framework also permits large negative effects on native employment, which greatly exceed those in competitive models. By adopting a low-pay strategy, firms are implicitly rejecting native labor in favor of cheaper migrants. This amounts to a movement down the (imperfectly elastic) labor supply curves of individual firms, in violation of competitive models. In principle, if migrants have sufficiently low reservation wages, firms may even profit by reducing their employment overall. This seemingly counterintuitive implication mirrors the well-known insight that, under monopsony, a minimum wage may *increase* employment.

The essential role of small and low-paying firms in this story may appear surprising, as "monopsony power" is commonly associated with large dominant firms, sustained by barriers to entry. But in our model, the increase in wage-setting power is driven by changes on the *other side* of the market (i.e. in labor force composition[1]), and this has very different implications. The growth of a low-pay sector may also be amplified by selective firm entry, as immigration allows small unproductive firms to operate profitably (and create "bad jobs", in the language of Acemoglu, 2001).[2]

All these results hinge on firms' inability to wage discriminate. If firms could instead set native and migrant wages *independently* (e.g. through individual bargaining), they would not have to adopt a common "pay strategy" for both groups. Firms could then extract large rents from low-reservation migrants (by offering them low pay), without sacrificing access to native labor. The effects of immigration on native wages and employment therefore depend crucially on how firms set pay.

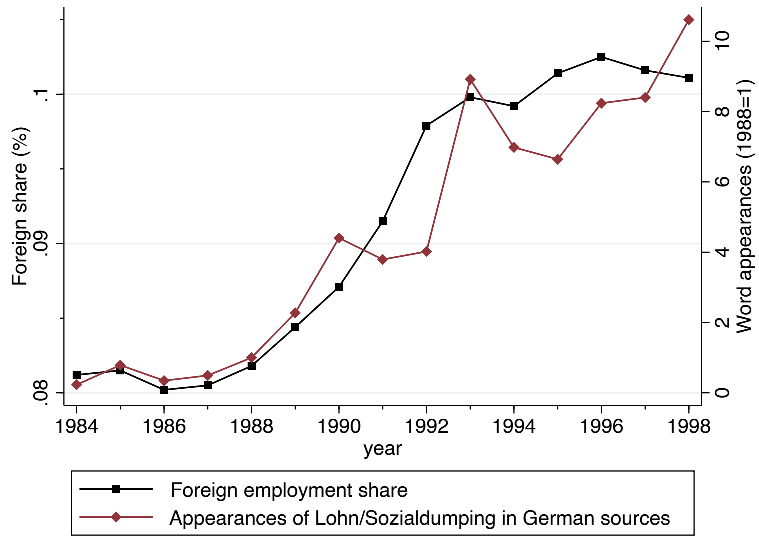
To test these predictions, we study a large and sudden influx of predominantly young and low-educated migrants to Germany, triggered by the collapse of the Iron Curtain. While this event has been studied before (e.g., Angrist and Kugler, 2003; D'Amuri, Ottaviano and Peri, 2010; Brücker and Jahn, 2011; Dustmann and Glitz, 2015; Bruns and Priesack, 2019), we pose new questions, study new outcomes (informed by our model), and rely on different empirical variation. The influx appears well-suited to exploring the implications of low reservation wages, as it was accompanied by fierce political debate on firms' alleged exploitation of cheap migrant labor. As Figure 1 shows, public concerns about *Lohndumping* ("wage dumping") and *Sozialdumping* ("social dumping") surged at precisely this time. Such concerns make little sense in a competitive framework, but are justified in the model we describe here.

We show that new migrants were paid 10% less than observably similar natives, and this is mostly explained by migrants sorting into low-paying firms. In line with our model, this can be attributed to low reservation wages and an inability of firms to (perfectly) wage discriminate. Indeed, we find that natives and migrants benefited

[1]Firm size is ultimately an outcome, and its relationship with market power (whether positive or negative) will depend on the model and source of variation (Syverson, 2019; Manning, 2021).

[2]These insights also speak to Hsieh and Klenow (2009), who argue that labor and other inputs in developing countries are inefficiently concentrated in a long tail of low-quality firms. In our framework, such a tail is sustained by migrants with low reservation wages.

Figure 1: References to *Lohndumping* or *Sozialdumping* in printed German sources



Foreign employment share computed from SIAB (data description below). Word appearances in German printed sources from Google Ngram, expressed as share of total annual words in database (and indexed to 1 in 1988). *Lohndumping* is translated as "wage dumping", and *Sozialdumping* as "social dumping".

similarly from working in high-paying firms (see also Arellano-Bover and San, 2020, on Israel; Dostie et al., 2023, on Canada; and Aslund et al., 2021, on Sweden).[3] This opens the door to the monopsonistic trade-off at the heart of the model: firms can secure migrant labor at low wages, but only at the cost of forgoing native hires.

To estimate the impact of the shock, we exploit spatial variation in migrant inflows across West German labor markets, identified by pre-existing migrant enclaves (as in Card, 2001). Administrative data on firms and workers allow us to address selection, compositional changes and other potential threats to identification, such as the coincident inflows of ethnic and East Germans.

As the model predicts, the new migrants disproportionately concentrated in low-paying firms. At the same time, we find reductions in both native wages *and* employment among these same firms. Crowd-out of native employment was so large that firm size contracted on average (we also corroborate these firm size effects in US data, in Appendix H). These findings are difficult to rationalize in a competitive labor market, where wage reductions should encourage *more* hiring, as firms move

[3]More broadly, Caldwell and Harmon (2019), Lachowska et al. (2022) and Di Addario et al. (2023) show that wage offers are often not tailored to individual workers, especially among the low-paid.

down their labor demand curves. Instead, we interpret these effects as a movement down their *supply* curves, as they shed native labor to exploit cheaper migrants.

Crucially, the wage effects among low-paying firms are not driven by compositional changes in employment, which would threaten identification (Bratsberg and Raaum, 2012; Ortega and Verdugo, 2022; Borjas and Edo, 2021; Dustmann et al., 2023). Nor do they reflect the concentration of particular skill types (with larger exposure to the migration shock) in these firms. Rather, they reflect genuine reductions in firm wage premia (as identified by "AKM" firm effects, as in Abowd, Kramarz and Margolis, 1999) independently of worker type. Consistent with our model, these reductions were driven by both existing firms and the entry of new low-paying firms.

The simple mechanism emphasized here – non-discriminating monopsony – is therefore consistent with a range of empirical findings, some shared with other work (e.g., large reductions in native employment) and some that are novel (e.g., reductions in both pay *and* average firm size, and the concentration of the employment and wage effects among low-paying firms). Our focus on the firm pay distribution is not arbitrary: it is guided by a simple and foundational model, whose key assumption of imperfect wage discrimination is well-substantiated in both our data and the modern wage-setting literature. We do not claim that this model offers the only possible explanation for *each* of our findings. Instead, our point is that it provides a particularly simple and plausible explanation for the *full set* of results;[4] and, more generally, that one of the workhorse models of labor economics has important, previously unexplored implications for the impact of immigration.

One cannot conclude from these results that immigration is generally harmful for native workers. Instead, we argue its impact depends heavily on migrants' reservation wages and labor market institutions (and not just on migrants' skill mix, as in competitive models), which vary significantly by context. This may help explain why some studies find large negative employment effects in settings with *low-paid* migrants: see Angrist and Kugler (2003) on Western Europe; Dustmann, Schoenberg and Stuhler (2017) and Bruns and Priesack (2019) on Germany; Amior (2020), Burstein et al.

[4]It seems difficult to find an equally simple model to motivate our key findings. For example, a competitive model with heterogeneous firms and workers (and productive complementarities between them) may explain why migrants sort to (and crowd out natives from) low-paying firms. However, such a model would not explain the coincidental reduction of both firm size *and* pay, nor why AKM wage premia *conditional* on worker type decline at the bottom of the firm pay distribution.

(2020), Monras (2020) and Doran, Gelber and Isen (2022) on the US; Muñoz (2023) on France and Belgium; and Delgado-Prieto (2024) on Colombia.

Moreover, since the wage effects are driven by monopsony power, our framework has very different (and arguably more direct) policy implications. In a competitive model, wage effects stem from shifts in relative factor proportions, so the role of policy is limited to interventions that alter factor supplies (such as training programs or visa skill criteria). In our framework however, the potentially harmful effects of immigration can be mitigated by targeting firms' monopsony power over migrants, rather than by restricting immigration itself. This includes policies that directly restrict firms' wage-setting power, such as minimum wages (e.g. Edo and Rapoport, 2019), collective bargaining agreements (Jäger, Noy and Schoefer, 2022), or the "prevailing wage" requirement in U.S. visa programs (Clemens and Lewis, 2022; Doran, Gelber and Isen, 2022; Amuedo-Dorantes et al., 2023); and also policies that improve immigrants' outside option, such as regularizations (e.g. Amior and Manning, 2020; Borjas and Edo, 2023; Monras, Vázquez-Grenno and Elias, forthcoming), relaxing job mobility restrictions (Townsend and Allan, 2024), or investing in labor market integration (Foged, Hasager and Peri, 2024).

Related literature This study subsumes parts of an earlier unpublished paper (Amior, 2017), which explores theoretically how monopsonistic firms can shape the impact of immigration. Amior and Manning (2020) apply this interpretation to assess wage effects across US skill cells, using a model with a representative firm. But here, we show that immigration can sustain differential pay strategies in equilibrium – and the creation of a low-pay sector. This yields new conceptual insights on the distribution of firm pay, workplace segregation, and native employment. Empirically, we test our predictions using matched administrative data, exploiting a well-defined natural experiment.

Our hypothesis rests on new migrants having low reservation wages, a claim supported by a large and growing literature. These low reservations have been rationalized in different ways, though the precise mechanism is not important for our argument.[5] Consistent with this claim, several studies have found that firms have greater

[5]Migrants may face greater liquidity constraints and restricted access to welfare. Their reference point may relate to their origin country, whether for psychological reasons or due to remittances

market power over migrant labor (Winter-Ebmer and Zweimüller, 1996; Nanos and Schluter, 2014; Hirsch and Jahn, 2015; Costas-Fernández and Lodato, 2024; Caldwell and Danieli, 2024). And low reservations can help explain why migrants often concentrate in small and/or low-paying firms (Aydemir and Skuterud, 2008; De Matos, 2017; Arellano-Bover and San, 2020; Aslund et al., 2021; Dostie et al., 2023; Dustmann, Ku and Surovtseva, 2024): we offer a story for this phenomenon, based on non-discriminating firms. More broadly, this story can help account for workplace segregation of migrants, as documented by Glitz (2014), Ansala, Åslund and Sarvimäki (2021) or Willis (2025).

Our paper also contributes to a growing literature on the firm-level effects of immigration: e.g. Dustmann and Glitz (2015); Beerli et al. (2021); Mahajan (2024). Some work focuses on the technological implications of high-skilled immigration: in particular, Mitaritonna, Orefice and Peri (2017) explore productivity effects across heterogeneous firms. Others study sorting or reallocation of workers across firms (Brinatti and Morales, 2021; Gyetvay and Keita, 2023; Silliman and Willén, 2024; Orefice and Peri, forthcoming). Closer to our story, Malchow-Moller, Munch and Skaksen (2012) find that migrant employees depress native wages within Danish firms, and attribute this to migrants' low reservation wages; Edo (2015) makes a similar argument using skill cell variation; and Dodini, Løken and Willén (2022) show that an inflow of Swedish commuters with comparatively low reservations decreased labor costs in Norwegian firms. Using calibrated job search models, Chassamboulli and Palivos (2014), Battisti et al. (2017) and Albert (2021) explore how migrants' reservations can affect wage bargaining and job creation. Finally, Delgado-Prieto (2023) finds that the effects of immigration in Colombia are concentrated in small firms, though the mechanism here is a technological constraint (only small firms hire informal labor).

Our findings also speak to the broader question of the distributional impact of immigration. Dustmann, Frattini and Preston (2012) estimate effects along the native

(Dustmann, Ku and Surovtseva, 2024). Poor information or undocumented status may inhibit job search (Hotchkiss and Quispe-Agnoli, 2013; Albert, 2021; Borjas and Edo, 2023) and cause migrants to underestimate their outside options (as in Jäger et al., 2024). Migrants may discount their time more heavily due to return intentions (Amior, 2017; Adda, Dustmann and Görlach, 2022), visa limits, or deportation risk. Finally, visa-related restrictions on job mobility may increase firms' market power (Naidu, Nyarko and Wang, 2016; Wang, 2021; Doran, Gelber and Isen, 2022; Townsend and Allan, 2024). Low migrant reservations may manifest not only in lower wages, but also in worse workplace amenities: e.g. migrants are more likely to work outside regular hours (Edo, 2015).

wage distribution, and Card (2009) and Gould (2019) study residual wage inequality. Consistent with these studies, we find that the adverse effects of immigration are concentrated among low-paid natives. However, we highlight the role of firms in shaping these distributional effects, independently of changes in worker productivity.

Our focus on the contribution of firms to earnings inequality builds on the agenda of Card, Heining and Kline (2013) and Song et al. (2019). Like these papers, we study changes in the distribution of AKM firm wage premia, which control for unobserved worker heterogeneity. But in line with our model, we interpret these premia as pay policies, determined in equilibrium; and we show they are malleable to economic shocks, just as our model predicts. This is not a trivial finding: as Lachowska et al. (2023) show, firm premia are very persistent over time.

In the next section, we set out our theoretical model. Section 3 describes our natural experiment, and Section 4 explores the role of firms in wage-setting for natives and migrants. In Section 5, we describe our empirical strategy, which exploits spatial variation in immigration. We estimate aggregate labor market effects in Section 6, and effects across the firm distribution in Section 7. In Section 8, we address composition bias in our wage estimates, by tracking AKM firm premia.

2 Model

Our key propositions can be derived from standard wage-posting models. For our main exposition, we rely on the framework of Albrecht and Axell (1984), which has the minimum ingredients we require: search frictions, monopsonistic wage-posting, and heterogeneous reservation wages. Our contribution is to explore its implications for the impact of immigration. The model is very stylized, and we do not seek to estimate it: instead, we derive qualitative predictions, which we test empirically.

Suppose there are n workers and k firms. Firms produce a homogeneous output good whose price is normalized to 1, with labor the sole factor of production. In the baseline model, we assume the marginal product of labor is fixed at p in all firms (following the exposition of Rogerson, Shimer and Wright, 2005). By fixing marginal products, we eliminate any labor market effects which materialize through the traditional competitive channels, allowing us to focus on the specific implications of our model.[6] Each firm pays a single wage w to all employees: in choosing this wage, firms trade off profit per worker with labor force size.

In our baseline model, only the unemployed search for work: they randomly meet firms at rate λ, and accept offers which exceed their reservations. Workers exogenously separate to unemployment at rate δ. A fraction μ of the labor force are migrants. Natives and migrants are productively identical, but differ in their reservation wages. In the baseline model, we attribute these differences to unemployment utility flows: natives receive b_N when unemployed, and migrants receive $b_M < b_N$. In practice, high discount rates or low meeting rates may also contribute to migrants' low reservations; but our focus is not on the origin of low reservations but on their implications.

After presenting the baseline model, we explore some pertinent theoretical extensions: heterogeneity in native reservation wages, on-the-job search (as in Burdett and Mortensen, 1998), an endogenous offer rate λ, heterogeneous firms, a labor force participation margin, wage discrimination, heterogeneous skills, and co-ethnic networks.

2.1 Equilibrium in baseline model

Let w_0 denote the reservation wage of unemployed migrants (i.e. the minimum acceptable offer), and w_1 the reservation of natives. These reservations will of course depend partly on the distribution of wage offers, which is itself endogenously determined.

In equilibrium, firms will only offer w_0 and w_1. Intuitively, firms which offer a wage below both reservations recruit no workers, and those which offer above either reservation can benefit by cutting their wage (profit per worker increases, at no cost to employment). The offer distribution can then be summarized by the triple (w_0, w_1, ϕ), where ϕ is the "low-pay sector share", i.e. the share of firms which offer w_0.

Let U_N and U_M denote the present discounted values of unemployed natives and migrants. These can be expressed in recursive form as:

$$rU_N = b_N + (1-\phi)\lambda\left[E_N(w_1) - U_N\right] \tag{1}$$

$$rU_M = b_M + (1-\phi)\lambda\left[E_M(w_1) - U_M\right] + \phi\lambda\left[E_M(w_0) - U_M\right] \tag{2}$$

where r is the discount rate, so rU_N and rU_M are the native and migrant flow values.

[6] In practice, we expect labor market effects to be shaped by *both* wage-setting power (as in our model) *and* factor proportions (as in standard competitive models). We do not claim the latter do not matter: rather, they are not the *only* channel through which immigration affects labor markets.

These consist of a basic utility flow (b_N or b_M), plus the expected asset gains from job finding (the $E - U$ terms), where $E_N(w)$ and $E_M(w)$ are the employment values in jobs paying w. Workers receive high-wage offers w_1 at rate $(1-\phi)\lambda$, and low-wage offers w_0 at rate $\phi\lambda$. Only migrants accept w_0 offers, and hence the additional term in (2). The employment values are given by:

$$rE_X(w) = w + \delta\left[U_X - E_X(w)\right] \tag{3}$$

for $X = \{N, M\}$. The flow utility of employed workers consists of their wage w, plus the expected loss from random separations, which occur at rate δ.

Since w_1 is the native reservation, we have $E_N(w_1) = U_N$. Using (1) and (3), it follows that the native reservation is simply equal to their unemployment utility flow: $w_1 = b_N$. Similarly, since w_0 is the migrant reservation, we have $E_M(w_0) = U_M$. Using this, (2) and (3), we have:

$$w_0 = \frac{(r+\delta)\,b_M + (1-\phi)\,\lambda b_N}{r+\delta+(1-\phi)\,\lambda} \tag{4}$$

which is a weighted average of the native and migrant unemployment utility flows, b_N and b_M. Intuitively, the migrant reservation w_0 exceeds their utility flow b_M, due to the opportunity cost of forgoing high-wage offers w_1 which arrive at rate $(1-\phi)\lambda$.

The steady-state native and migrant unemployment rates are given by:

$$u_N = \frac{\delta}{\delta + (1-\phi)\,\lambda} \tag{5}$$

$$u_M = \frac{\delta}{\delta + \lambda} \tag{6}$$

To solve for the low-pay sector share ϕ, we now specify the firm's problem. Each firm chooses a single wage w (either w_0 or w_1, as explained above) to maximize profit:

$$\max_{w \in \{w_0, w_1\}} \pi(w) = (p - w)\, l(w) \tag{7}$$

where $l(w)$ is the labor supply to the firm, comprised of both natives and migrants. Since firms cannot wage discriminate, there is a trade-off here: a low offer w_0 increases profit per worker $(p - w)$, but reduces labor supply (as natives only accept w_1 offers).

As Rogerson, Shimer and Wright (2005) show, this model has a unique equilibrium. The equilibrium takes one of three forms, depending on the parameter values:

1. $\pi(w_1) > \pi(w_0)$, and all firms offer w_1 (i.e. the low-pay sector share $\phi = 0$)

2. $\pi(w_1) = \pi(w_0)$, and firms offer different wages[7] (i.e. $0 < \phi < 1$)

3. $\pi(w_1) < \pi(w_0)$, and all firms offer w_0 (i.e. $\phi = 1$)

Corresponding to these three cases, the equilibrium low-pay sector share ϕ is:

$$\phi = \begin{cases} 0 & \text{if } \tilde{\mu} \leq \frac{r+\delta+\lambda}{r+\delta} \\ \frac{\delta+\lambda}{\lambda}\left[1 - \frac{r}{(r+\delta)\tilde{\mu}-(\delta+\lambda)}\right] & \text{if } \tilde{\mu} \in \left(\frac{r+\delta+\lambda}{r+\delta}, \frac{\delta+\lambda}{\delta}\right) \\ 1 & \text{if } \tilde{\mu} \geq \frac{\delta+\lambda}{\delta} \end{cases} \tag{8}$$

where

$$\tilde{\mu} = \frac{\mu}{1-\mu} \cdot \frac{b_N - b_M}{p - b_N} \tag{9}$$

See Appendix A for a derivation. Equation (8) shows the equilibrium low-pay sector share ϕ is increasing in the exogenous $\tilde{\mu}$ parameter; and in turn, equation (9) shows that $\tilde{\mu}$ is increasing in (i) the migrant share μ[8] and (ii) the differential between native and migrant unemployment utilities, i.e. $b_N - b_M$.

2.2 Comparative statics

We now consider the impact of immigration. Our strategy is to study changes in the migrant share μ, holding $\frac{n}{k}$ (the ratio of workers to firms) fixed: this allows us to abstract from scale effects, and focus entirely on the implications of labor force composition. Of course, one might expect $\frac{n}{k}$ to change in response to immigration, and we consider this possibility in an extension below. In practice though, the $\frac{n}{k}$ ratio changes little in our empirical application.

Proposition 1. *Migrants concentrate in low-paying firms.*

This follows from the assumption that firms cannot tailor offers to individual workers: firms which offer low wages (w_0 in our stylized model) cannot recruit high-reservation workers (i.e. natives). In this way, workplace segregation arises *endogenously* from firms' wage policies, even without homophily or ethnic networks.

[7] Note that $\pi(w_1) = \pi(w_0)$ is not a knife-edge case: it arises for a discrete range of parameter values, as the low-pay sector share ϕ serves to equalize profits in equilibrium.

[8] If there are sufficiently few migrants (such that $\tilde{\mu} \leq \frac{r+\delta+\lambda}{r+\delta}$), a w_0 offer is never profitable (so $\phi = 0$). Conversely, with sufficiently many migrants ($\tilde{\mu} \geq \frac{\delta+\lambda}{\delta}$), all firms will offer w_0 (so $\phi = 1$).

Proposition 2. *A larger migrant share μ induces firms to reduce offers at the bottom of the pay distribution. In our stylized model, this manifests through a larger low-pay sector share ϕ and smaller w_0. These effects are increasing in the $\frac{b_N - b_M}{p - b_N}$ ratio.*

By cutting wage offers, firms can increase their profit per worker – but if they cannot wage discriminate, this denies them access to high-reservation workers (i.e. natives). As the migrant share μ increases however, this trade-off becomes more attractive; and in equilibrium, more firms will reduce their offers at the bottom of the pay distribution, where migrants are concentrated.

In our stylized model, these wage effects manifest in two ways. First, as equation (8) shows, a larger migrant share μ increases the low-pay sector share ϕ: i.e. more firms offer the low wage w_0. Second, as (4) shows, the larger ϕ causes the low wage w_0 itself to decrease. Intuitively, since the larger ϕ reduces the quality of migrants' outside options, firms can now recruit them at even lower pay.

Looking at (9), these effects of migrant share μ are increasing in $\frac{b_N - b_M}{p - b_N}$. Intuitively, immigration is more likely to induce firms to undercut native workers if migrant labor can be purchased more cheaply: i.e. if b_M is small relative to b_N.[9]

Proposition 3. *As more firms adopt the low-pay strategy (in response to a larger migrant share μ), native employment decreases at the bottom of the pay distribution. This effect is increasing in the $\frac{b_N - b_M}{p - b_N}$ ratio.*

This follows immediately from Proposition 2. As the low-pay sector share ϕ increases, those firms which switch to the low-pay strategy (i.e. from w_1 to w_0, in our stylized model) must forgo employment of high-reservation workers (i.e. natives).

At the aggregate level, this expansion of the low-pay sector reduces native employment: as equation (5) shows, u_N is increasing in ϕ. As with wages, this employment effect is stronger if $\frac{b_N - b_M}{p - b_N}$ is larger. Among natives who remain employed, there is an implicit reallocation towards those (fewer) firms which continue to offer w_1.

Proposition 4. *A larger migrant share μ may cause a reduction in average firm size.*

[9] This effect is amplified if productivity p is low relative to the native reservation b_N: this limits the rents from employing natives, so a low-pay strategy becomes more attractive. This is important for our empirical application, as Germany fell into recession in the latter half of the period we study.

Average firm size can be expressed as $\bar{l} = \phi l(w_0) + (1-\phi) l(w_1)$, where ϕ is the share of firms offering w_0. As Appendix A.3 shows, holding the worker-firm ratio $\frac{n}{k}$ fixed, the effect of migrant share μ on $\bar{l}$ is:

$$\frac{d\bar{l}}{d\mu} = \underbrace{\frac{n}{k}\left[\frac{\lambda}{\delta+\lambda} - \frac{\lambda(1-\phi)}{\delta+\lambda(1-\phi)}\right]}_{\text{Composition effect}} - \underbrace{\frac{n}{k} \cdot \frac{(1-\mu)\lambda\delta}{[\delta+\lambda(1-\phi)]^2} \cdot \frac{d\phi}{d\mu}}_{\text{Wage-setting effect}} \tag{10}$$

The sign of $\frac{d\bar{l}}{d\mu}$ is ambiguous: it depends on the relative size of two countervailing effects. The first is a positive "composition effect": for a given wage offer distribution, a larger migrant share μ increases the size of low-pay firms, because only migrants accept their offers. The second is a negative "wage-setting effect": a larger μ induces more firms to adopt the low-pay strategy, which reduces native employment. Depending on the parameter values, either effect may dominate.[10]

Finally, depending on how the number of firms k changes (see Section 2.4 below), not only average firm size but also *total employment* may decrease.

2.3 What is new here?

These labor market impacts differ markedly from those predicted by the standard competitive framework – and are new to the literature, even in nascent work linking monopsony and immigration. Moreover, they have distinct implications for policy.

Labor market impacts. First, the impact of immigration varies along the distribution of *firms*, even for workers of identical skill. As the migrant share μ grows, more firms adopt a low-pay strategy and shed native labor. High-wage jobs become more scarce, and workers who do not secure them must either accept low offers or remain unemployed. This contrasts with more conventional models, where the effects of immigration vary only along the *skill* distribution, due to differential changes in marginal products. We do not rule out this channel, but our model highlights important distributional effects which empirical research might otherwise miss. In particular, our model predicts that wage effects should be heavily concentrated among low-paying firms, a novel empirical implication which we validate below.

Second, our model opens the door to large negative employment effects, which

[10] For example, if the initial low-pay sector share ϕ is positive but sufficiently close to zero, the composition effect in (10) will also be close to zero; and the wage-setting effect will dominate.

are otherwise difficult to rationalize. In a competitive framework, since workers are paid their marginal product, we are restricted to movements along the labor demand curve; so any reduction in wages must be accompanied by a quantitatively substantial expansion of total employment.[11] In contrast, immigration in our model generates a shift down firms' labor *supply* curves (for given marginal product p), as they increasingly adopt low-pay strategies. As Proposition 4 shows, even a contraction of total employment becomes feasible (i.e. crowd-out exceeding one-for-one). This message is reminiscent of a well-known result in the minimum wage literature: a higher minimum wage need not generate employment losses if firms have market power. Conversely here, a wage reduction need not be associated with an expansion of total employment.

Policy implications. Our model also has very different implications for policy. In a competitive framework, wage impacts stem from shifts in relative factor proportions: this limits policy options to interventions that affect factor supplies (e.g., training programs or visa skill criteria). In contrast, the key margin in our model is the wage-setting behavior of firms *conditional* on productivity. Any adverse wage or employment effects can be mitigated by policies that constrain firms' market power over migrants – benefiting native and migrant workers alike. These include interventions which directly restrict firms' wage setting power, such as minimum wages, collective bargaining, or "prevailing wage" restrictions[12]; as well as those which improve migrants' outside options, such as regularization or integration policies.

2.4 Theoretical extensions

The model above clarifies our basic story, but it is very stylized. We now consider various theoretical extensions, some which amplify the effects we describe above, and others which diminish them.

(i) Heterogeneous native reservations. In the baseline model, the wage and

[11]Consider a pessimistic case for native labor, where native and migrant workers are perfect substitutes, in a two-factor model with labor and capital. Even here, assuming Cobb-Douglas technology (with a $\frac{2}{3}$ labor share), a 1% reduction in wages (driven by immigration) would generate a 3% increase in total employment (with capital fixed) or more (if capital is elastic).

[12]Restrictions to prevent "wage dumping" are already a common feature of immigration policies, such as the "prevailing wage" requirement in the H-1B and other U.S. visa programs. These requirements make little sense in a competitive labor market, where wages merely reflect marginal products, but are very relevant in the non-discriminating monopsonistic framework we describe here.

welfare effects fall entirely on migrants: natives receive no surplus in equilibrium (they are paid their reservation wage), so they lose nothing from exiting employment. But this is not true if natives have heterogeneous reservation wages. Suppose a limited fraction of natives share the same unemployment utility flow as migrants, b_M. Then, natives' *realized* wages will also contract, and not just the *offers* they receive.

(ii) On-the-job search. In Appendix B, we introduce on-the-job search, as in Burdett and Mortensen (1998). Rather than a single wage w_0, the low-pay sector now contains a distribution of offers (between b_M and b_N), as firms compete directly for employees; and the high-pay sector contains a distribution of offers exceeding b_N. The propositions above are unaffected. But since natives now receive a surplus, we do see a native wage effect. Intuitively, when firms drop into the low-pay sector, this reduces high-pay competition; so native wages converge towards b_N.[13]

(iii) Other reservation wage stories. In the baseline model, we attribute differences in native and migrant reservations entirely to out-of-work utility, b_N and b_M. But in principle, these differences may be amplified by high migrant discount rates r or low contact rates λ.[14]

(iv) Endogenous $\frac{n}{k}$ and contact rate λ. In the baseline model, we take the ratio of workers n to firms k as given. But there are reasons why it may change. First, $\frac{n}{k}$ may contract if the number of firms k remains fixed, and immigration causes the labor force n to expand. Alternatively, larger profits may encourage large firm entry, such that k grows relative to n; and this may also shift the contact rate λ. In Appendix C, we show the wage and employment effects (in Propositions 2-4) are preserved: intuitively, firms will only enter in equilibrium if they can offer lower wages.

(v) Heterogeneous firms. The baseline model predicts differential wage and employment effects across the firm distribution, even though firms are identical. In Appendix D, we show that introducing heterogenous firms (which differ in productiv-

[13]This extension also implies some interesting transitory dynamics: on arrival, migrants begin at the bottom of the jobs ladder, and gradually work their way up. This speaks to empirical evidence which documents an important contribution of job mobility to migrant wage assimilation (Lehmer and Ludsteck, 2015; Dustmann, Ku and Surovtseva, 2024; Arellano-Bover and San, 2020).

[14]For example, migrants may discount their time in the host country more heavily (lower r in the model) due to return intentions or deportation risk (Amior, 2017; Adda, Dustmann and Görlach, 2022). Alternatively, Caldwell and Danieli (2024) find that migrants have fewer outside job options than natives, which may imply a lower λ in our model. As equation (4) shows, if $b_M < b_N$, a low r or low λ will reduce the migrant reservation wage w_0 further.

ity p) amplifies these effects. As in Albrecht and Axell (1984), low-p firms offer lower wages in equilibrium, because they maximize profit at lower employment; and they also drop into the low-pay sector more readily in response to immigration. Under free entry, immigration may also induce Melitz-type (2003) selective entry of low-quality firms, which would be unable to operate without low-reservation labor.[15]

(vi) Native exit. If natives lose job opportunities, some may choose to exit the labor force (e.g. early retirement) or relocate elsewhere (if the shock is spatially concentrated, as in our empirical application). This causes the migrant share μ to grow further, encouraging more firms to adopt low-pay strategies, so even more natives exit, and so on. This process makes the labor market become ever less competitive.

(vii) Wage discrimination. We have assumed that firms cannot wage discriminate against migrants (doing identical work). If instead firms can *perfectly* wage discriminate (i.e. the opposite extreme), they would recruit migrants at wage b_M and natives at b_N, and the migrant share μ would have no effect. Note that perfect discrimination arises implicitly in random matching frameworks where wages are bargained ex post (after contact occurs) between individual firms and workers (as in e.g. Chassamboulli and Palivos, 2014, Battisti et al., 2017): this form of bargaining protects natives from any direct competition with migrant labor.[16] An intermediate scenario with *partial* discrimination (e.g. some firms can discriminate, others cannot) would preserve our model's predictions qualitatively, but diminish them quantitatively. In practice, in our German setting, we do not find much wage discrimination against migrants within firms.

(viii) Heterogeneous skills. We have assumed above that natives and migrants do not differ in skill. But suppose instead that they are distributed (potentially differently) across multiple skill types j. The baseline model can then be interpreted as the labor market for a particular skill type j, whose constituent natives and migrants are productively identical. Wages in market j will depend on both p_j (the skill-specific marginal product) and firms' wage-setting choices. If migrants are distributed differently to natives across skill types j, this would partially shelter natives from direct

[15]This is analogous to Dustmann et al. (2021), who show how a minimum wage forces low-quality firms out of the market. Similarly, Manning (2010) attributes the concentration of low-quality firms in smaller cities to weaker labor market competition.

[16]See Albert (2021) for a more complex bargaining model which does allow for direct competition.

labor market competition. If there is no skill overlap at all, all adverse wage-setting effects would be eliminated. As Amior and Manning (2020) show, the implications of skill segregation are then analogous to wage discrimination: in both cases, natives are sheltered from direct labor market competition with migrants.

(ix) Co-ethnic networks. Gyetvay and Keita (2023) highlight the importance of firm-level co-ethnic networks: if migrants concentrate in different firms due to ethnic preferences or networks, this will moderate labor market competition with natives.

Note these "exogenous" forms of segregation (i.e. determined outside the model, whether due to heterogeneous skills or preferences) have very different implications to segregation which arises *endogenously* through firms' wage policies (as in Proposition 1). While exogenous segregation *precludes* labor market competition between natives and migrants, endogenous segregation is an *outcome* of this same competition.

3 Data and German immigration shock

In this section, we characterize the German immigration shock of the late 1980s and early 1990s. After describing our data sources, we report national trends in migrant shares and study the characteristics of the new arrivals.

3.1 Data sources

Our main datasets are the Sample of Integrated Labour Market Biographies (SIAB) and the Establishment History Panel (BHP), both from the Institute for Employment Research (IAB). We use weakly anonymized data, accessible by remote execution. We rely additionally on district-level population counts and bilateral flows from the Federal Statistical Office of Germany, the Federal Office for Building and Regional Planning, and the 1987 Census (GESIS ZA2472). For our main analysis, we study 204 local labor markets in the SIAB, or 203 in the BHP (which uses a more recent territorial definition, merging two districts). Locations are defined by place of work rather than residence, and "migrants" by nationality rather than birthplace (naturalizations were infrequent in our analysis period).

Sample of Integrated Labour Market Biographies (SIAB) For our worker-level analysis, we use the SIAB-v7510 (Vom Berge, Burghardt and Trenkle, 2014), a 2% panel of dependent employees subject to social security contributions. The data are representative for over 80% of the workforce, but exclude civil servants, the self-employed, full-time students, and the military.[17] We focus on individuals aged 16-65 in West Germany (excluding West Berlin). For the employment analysis, we consider both full- and part-time workers, and construct an annual panel using records from June 30 of each year. We restrict the wage analysis to full-time workers. Wages correspond to the average gross daily wage in the employment spell containing this reference date.[18] The IAB allows users to attach establishment-level characteristics to SIAB worker records: among other outcomes, we merged the AKM firm effects estimated by Card, Heining and Kline (2013) on the universe of employment records.

Establishment History Panel (BHP) To study effects across the firm pay distribution, we use the BHP-v7510 and BHP-v7519[19] (Gruhl, Schmucker and Seth, 2012). These contain aggregated (establishment-level) information on employment and wages, for 50% of all establishments: i.e. a significantly larger sample than the SIAB, which covers only 2% of employees. For presentational purposes, we use the terms "establishments" and "firms" interchangeably.

3.2 National trends in immigration

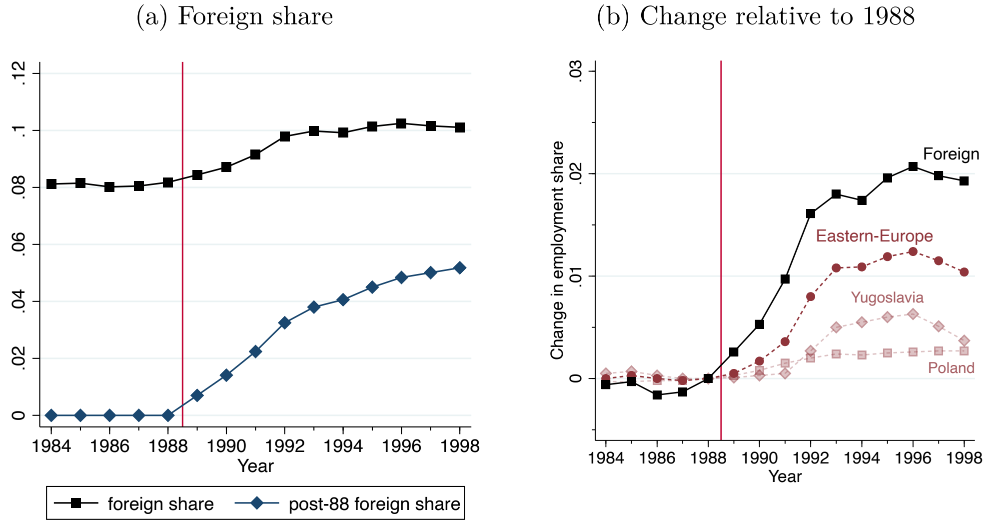
The early 1990s saw a large and sudden immigration wave, triggered by the fall of the Iron Curtain and Yugoslav War. As Figure 2a shows, between 1988 and 1993, the share of foreign nationals in regular employment grew from 8 to 10% (black line). By 1997, over 5% of the workforce consisted of foreigners who entered after

[17]The native self-employment rate has remained fairly stable in our analysis period, and migrant arrivals are unlikely to displace civil servants due to legal restrictions (Brücker and Jahn, 2011).

[18]Wages are right-censored at the social security contribution ceiling (less than 6% of observations): like Dustmann, Ludsteck and Schönberg (2009), we impute censored wages under the assumption of normally distributed errors, while allowing for different residual variance by gender and year. We also impute missing educational information, following Fitzenberger, Osikominu and Völter (2006).

[19]We use BHP-v7510 to construct local migrant shares and the enclave instrument (as it reports employment by nationality), and BHP-v7519 for all other analysis: this latter version contains more detailed wage data and AKM firm effects (estimated by Bellmann et al., 2020, on the full sample).

Figure 2: Foreign share in employment



SIAB, foreign share of employment (panel a) and change in employment shares of selected nationalities (panel b).

1988 (blue line), equal to about 1 million workers. Panel b shows that much of the shock originated from Eastern Europe, especially Yugoslavia and Poland. In addition, there was an influx of subcontracted "posted workers" from foreign firms who are not subject to social security (and therefore not listed in our data): these numbered about 90,000 in 1993, most of whom were employed in construction (Werner, 1996).

3.3 Observable characteristics of new migrants

Table 1 shows that the new migrants (entering after 1988) had less education than natives, and were also much younger: more than 60% were under 30. They also tended to work in smaller firms: their average establishment size is half that of natives'. The contrast is even more striking when comparing them to previous migrants (which includes the "guest worker" generation), who often worked in large establishments in manufacturing or other tradable industries (Brinatti and Morales, 2021).

The influx was heavily concentrated in certain sectors, as shown in Appendix Table A1. Foreign share increased by nearly 11 pp in hospitality, and also grew strongly in agriculture, food manufacturing, household/business services, and construction. Few migrants entered the public sector or industries that were contracting at the time, such as mining. While previous migrants were overrepresented in tradable industries (a legacy of the guest worker program), new arrivals were not (column 9).

Table 1: Characteristics of natives and migrants

	Female	Education shares			Age shares			Estab.	Tradable
	share	Low	Mid	High	16-29	30-49	50-65	size (∅)	share
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Natives	0.420	0.164	0.754	0.082	0.294	0.487	0.219	1,336	0.378
Previous migrants	0.303	0.462	0.492	0.046	0.160	0.599	0.241	2,204	0.540
New migrants	0.354	0.620	0.340	0.040	0.625	0.347	0.028	718	0.349

Notes: SIAB, mean values for 1990-96, for individuals aged 16-65. "Previous" migrants entered employment before 1989, "new" migrants in or after 1989. "Mid" education is upper secondary or vocational degree, and "high" is university or technical college. Sample in millions is 2.064 for natives, 0.161 for previous migrants, and 0.073 for new migrants.

4 Validation of wage-setting assumptions

Our key assumption is that wage offers (to productively identical natives and migrants) can differ *between* firms, but not *within* them: this opens the door to the monopsonistic trade-off at the heart of our model. Before estimating the impact of the shock, we assess this assumption empirically. We first study *average* native-migrant wage differentials, and then differentials across the firm pay distribution.

4.1 Average pay differentials and firm effects

In Table 2, we use simple Mincer equations (for log wages) to estimate native-migrant wage differentials. On average, pre-1989 migrants earned slightly more than natives (4 log points), but new migrants were paid 44 log points less (column 1). Though columns 2-3 show that much of this differential can be statistically explained by age, education, gender and occupation (12-group classification), new migrants still earned 10 points less conditional on these characteristics.[20]

This differential may be rationalized by low migrant reservation wages in many non-competitive frameworks, not just ours. But as we now show, it is mostly driven by migrants *sorting into* low-paying firms, and not wage discrimination *within* firms – just as Proposition 1 predicts. We first restrict our sample to firms containing both natives and migrants: note the coefficients remain similar (cf. columns 3 and 4), with a -0.12 new migrant effect. In column 5, we now introduce firm fixed effects: remarkably, this eliminates most of the gap, which falls below 4%. Conditioning on

[20]These large wage gaps are specific to the immigration episode we study. In Appendix E.2, we show that in the early 1980s, new migrants received similar pay to comparable natives.

Table 2: Average migrant wage differentials

	Basic sample			Firms with natives and migrants		
	(1)	(2)	(3)	(4)	(5)	(6)
Previous migrants	0.041***	-0.005*	0.021***	-0.010***	-0.006***	-0.005**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
New migrants	-0.440***	-0.085***	-0.098***	-0.120***	-0.037***	-0.026***
	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
Year fixed effects	Y	Y	Y	Y	Y	Y
Edu × age × sex FEs		Y	Y	Y	Y	Y
Edu × age × sex × occ FEs			Y	Y	Y	Y
Firm FEs					Y	Y
Firm × occ FEs						Y
Observations (mil.)	2.583	2.583	2.583	1.022	1.022	1.022
R^2	0.023	0.512	0.583	0.629	0.755	0.805

Notes: SIAB, mean values for 1990-96, for individuals aged 16-65. "Previous" migrants entered employment before 1989, "new" migrants in or after 1989. Standard errors clustered at establishment level, * p<0.10, ** p<0.05, *** p<0.01.

interacted firm-occupation effects (column 6) reduces the gap still further.[21]Consistent with these results, we confirm in Appendix E.5 that new migrants are concentrated in low-paying firms (with low median wages and AKM premia).[22]

This central role of between-firm variation is consistent with the institutional setting: Germany had no minimum wage at the time; and though there is collective bargaining at the industry-region level, individual firms can choose to opt out. Small firms are especially likely to do so, and coverage eroded significantly in the 1990s (Jäger, Noy and Schoefer, 2022). Importantly, workplace segregation of migrants is not merely a byproduct of “skill sorting” (i.e., assortative matching between productive workers and firms); in line with Swedish evidence from Aslund et al. (2021), Appendix E.5 shows that new migrants are much more concentrated in low-paying firms than natives of the same education, gender and age.

[21]Native-migrant differentials were significantly larger for older workers, both between and within firms (unlike the younger migrants who dominate our sample). This may reflect institutional regulations or limited transferability of work experience. Moreover, wages were even lower for “posted” workers, who are outside our sample: Cyrus and Helias (1993) report that Polish posted workers received less than half the going rate. See also Muñoz (2023) on posted workers in France.

[22]These findings are in line with Aydemir and Skuterud (2008), Dustmann, Ku and Surovtseva (2024), Arellano-Bover and San (2020) and Dostie et al. (2023), who show that firm effects contribute significantly to migrant wage differentials in other contexts. Like Arellano-Bover and San (2020), we also show in Appendix E.5 that migrants gradually sort to higher-paying firms over time. This may be rationalized by an on-the-job search extension to our model: see footnote 13.

Table 3: Migrant wage differentials across firm pay distribution

	Previous migrant premium			New migrant premium		
	OLS	IV	EB	OLS	IV	EB
	(1)	(2)	(3)	(4)	(5)	(6)
Native firm premium	0.549***	1.005***	0.969***	0.586***	0.969***	1.011***
	(0.014)	(0.037)	(0.020)	(0.018)	(0.045)	(0.032)
Observations	10,810	8,176	10,810	7,648	5,450	7,648

Notes: Establishment-level regressions, based on SIAB data over 1990-96. "Previous" migrants entered employment before 1989, "new" migrants in or after 1989. Standard errors clustered at establishment level, * p<0.10, ** p<0.05, *** p<0.01.

4.2 Wage differentials across firm pay distribution

Table 2 focuses on *average* wage differentials. We next show that pay gaps vary little across the *firm distribution*: consistent with our model, migrants benefit *equally* to natives from working in higher-paying firms.

We begin by estimating firm premia, separately for natives, new migrants and previous migrants. For each group, we estimate Mincer equations with interacted education-age-gender effects, year effects, and firm effects (which we save). We then regress the estimated firm premia for migrants on those of natives, across those (typically larger) firms which contain both natives and migrants.

We present our estimates in Table 3. The OLS coefficients in columns 1 and 4 are 0.5 or 0.6, suggesting that firms which pay natives 10% more (conditional on their observables) tend to pay migrants only 5 to 6% more. However, these coefficients are attenuated by measurement error in the native firm premia. This bias can be corrected using “split-sample” IV as in e.g. Drenik et al. (2023), or empirical Bayes (EB) as in Walters (2024): see Appendix E.3 for details. With either approach, the estimated coefficients on the native premia are close to 1, for both new and previous migrants.[23]

In summary, even though new migrants are more likely to accept jobs at low-paying firms (Table 2), high-paying firms appear unable or unwilling to discriminate against them. This matches evidence from other countries[24], and more generally, the

[23]One might worry that our estimates are conflated by unobserved worker heterogeneity across firms. But following a strategy akin to Aslund et al. (2021), we show in Appendix E.4 that natives and migrants who *transition* from firms with low to high AKM premia enjoy similar wage increases.

[24]Dostie et al. (2023) find similar results in Canada; Arellano-Bover and San (2020) estimate

finding that wage offers are not typically tailored to individual workers in low-skilled markets (Caldwell and Harmon, 2019; Lachowska et al., 2022; Di Addario et al., 2023).

5 Empirical strategy

We now describe our empirical strategy, which exploits regional variation in immigration using a past-settlement instrument. We also discuss potential confounders related to German reunification and sectoral shifts.

5.1 Regional variation and estimating equation

We exploit variation in migrant arrivals across local labor market regions (*Arbeitsmarktregionen*) in West Germany. We implement a generalized difference-in-differences model allowing for dynamic treatment effects, estimating separately for each year $t \in \{1985, ..., 1996\}$:

$$\Delta y_{rt} = \alpha_t + \beta_t \Delta m_r + \gamma_t X_{rt} + \varepsilon_{rt} \tag{11}$$

where $\Delta y_{rt} = y_{rt} - y_{r88}$ is the change in some outcome y_{rt} (such as wages or employment) in region r between the base year 1988 and year t, Δm_r measures the regional immigration shock between 1988 (when the migrant share began to expand) and 1993 (when it stabilized), and X_{rt} is a vector of region r controls. We describe the shock variable and controls in greater detail below. Observations are weighted by base year employment. As (11) is expressed in differences, we are implicitly controlling for pre-treatment regional differences in outcome y (i.e. region fixed effects).

We estimate (11) separately for each year t: this allows the impact of both immigration (β_t) and controls (γ_t) to vary by year. For post-treatment years $t > 1988$, the β_t represent the dynamic (reduced-form) impact of the immigration shock Δm_r in year t. For pre-treatment years $t < 1988$, the β_t represent falsification tests on the existence of pre-trends to support the validity of our research design. These tests are informative in our setting, as the sudden and unexpected onset of the shock allows

that migrants receive 85% of the rents of natives in high-pay firms in Israel (i.e. there is some discrimination, but limited); and in Sweden, Aslund et al. (2021) find that migrants benefit somewhat *more* than natives from working in productive firms. Interestingly, the pattern appears very different for other, non-regular forms of labor: outsourced workers only receive half the premium paid by firms to their regular employees (Drenik et al., 2023), and posted workers receive just 10% (Muñoz, 2023).

for a sharp distinction between pre- and post-treatment periods. Moreover, our estimates are not subject to dynamic spillovers from earlier shocks, which can be sizable in other settings (Amior and Manning, 2018; Jaeger, Ruist and Stuhler, 2018).

We use the same shock Δm_r for every year t, and irrespective of whether the outcome Δy_{rt} is defined over the entire region r or for particular firms or workers. Since we rely on "pure" spatial variation, we identify the "total" effect of the particular immigration event we study (Dustmann, Schoenberg and Stuhler, 2016).

5.2 Identifying the immigration shock

We identify regional immigration shocks Δm_r with the enclave instrument of Card (2001). This instrument predicts local changes in foreign shares based on the distribution of foreign nationals at baseline, motivated by migrants' preference to settle in large enclaves. The aim is to isolate variation which is orthogonal to omitted demand shocks. Formally:

$$\Delta m_r = \frac{\sum_o s_{or80} \left(n_{o93} - n_{o88} \right)}{n_{r80}} \tag{12}$$

where $n_{o93} - n_{o88}$ is the 1988-93 national-level change in the number of origin o migrant workers, $s_{or80} = \frac{n_{or80}}{n_{o80}}$ is the share of origin o migrants located in region r in 1980, and the denominator n_{r80} is total employment in region r in 1980. We purposely choose a fixed time interval for the enclave shock, as both the treatment intensity and response are plausibly dynamic (and difficult to disentangle).

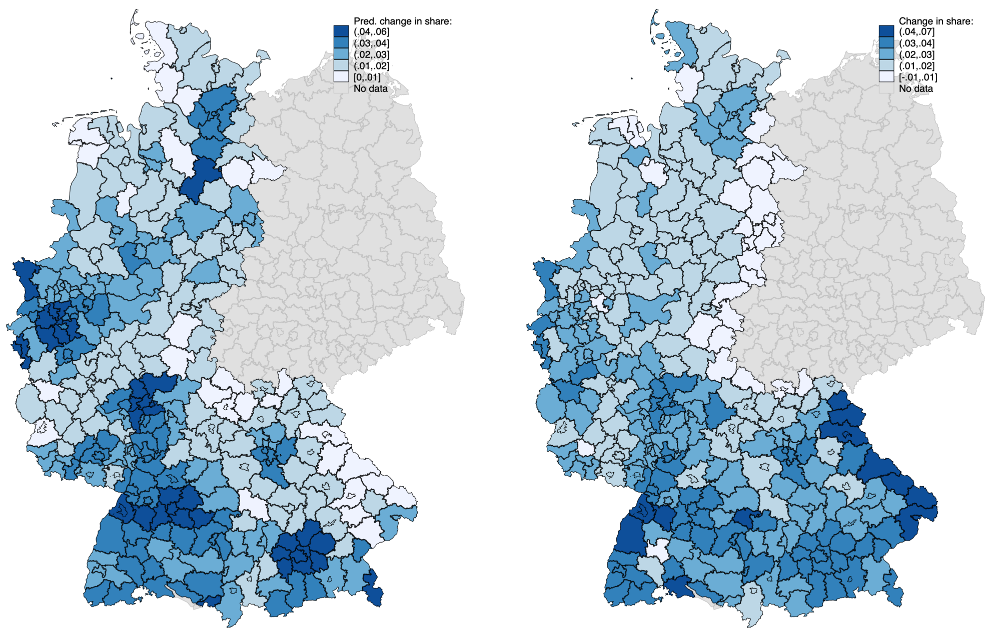
We have chosen to use the enclave shock Δm_r as an explanatory variable, and not as an instrument for realized immigration; so the coefficients β_t in (11) can be interpreted as "reduced form" effects of Δm_r. This allows us to avoid taking a stance on whether the relevant endogenous variable is the overall or post-1988 foreign share (see Figure 2a). As with all shift-share instruments, identification may be motivated by the exogeneity of the initial local origin shares to omitted shocks or by exogenous aggregate-level (origin-specific) migrant inflows (Borusyak, Hull and Jaravel, 2025).[25]

Figure 3 maps the spatial distribution of both the enclave shock Δm_r (Panel a) and changes in foreign employment share (Panel b) between 1988 and 1993. Visually, the enclave shock appears to predict immigration well: both are clustered in similar

[25] As the migrant influx was triggered by external political events (see Section 3.2), our setting arguably satisfies the assumption of exogenous aggregate-level shocks.

Figure 3: Changes in foreign employment share (1988-93)

(a) Predicted: enclave shock Δm_r (b) Actual change in foreign share



Notes: BHP. Panel a shows predicted changes in foreign employment share between 1988 and 1993 (i.e. the enclave shock Δm_r), across local labor markets in West Germany. Panel b shows actual changes in foreign employment share.

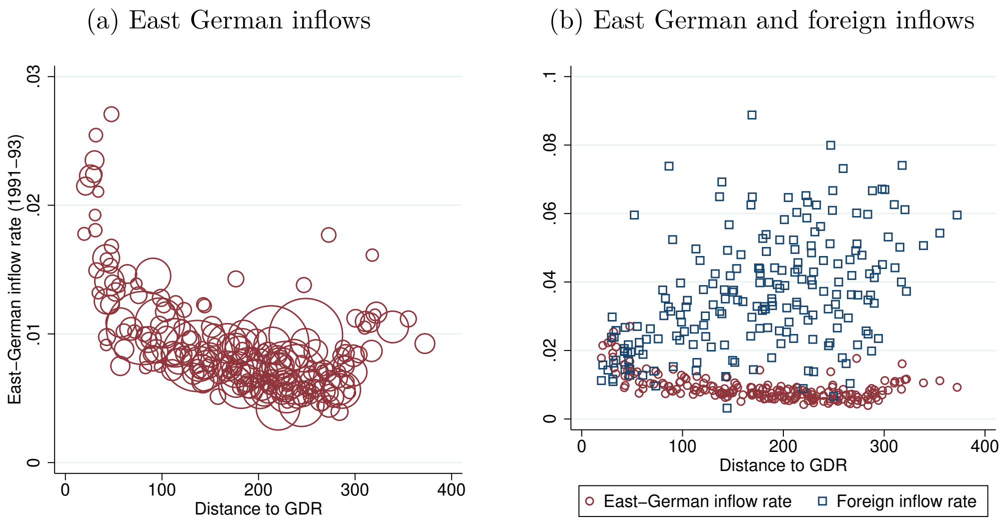
places. In Appendix Figure A3, we plot the variables against each other: the correlation is 0.55, and is driven by both high and low-population regions. In two regions, the enclave shock Δm_r lacks predictive power. First, foreign shares grew strongly near the Czech border (in the Southeast) due to a cross-border commuting policy (see Dustmann, Schoenberg and Stuhler, 2017). Second, surprisingly few migrants settled near the East-West German border, likely to avoid labor market competition with East German inflows after reunification. See Appendix F.2 for details.

5.3 Potential confounders and controls

Our setting offers several advantages: external triggers of migrant inflows ("push factors"), their size and spatial dispersion, their sharp and unexpected onset after a period of steady foreign shares (yielding a clean distinction between pre- and post-treatment periods), and high-quality panel data on workers and firms. But there were other major events which may confound our results: we discuss each in turn.

(i) Reunification. Reunification led to a large inflow of East Germans to the

Figure 4: Comparing East German and foreign inflows



Notes: Federal Statistical Office and SIAB. Panel a plots inflow rates of East Germans between 1991 and 1993 in West German districts (*Kreiswanderungsmatrix*), against distance to the inner German border. Panel b compares these East German inflows with foreign inflows between 1989 and 1993.

West, but we argue its effects can be captured by a distance control. While East Germans are not reliably identified in the SIAB, the Federal Statistical Office reports inter-district population flows from 1991. Figure 4a shows that inflow rates of East Germans are strongly predicted by distance to the inner German border (see also Bruns and Priesack, 2019): the correlation with its log is -0.67. In contrast, distance is mostly uncorrelated with foreign inflows (panel b), with the exception of regions closest to the border, which attract very few migrants (see above). Once we condition on log distance however, actual and predicted changes in foreign share are uncorrelated with East German inflows: see Appendix F.3. We therefore include this control in all regressions; note it also captures other (time-varying) distance-related consequences of reunification, such as changes in the spatial distribution of trade.

(ii) Repatriation of ethnic Germans. When the Iron Curtain fell, many ethnic Germans in the Eastern Bloc exercised their right to move to Germany (as German nationals). In Appendix F.4, we show that ethnic German and foreign inflows are negatively correlated spatially, but the relationship is weak (and could be part of the impact we aim to capture, if ethnic Germans avoided regions more exposed to foreign inflows). Their repatriation is therefore not a concern for our analysis.

(iii) Other demand and supply shocks. As in most immigration studies, foreign shares are spatially correlated with sectoral and demographic structure. This can be problematic if these attributes predict future wage or employment growth. One particular concern is the recession of 1993, which led to large employment losses in manufacturing, shortly after immigration peaked in 1991.[26] To address this challenge, we control for two Bartik-type shift-shares, which predict employment and wage growth (respectively) using each region's 1980 industrial composition.[27] Turning to the supply side, a potential concern is the sharp decline in fertility in West Germany in the 1960s and 1970s; this reduced population growth in subsequent decades, especially in regions where fertility was initially highest (Basten, Huinink and Klüsener, 2011). To exclude this variation, we project working-age (18-59) population growth forwards using regional population pyramids from the 1987 census (aging each local cohort year-by-year); and we control for these projections in all regressions.

6 Aggregate region-level effects

In this section, we study aggregate effects of immigration on local labor markets, following the example of much of the literature. Though not the heart of our analysis, this will provide important context for what follows. We find large crowd-out of native employment, consistent with non-discriminating monopsonistic firms. In Sections 7 and 8, we will test this interpretation by estimating wage and employment effects across the firm pay distribution.

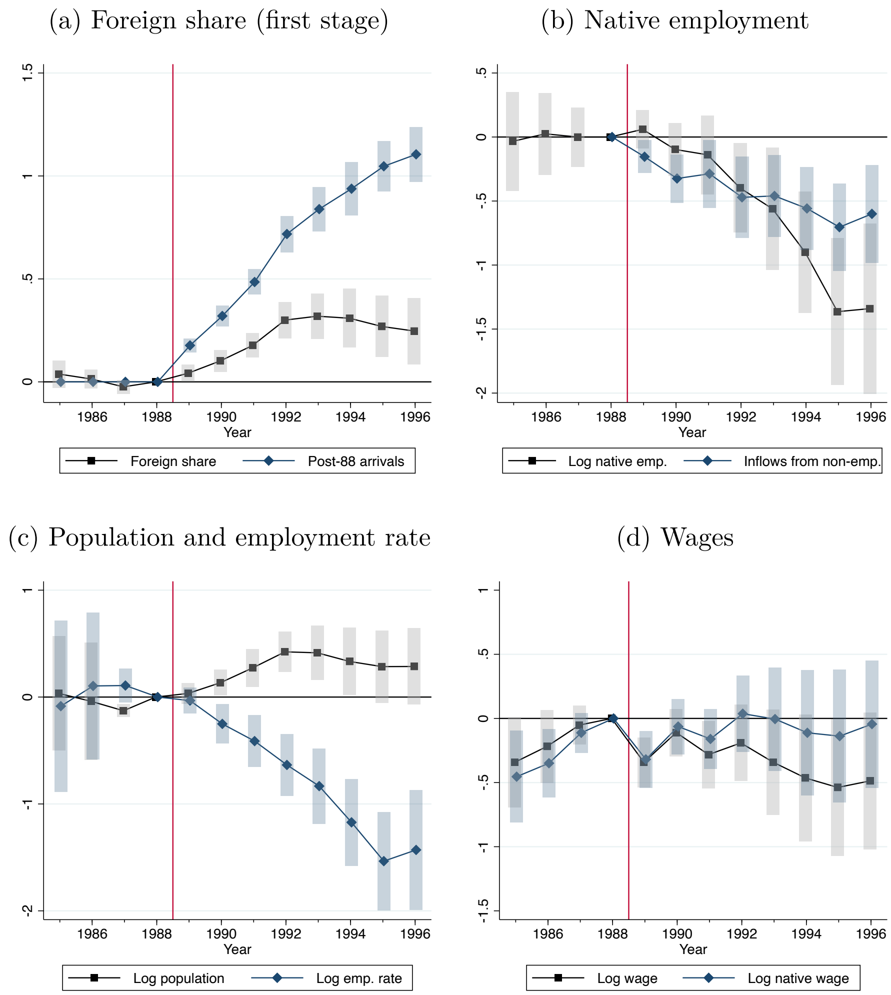
6.1 Changes in regional foreign share

In Figure 5a, we plot effects of the enclave shock Δm_r on the foreign employment share, as estimated by equation (11). The black line shows the overall foreign share, relative to 1988: there is no pre-trend, and the β_t coefficient peaks at 0.3 in 1993. The blue line traces the share of post-1988 foreigners: the effect is zero by construction

[26] Note the recession is only a confounder if its intensity covaries spatially with the immigration shock. However, it may amplify the genuine wage-setting effects we seek to identify: as Section 2.2 shows, the model predicts that these effects become more acute if productivity p is low.

[27] The "employment Bartik" weights national-level industry employment growth with initial local composition (see Bartik, 1991). The "wage Bartik" applies these weights to national wage growth (as in Beaudry, Green and Sand, 2012). We use a two-digit industry classification, with 94 codes.

Figure 5: Aggregate regional impacts



SIAB, regression estimates based on equation (11) across 204 regions, with 95% CIs. Dependent variable is regional change in some outcome between 1988 and year t. Panel a focuses on foreign employment shares (overall and post-1988 arrivals), Panel b on log native employment and the contribution of inflows from non-employment, Panel c on log population and employment-population ratio, and Panel d on mean log wage of all full-time workers and natives.

before 1988, and reaches 1 by 1995. This coefficient makes it simple to interpret the estimates below: a 1-point change in Δm_r corresponds to a 1 pp foreign inflow. Based on our model, it is likely to be the post-1988 arrivals who matter most, as the evidence suggests they have low reservation wages (see Section 4). In Appendix G.2, we show that this response is robust to different controls and regression weights.

6.2 Impact on regional employment and wages

Figure 5b shows the impact on log native employment. This is large and negative, reaching -1.3 by 1995 for a 1 pp foreign inflow. It varies somewhat with controls and regression weights, but remains large in all specifications (Appendix G.2). In the same figure, we show it is partially driven by reduced native *inflows* from non-employment, especially in the first years after treatment (see Appendix G.1 for details).

Our hypothesis does not rest on whether crowd-out exceeds one-for-one: as Proposition 4 shows, the model is ambiguous on this point. However, our model can help rationalize a very large effect (even exceeding one-for-one). Crowd-out here is certainly large compared to the literature, but not uniquely so: Dustmann, Schoenberg and Stuhler (2017) find that Czech commuters in Germany (in the same period) also induce large crowd-out; and see Muñoz (2023) on posted workers in France, and Delgado-Prieto (2024) on Venezuelan refugees in Colombia. Our model predicts that the employment effect depends on migrants' reservation wages, and this will vary substantially by context. In Appendix G.4, we explore this idea by comparing the effect of inflows from different origin countries. It turns out the large negative effects in Figure 5b are driven by origin groups which sort into lower-paying firms (consistent with lower reservation wages), just as our model predicts. In Appendix G.5, we show that crowd-out occurs in all sectors, but is largest in tradable industries.

Figure 5c shows a moderate increase in the population of 15-65s, with a similar trajectory to the foreign share in Figure 5a. At the same time, the blue line shows a large reduction in the employment-to-population rate, which contracts by 1.5% by 1995 for a 1 pp foreign inflow. This effect is robust to different sets of controls and regression weights (Appendix G.2). Overall, the immigration shock led to large-crowd out of native employment, and more modest crowd-out of population.

Finally, Figure 5d shows that average regional wages decline (black line), reflecting the arrival of low-paid migrants, but remain stable if migrants are excluded (blue). This might appear surprising, given the falling employment rate. But these wage effects are contaminated by compositional shifts in native employment: low-paid workers are disproportionately displaced. We address this challenge in Section 8 using a "movers" design, which reveals large negative effects on regional wage premia.

7 Effects across the firm pay distribution

To test our model's predictions more directly (and specifically Propositions 1-4), we next study the impact of regional immigration shocks across the *firm pay distribution*. We rely primarily on the Establishment History Panel (BHP), which covers half of all establishments: this allows us to track how different parts of the firm pay distribution respond. Throughout, we use the terms "establishments" and "firms" interchangeably.

7.1 Firm quartile definitions

We split firms into four quartiles according to their median wage, separately by region and year[28]: this allows us to track quartiles of the firm pay distribution over time. Our approach here is analogous to labor analyses which track percentiles of the *worker* distribution (as in Dustmann, Frattini and Preston, 2012), except we do so for firms.[29] Tracking quartiles (rather than percentiles) makes it simple to estimate employment effects across the firm distribution. Note the shock has no discernible effect on the number of firms (relative to workforce): we return to this point in Section 7.4, where we discuss effects on firm size.

Table 4 provides summary statistics by quartile for the year 1988 (pre-treatment). Firms in Q1 pay 60 log points less than those in Q2, and 120 less than those at the top. Low-paying firms also tend to be smaller: Q1 firms have just 2.9 workers on average, compared to 33.6 at the top. Accordingly, the top quartile accounts for 55% of all employment. These patterns are consistent with standard monopsony models: high-paying firms recruit more workers. They also employ fewer low-skilled and foreign workers (at baseline), but these differences are less pronounced.

In the model, dispersion in firm pay is frictional: it represents divergent wage offers to productively identical workers, sustained in equilibrium by search frictions.

[28]One might alternatively rank firms by their AKM wage premia: we adopt this approach in Section 8.3. As we explain there, each approach offers advantages. Unlike the AKM premia, we observe median wages year-by-year, which allows us to estimate annual effects. And though the AKM premia condition on worker effects (a valuable benefit), they are also estimated with substantial error.

[29]The identity of firms within these quartiles is liable to change, but this is by intent: our model is informative about how the distribution responds, rather than individual firms. Also, tracking individual firms is empirically challenging given the vast churn: 38% of firms in 1995 were not present in 1988 (our baseline year). Still, our results are robust to restricting the sample to incumbent firms present in both years (see below).

Table 4: Descriptive statistics by firm wage quartile (in 1988)

	Q1	Q2	Q3	Q4
Establishments (#)	162,313	162,484	162,455	162,606
Mean wage (log)	3.023	3.622	3.899	4.217
Employment	474,204	1,180,779	2,668,530	5,477,851
Shares in each quartile	0.048	0.119	0.269	0.552
Edu shares				
Low	0.293	0.266	0.248	0.186
Middle	0.672	0.702	0.707	0.707
High	0.016	0.021	0.035	0.096
Establishment size				
mean (firm-weighted)	2.9	7.3	16.4	33.6
mean (worker-weighted)	16.8	72.8	401.0	1873.6
share small (emp<5)	0.845	0.645	0.466	0.417
share large (emp>=100)	0.001	0.007	0.026	0.053
Tradable industry share	0.189	0.306	0.357	0.475
Share foreigners	0.093	0.073	0.075	0.067
Destination shares of job movers (rows sum to 1)				
Movers originating from Q1	0.291	0.306	0.219	0.185
Movers originating from Q2	0.101	0.374	0.295	0.230
Movers originating from Q3	0.032	0.148	0.419	0.403
Movers originating from Q4	0.020	0.065	0.209	0.705

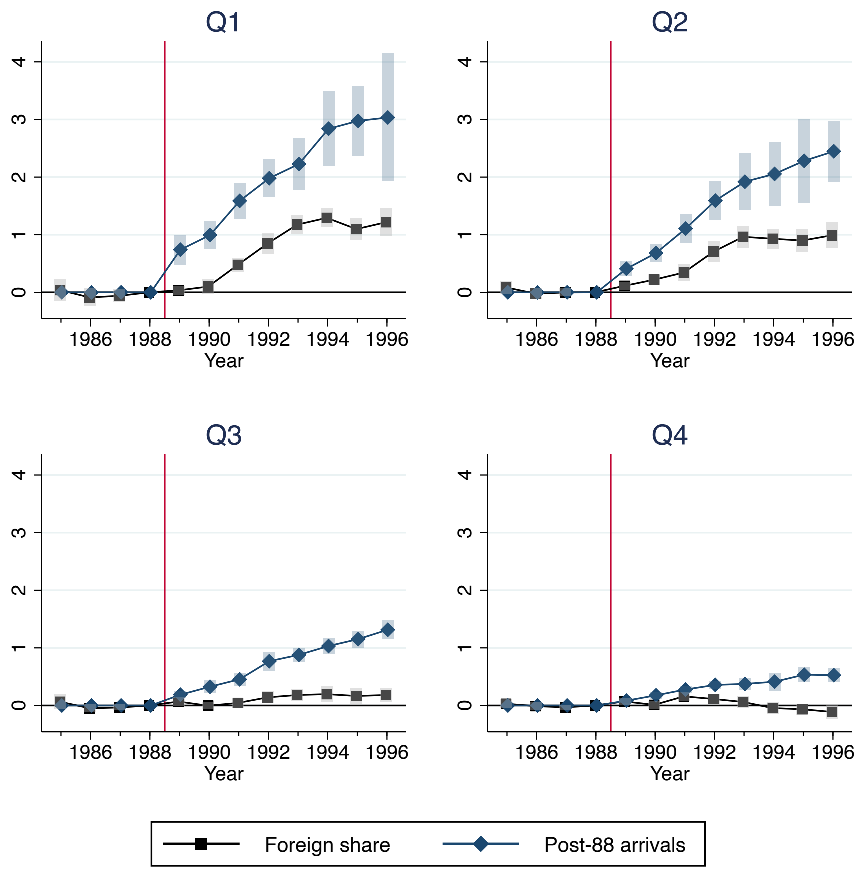
Notes: All data except for final panel based on Establishment History Panel (BHP) in 1988, by quartiles of the median establishment wage (within local labor market and year). Shares of job movers computed using SIAB, 1985-1988. Skill, industry and foreign shares are worker-weighted.

To support this interpretation in our data, the final panel of Table 4 describes worker mobility across the quartiles (using annual job transitions in the SIAB). Job movers frequently switch between quartiles, with upward mobility to high-pay firms much more common than downward mobility. This is indicative of a "jobs ladder", a natural consequence of search frictions (see Appendix B), and suggests that these firms compete over similar workers (as in the model).

7.2 Changes in foreign share by firm quartile (Prop 1)

Figure 6 estimates changes in foreign shares across the distribution of firms. Using equation (11), separately for each quartile, we regress changes in (i) the foreign share and (ii) the post-1988 foreign share on the region-level enclave shock Δm_r. The post-1988 share (blue line) increases in all quartiles, but much more in low-pay firms: the expansion (in pp) is six times larger in Q1 than Q4. This finding is consistent with **Proposition 1**: *Migrants concentrate in low-paying firms.* As Appendix E.5 shows, this sorting is not merely a byproduct of assortative matching between low-skilled

Figure 6: Impact on foreign share by firm wage quartile



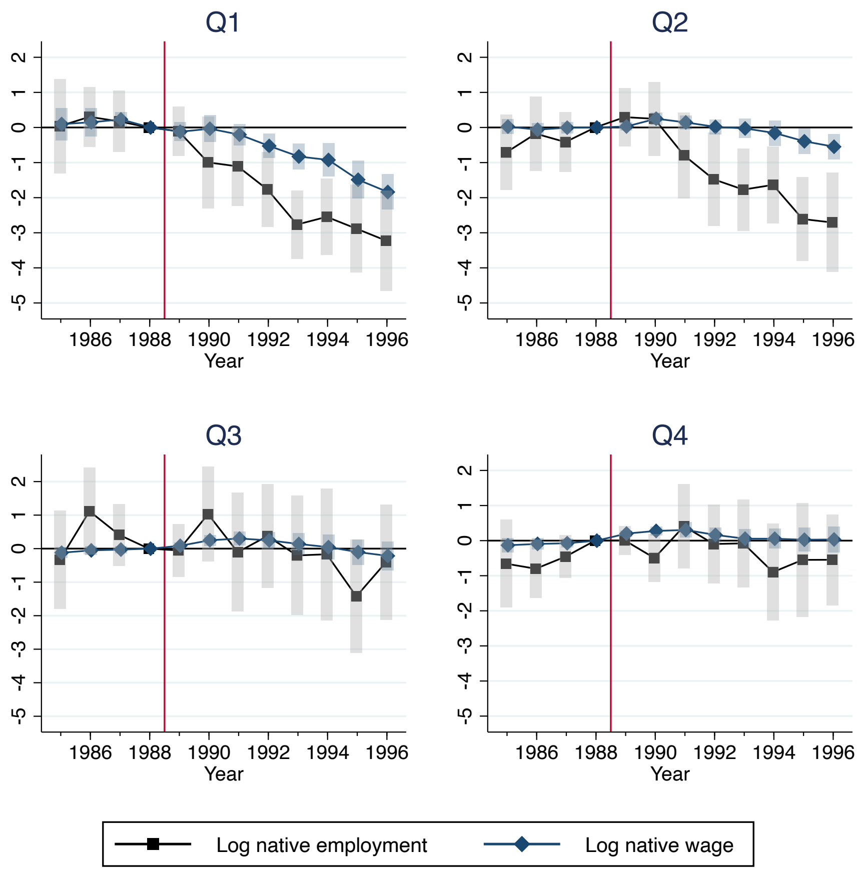
Regression estimates based on equation (11) across 203 local labor markets with 95% CIs. Dependent variable is regional change in foreign employment share (black line, measured in the BHP) or post-1988 arrivals shares (blue line, SIAB) in the respective quartile of the firm wage distribution, between base year 1988 and indicated year.

workers and low-paying firms. Instead, we argue that migrants' low reservation wages are the driving force: this is key to interpreting firms' wage and hiring responses.

7.3 Wage and employment effects by quartile (Prop 2-3)

Figure 7 traces the impact on mean native wages and employment, separately by firm quartile. The blue line shows a large wage reduction in Q1 (where the new migrants are most heavily concentrated), a milder effect in Q2, and no significant effect in high-wage firms. As Table 5 shows, wage effects are similar for natives and migrants: i.e. they are not merely driven by changes in migrant composition. The effects are precisely estimated and consistent with **Proposition 2**: *A larger migrant*

Figure 7: Wage and employment and effects by firm wage quartile



BHP, regression estimates based on equation (11) across 203 local labor markets with 95% CIs. Dependent variable is regional change in log native employment (black line) or mean log establishment wage (blue line) in the respective quartile of the firm wage distribution, between base year 1988 and indicated year.

share induces firms to reduce wage offers at the bottom of the pay distribution.

In magnitude, a 1 pp immigration shock reduces the Q1 native wage by 1.5% by 1995. Since the national-level inflow was nearly 5% by 1995 (Figure 2), this coefficient implies a 7.5% average reduction in Q1 across all regions. This is a large effect, but Q1 firms only account for 5% of employment (Table 4). The wage effects are therefore heavily concentrated in a small corner of the labor market. Previous studies have explored distributional effects on local wages within observable skill groups (e.g. Card, 2009; Dustmann, Frattini and Preston, 2012; Gould, 2019); our estimates highlight the role of firms in generating these effects.

In Appendix G.3, we present these same effects across firm pay percentiles, rather

Table 5: Wage and employment effects by firm quartile (1988-95)

	By firm wage quartile			
	Q1	Q2	Q3	Q4
	(1)	(2)	(3)	(4)
Panel A: Firm log wage effects				
all	-1.675***	-0.569***	-0.239	-0.040
	(0.278)	(0.187)	(0.195)	(0.161)
natives	-1.488***	-0.393**	-0.104	0.026
	(0.273)	(0.184)	(0.193)	(0.172)
foreign	-2.193***	-0.417	0.089	1.026***
	(0.444)	(0.302)	(0.287)	(0.259)
Panel B: Log employment effects				
natives	-2.882***	-2.608***	-1.423*	-0.548
	(0.639)	(0.607)	(0.861)	(0.827)
total	-0.851	-1.122*	-1.160	-0.458
	(0.725)	(0.665)	(0.761)	(0.840)

BHP, estimates based on equation (11) across 203 local labor markets. Panel A: Dependent variable is regional change in mean log establishment wage in indicated firm quartile between 1988 and 1995. Bottom panel: Dependent variable is regional change in log native or total employment in quartile.

than by quartile. We also show that restricting the sample to incumbent firms (present in both 1988 and 1995) does not affect the basic patterns. And we show that these distributional effects manifest mostly within detailed industries, not between them.

We next turn to native employment. Consistent with **Proposition 3**, Figure 7 shows a large and rapid reduction in native employment among low-paying firms: a 1 pp immigration shock reduces Q1 native employment in 1995 by 2.9%. We see similarly large native employment losses in Q2, mild losses in Q3, and no significant effect in Q4. So, while new migrants concentrate heavily at the bottom of the firm distribution (Figure 6), native employment is increasingly restricted to the top.

As Appendix G.6 shows, workplace segregation (as measured by a dissimilarity index) therefore increases sharply. Common interpretations of workplace segregation include ethnic preferences/networks or skill segregation (natives and migrants doing different jobs). But our model shows how it can also arise endogenously from an inability to discriminate on wages: if firms choose to hire migrant labor at low wages, they must forgo natives employees. Workplace segregation may then not mitigate, but *reflect* labor market competition between natives and migrants. By limiting the scope of migrants' coworker networks, such (endogenous) segregation may in turn

Table 6: Impact on number of firms and firm size (1988-1995)

	Log number of firms	Log mean firm size		Δ Log share of firms with # employees			
		All firms	Incumbents	1-4	5-19	20-99	100+
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Enclave shock Δm_r	0.277	-1.020***	-0.798**	0.329***	-0.473**	-1.364***	0.188
	(0.218)	(0.287)	(0.321)	(0.103)	(0.232)	(0.289)	(0.605)

BHP, estimates based on equation (11) across 203 local labor markets. Incumbent firms are those present in both 1988 and 1995. Dependent variable in columns 4-7 is regional change in log share of firms of indicated size. * p<0.10, ** p<0.05, *** p<0.01.

impede the long-run integration of immigrants into the host economy (Glitz, 2014; Ansala, Åslund and Sarvimäki, 2021; Willis, 2025).

7.4 Impact on firm size (Prop 4)

The reduction in native employment is so large that even *total* employment contracts: see Panel B of Table 5. As we now show, this manifests in smaller firm size, a possibility highlighted by **Proposition 4**: *A larger migrant share may cause a reduction in average firm size.*

To interpret these effects, it is useful to first study what happens to the *number* of firms (k in the model). Column 1 of Table 6 shows this grows somewhat, but not significantly.[30] The growth in working-age population (i.e. n) in Figure 5c is in fact very similar, implying the $\frac{n}{k}$ ratio is unaffected (as assumed in our baseline model).

However, we do see a large reduction in mean firm size in column 2, which is robust to specification (Appendix G.2). It is driven by a larger share of small firms (below 5 workers), and a smaller share of medium-sized firms (5-99). It is not merely driven by selective entry and exit: column 3 shows the firm size reduction is similar among "incumbent" firms (present in both 1988 and 1995). Thus, the contraction of local employment is occurring partly *within* firms. This finding appears inconsistent with conventional factor demand theory: firms should *expand* their employment as more labor becomes available. But as Proposition 4 shows, it can be rationalized by monopsonistic firms trading off native employees for cheaper migrant labor.

Though firm size is an unusual outcome in the immigration literature, it is a natural focus of our model – and simple to measure in many contexts. For comparison,

[30] Though there is no significant effect on the *number* of firms, we do find evidence of selective firm entry (in line with our model): see Section 8.2 below.

we offer evidence on firm size effects in the US in Appendix H, exploiting spatial variation in enclave shocks between 1980 and 2020. As in our German setting, we find negative effects on firm size, though the US effects are smaller in magnitude. One possible interpretation is that the "wage-setting" effect (in Proposition 4) is more dominant in our German setting, due to lower migrant reservation wages.

8 Impact on AKM firm wage premia

In Figure 7, we find negative wage effects which are concentrated at the bottom of the firm pay distribution. In line with our model, we argue that these represent differential changes in firm wage policies (conditional on workers' marginal products). But there are two potential challenges to this interpretation.

The first is composition bias: if native employment effects are selective (e.g. concentrated among low-paid workers), wage changes may partly reflect shifts in worker *composition*, rather than the impact on any particular worker (Bratsberg and Raaum, 2012; Ortega and Verdugo, 2022; Borjas and Edo, 2021; Dustmann et al., 2023). The second is assortative matching: if low-paying firms disproportionately employ low skilled workers who compete more heavily with the new migrants, the wage effects may simply reflect a general reduction in the price of these skill types.

However, both challenges can be addressed by studying changes in AKM firm premia – and augmented versions thereof, which abstract from region-wide changes in the wages of different worker types. We begin by explaining how the premia are identified (in Section 8.1), and then estimate how they respond to immigration shocks: average changes in Section 8.2, and then distributional changes in Section 8.3.

8.1 Estimation of firm premia

We rely on pre-compiled AKM firm premia, which are attached to our BHP establishment data. Bellmann et al. (2020) estimate these premia separately for different time intervals, including 1985-92 and 1993-99 (which we treat as our "pre-" and "post-treatment" periods). For each interval, they extract the premia from the following model for log wages:

$$y_{it} = \alpha_t + \eta_{j(i,t)} + \theta_i + \gamma X_{it} + \varepsilon_{it} \tag{13}$$

where y_{it} is the log wage of worker i at year t, α_t are year effects, $\eta_{j(i,t)}$ are firm effects (for the firm j in which individual i worked in year t), θ_i are worker effects (which account for time-invariant skill differentials), and the vector X_{it} includes full interactions between education and a cubic in age. Given the presence of worker effects, the firm premia η_j are identified from workers who move between firms.[31]

The pre-compiled AKM estimates are useful for two reasons. First, they are based on full count employment data, which helps reduce the "limited mobility bias" from observing few movers between firms. Second, using estimates from *other* researchers imposes discipline on our specification.

8.2 Impact of shock on average firm premia

We begin by studying how immigration affects regional averages of firm premia. Just as individual firm premia are identified by movers between *firms*, regional variation in these premia are identified by movers between *regions*. By tracking movers, we can eliminate composition bias from estimates of wage effects.[32] Card, Rothstein and Yi (2025) explore spatial variation in these regional averages, but we estimate how they *change* in response to local shocks.

In Table 7, we estimate the impact of the enclave shock Δm_r on the average premia, using equation (11). Let $\eta_{r,0}$ denote the mean of the firm premia η_j in area r, estimated in the 1985-92 interval (i.e. the "pre-period", subscript 0); and $\eta_{r,1}$ the mean of the premia in the 1993-99 interval (i.e. the "post-period", subscript 1). Column 1 shows that the change, $\eta_{r,1} - \eta_{r,0}$, contracts by 0.72 in response to a 1 pp immigration shock: i.e. a large wage reduction for *individuals of fixed characteristics*. This can be reconciled with the absence of mean wage effects (in Figure 5d) by selective crowd-out of low-paid native workers: we demonstrate this empirically in Appendix G.9.

[31]Identification relies on an "exogenous mobility" assumption: the sequence of ε_{it} innovations must be orthogonal to the sequence of worker i's firm choices (see Card, Heining and Kline, 2013). In support of this claim, Appendix G.7 shows that the wage trends of workers switching between low- and high-premia firms are parallel before the move: this suggests these transitions are uncorrelated with other individual determinants of wage growth.

[32]This approach is different from purging time-constant worker fixed effects, as in e.g. Dustmann, Schoenberg and Stuhler (2017). While such designs capture wage changes among *incumbent* workers, identification in our exercise stems entirely from *movers*. Moreover, since (13) is estimated separately by period, we implicitly allow the worker effects to differ between the pre- and post-periods.

Table 7: Mean changes in firm wage premia

	Mean change in AKM premia	Contributions		
		firm incumbents	firm entrants	firm exiters
	(1)	(2)	(3)	(4)
Enclave shock Δm_r	-0.723***	-0.376***	-0.405***	0.058
	(0.134)	(0.037)	(0.042)	(0.097)

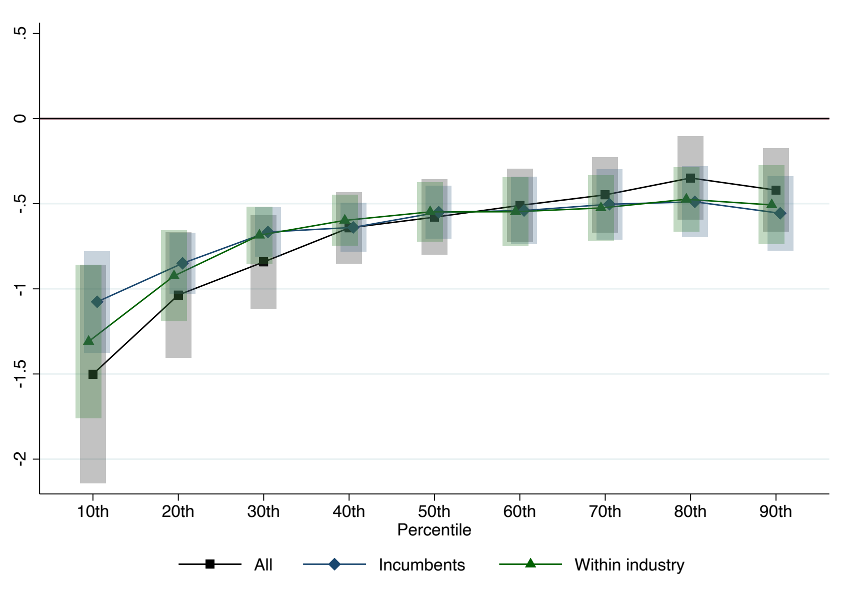
BHP, estimates based on equation (11) across 203 local labor markets. Firm AKM premia are estimated by Bellmann et al. (2020) on universe of employment records, for the intervals 1985-92 and 1993-99. Column 1 shows impact on regional average between the two intervals. * p<0.10, ** p<0.05, *** p<0.01.

This effect can be decomposed into (i) wage cuts by incumbent firms (present in both the pre- and post-period) and (ii) shifts in firm composition due to selective entry or exit: see Appendix G.8 for a derivation. The incumbent effect can be motivated by our baseline model, and the compositional effect by the "heterogeneous firm" extension in Section 2.4: low-reservation migrants can sustain the entry of low-paying (potentially less productive) firms. Columns 2-4 show that incumbent firms account for half the effect, and the remainder is driven by new entrants.

In Appendix G.4, we compare how the average premia respond to immigration from different origin countries. Consistent with our model, the negative effects are driven by origin groups which typically sort into lower-paying firms (indicative of lower reservation wages). In Appendix G.5, we show that wage premia decrease in all sectors, and most strongly in construction.

For the analysis above, we rely on pre-compiled AKM premia. But regional premia can also be estimated in our 2% SIAB worker sample, by replacing the firm fixed effect η_j in equation (13) with a region fixed effect – as in e.g. Combes, Duranton and Gobillon (2008). Card, Rothstein and Yi (2025) note that this strategy can introduce biases, due to regional movers changing their position in the local firm hierarchy. But for our purposes (estimating responses to local shocks), the bias appears not to be consequential: Appendix G.9 shows this strategy produces very similar results, closely matching the estimates of column 1 in Table 7. It also allows us to define our own subsamples, and to show that: (i) dropping migrants makes little difference to the wage effects, (ii) the enclave shock has no effect on changes in wage premia before 1988, and (iii) the negative wage effect vanishes if we use simple regional means of log

Figure 8: Changes in AKM firm wage premia by percentile



Notes: BHP, regression estimates based on equation (11) across 203 local labor markets.

wages instead of mover-identified premia (i.e. if we do not control for composition). In Appendix G.10, we also apply this "regional premia" method to study heterogeneous effects across worker types.[33]

8.3 Impact of shock on distribution of firm premia

Above, we studied how the shock affects regional *averages* of firm premia. We next consider how it affects their *distribution*. In Figure 8, we estimate effects on percentiles (within regions) of the firm premia distribution, again between the 1985-92 and 1993-99 periods. Consistent with Figure 7, the effects are largest at low percentiles. For a 1 pp immigration shock, the 10th percentile AKM contracts by 1.5%, and the 90th percentile by only 0.4%. The blue line shows effects for incumbent firms only, i.e. those present in both the pre- and post-period. The patterns are qualitatively similar,

[33]The wage effects fall mostly on young and low-paid natives, and the low-paid also face the largest employment losses. In conventional models, this may be attributed to differential changes in workers' marginal products, with the most adverse effects concentrated among "similar" natives. We do not discount the possibility of such effects; but interestingly, the heterogeneity is most pronounced when classifying workers by their *wage* rather than education or age. This is consistent with an important role for firms, which we now address more explicitly.

though the decline in wage premia is moderated at the bottom: this reflects the exclusion of low-wage entrants from the sample (see column 3 of Table 7). Finally, the green line shows the impact on AKM residuals, purged of detailed industry effects (97 categories) interacted with time effects. This makes little difference: the distributional effects manifest mostly *within* industries, not between them.

Though the patterns here are similar to Figure 7, the AKM analysis offers two potential benefits.[34] First, by conditioning on worker fixed effects, it eliminates compositional bias in wage changes. Still, one might worry that differential firm-level wage changes merely reflect differences in their skill mix (if immigration differentially affects region-level skill prices). In principle though, if we can track workers *moving* between firms (within regions), separately in the pre- and post-period, we can isolate changes in the distribution of firm premia paid to *fixed* worker types.

In practice however, the AKM firm premia are identified not only by *within*-region job movers, but also by *between*-region movers. This means we cannot fully reject conflation with regional skill price changes, even in Figure 8. We address this concern in two ways. First, we show that the distributional pattern in Figure 8 holds also within education groups, i.e. within observable worker types. Second, we show that it holds if we identify pay premia using only workers who switch firms within the *same region.* We build from the movers design in Appendix G.9, again relying on the SIAB worker sample; but instead of estimating regional wage premia, we now estimate returns to firm quartile bins *within* regions.[35] The top row of Table 8 replicates the main findings from Figure 8, but using our self-estimated bin premia (from the SIAB) instead of the pre-compiled firm premia, and reporting wage impacts *relative* to the top quartile. Consistent with our estimates above, pay premia decline more in the bottom firm bin. In the second row, we net out region-by-education interactions from the estimated pay premia, separately for the pre- and post-period. This abstracts from any region-wide wage impacts related to observable education, but we still find

[34]The AKM analysis also has important limitations. First, we are unable to track wage effects year-by-year. And second, the firm premia are estimated with substantial error – especially in smaller firms, where new immigrants are most heavily concentrated. This will bias our distributional estimates towards the mean, understating the magnitude of the negative effects at low percentiles, and overstating them at the top (which in reality may be negligible, as Figure 7 would suggest).

[35]By aggregating firms to quartile bins, we can implement a mover design without the full count data: i.e. relying on cross-bin rather than cross-firm movers.

Table 8: Relative changes in firm wage premia (Robustness)

	By firm AKM quartile: Diff. vs. Q4		
	Q1	Q2	Q3
	(1)	(2)	(3)
Δlog native wage (movers)	-2.267***	-0.610	-0.386
1994-96 v 1986-88	(0.694)	(0.489)	(0.309)
Δlog native wage (w/ region x educ. FEs)	-2.348***	-0.696	-0.445
1994-96 v 1986-88	(0.727)	(0.476)	(0.293)
Δlog native wage (w/ region x worker FEs)	-3.052***	-1.066	-0.459
1994-96 v 1986-88	(1.102)	(0.793)	(0.507)

SIAB, regression estimates based on equation (11) across 204 local labor markets. The dependent variable in column 1 (2 or 3) is the Q1 change (Q2 or Q3 change) in region-by-firm quartile wage premia of natives between the periods 1986-88 (pre-treatment) and 1994-96 (post-treatment), net of the change in Q4. The premia are estimated separately for each period using a "movers" design (Appendix G.9), controlling for worker fixed effects and interactions of age, education, sex, and year (all columns), and region-by-education effects (second row) or region-by-worker effects (third row). Firm quartiles are defined using pre-compiled AKM firm premia from Card, Heining and Kline (2013), separately by region and period. * p<0.10, ** p<0.05, *** p<0.01.

larger pay reductions in the bottom bin. Finally, in column 3, we identify pay premia from those workers who switch firms *within* region, by conditioning on interacted region-worker fixed effects. This specification abstracts from *any* region-wide changes in skill prices, in both observable and unobservable skills. While the precision of our estimates declines, the point estimates become more rather than less pronounced.

To summarize, this section identifies large wage reductions at the bottom of the firm pay distribution, which are attributable to changes in *firm premia* and not to worker composition.[36] These effects are driven by both incumbent firms (present both before and after the shock) and by the entry of new low-paying firms. These results are consistent with the model's predictions, and can be attributed to the arrival of migrants with low reservation wages. In comparison, a competitive model could motivate why wages decline more in firms employing certain types of workers (e.g., young or low-educated), but not why wage premia decline at the bottom of the firm pay distribution *independently* of worker type.

[36]This builds on Card, Heining and Kline (2013) and Song et al. (2019), who explore changing dispersion in firm premia at the aggregate level. Here, we do so at the regional level, in response to an *identifiable shock*; and with the response being predictable by economic theory. Interestingly, Card, Heining and Kline (2013) find that much of the aggregate increase in firm pay dispersion in Germany can be attributed to new entrants: we find the same in response to the immigration shock.

9 Conclusion

We argue that the arrival of migrants with low reservation wages strengthens the monopsony power of firms. Firms can exploit "cheap" migrant labor by cutting wage offers, but they must then forgo native hires who demand higher wages. Using a simple job search model, we derive four propositions that characterize the labor market impact along the firm pay distribution; and we test these predictions using spatial variation from the 1990s immigration wave in Germany.

We show empirically that new migrants sort heavily into low-paying firms, consistent with low reservation wages and an inability of firms to wage discriminate (Proposition 1). Indeed, migrants appear to benefit equally to natives from working in higher-paying firms. This inability (or unwillingness) to discriminate opens the door to the monopsonistic trade-off at the heart of the model: to secure "cheap" migrant labor, firms must forgo native hires; and this strategy becomes profitable to more firms as the migrant workforce grows. Consistent with this story, we find large wage reductions at the bottom of the firm pay distribution (Proposition 2). By studying changes in AKM firm premia, we can attribute these distributional effects to the *wage policies* of low-paying firms, as opposed to changes in the market prices of their particular employees.

Associated with these wage cuts, we find native employment losses among low-paying firms (Proposition 3) that are so large that firm size declines overall (Proposition 4). This is difficult to reconcile with a competitive model, in which wage cuts should encourage firms to hire *more* workers (as they move down their labor demand curves); but it is consistent with monopsonistic firms moving down their (imperfectly elastic) *supply* curves. The sorting of migrants to low-paying firms and native crowd-out endogenously generate large workplace segregation: this segregation does not preclude but rather *reflects* labor market competition between natives and migrants.

Since all these effects depend on migrants' reservation wages (which are likely to vary substantially by context), our arguments may also help account for conflicting results on the labor market impact of immigration. Importantly, adverse effects are not inevitable, and may be mitigated by policies that restrain firms' monopsony power over migrants (such as minimum wages, regularizations, or investments in integration), rather than by restricting immigration itself.

References

Abowd, John M., Francis Kramarz, and David N. Margolis. 1999. “High Wage Workers and High Wage Firms.” *Econometrica*, 67(2): 251–333.

Acemoglu, Daron. 2001. “Good Jobs Versus Bad Jobs.” *Journal of Labor Economics*, 19(1): 1–21.

Adda, Jérôme, Christian Dustmann, and Joseph-Simon Görlach. 2022. “The Dynamics of Return Migration, Human Capital Accumulation, and Wage Assimilation.” *Review of Economic Studies*, 89(6): 2841–2871.

Albert, Christoph. 2021. “The Labor Market Impact of Immigration: Job Creation vs. Job Competition.” *American Economic Journal: Macroeconomics*, 13(1): 35–78.

Albrecht, James W., and Bo Axell. 1984. “An Equilibrium Model of Search Unemployment.” *Journal of Political Economy*, 92(5): 824–840.

Amior, Michael. 2017. “The Impact of Migration in a Monopsonistic Labor Market: Theoretical Insights.” Unpublished.

Amior, Michael. 2020. “Immigration, Local Crowd-Out and Labor Market Effects.” Unpublished.

Amior, Michael, and Alan Manning. 2018. “The Persistence of Local Joblessness.” *American Economic Review*, 108(7): 1942–70.

Amior, Michael, and Alan Manning. 2020. “Monopsony and the Wage Effects of Migration.” CEP Discussion Paper No. 1690.

Amuedo-Dorantes, Catalina, Esther Arenas-Arroyo, Parag Mahajan, and Bernhard Schmidpeter. 2023. “Low-Wage Jobs, Foreign-Born Workers, and Firm Performance.” IZA Discussion Paper No. 16438.

Angrist, Joshua D., and Adriana D. Kugler. 2003. “Protective or Counter-Productive? Labour Market Institutions and the Effect of Immigration on Natives.” *Economic Journal*, 113(488): F302–F331.

Ansala, Laura, Olof Åslund, and Matti Sarvimäki. 2021. “Immigration History, Entry Jobs and the Labor Market Integration of Immigrants.” *Journal of Economic Geography*, 22(3): 581–604.

Arellano-Bover, Jaime, and Shmuel San. 2020. “The Role of Firms in the Assimilation of Immigrants.” Unpublished.

Aslund, Olof, Cristina Bratu, Stefano Lombardi, and Anna Thoresson.

2021. “Firm Productivity and Immigrant-Native Earnings Disparity.” IFAU Working Paper 2021:18.

Aydemir, Abdurrahman, and Mikal Skuterud. 2008. “The Immigrant Wage Differential Within and Across Establishments.” *ILR Review*, 61(3): 334–352.

Bartik, Timothy J. 1991. *Who Benefits from State and Local Economic Development Policies? Books from Upjohn Press*, W.E. Upjohn Institute for Employment Research.

Basten, Stuart, Johannes Huinink, and Sebastian Klüsener. 2011. “Spatial Variation of Sub-National Fertility Trends in Austria, Germany and Switzerland.” *Comparative Population Studies*, 36(2-3).

Battisti, Michele, Gabriel Felbermayr, Giovanni Peri, and Panu Poutvaara. 2017. “Immigration, Search and Redistribution: A Quantitative Assessment of Native Welfare.” *Journal of the European Economic Association*, 16(4): 1137–1188.

Beaudry, Paul, David A. Green, and Benjamin M. Sand. 2012. “Does Industrial Composition Matter for Wages? A Test of Search and Bargaining Theory.” *Econometrica*, 80(3): 1063–1104.

Beerli, Andreas, Jan Ruffner, Michael Siegenthaler, and Giovanni Peri. 2021. “The Abolition of Immigration Restrictions and the Performance of Firms and Workers: Evidence from Switzerland.” *American Economic Review*, 111(3): 976–1012.

Bellmann, Lisa, Benjamin Lochner, Stefan Seth, Stefanie Wolter, et al. 2020. “AKM Effects for German Labour Market Data.” Institute for Employment Research (IAB), Nuremberg FDZ-Methodenreport 01|2020 EN.

Borjas, George J., and Anthony Edo. 2021. “Gender, Selection into Employment, and the Wage Impact of Immigration.” NBER Working Paper No. 28682.

Borjas, George J., and Anthony Edo. 2023. “Monopsony, Efficiency, and the Regularization of Undocumented Immigrants.” NBER Working Paper No. 31457.

Borusyak, Kirill, Peter Hull, and Xavier Jaravel. 2025. “A Practical Guide to Shift-Share Instruments.” *Journal of Economic Perspectives*, 39(1): 181–204.

Bratsberg, Bernt, and Oddbjørn Raaum. 2012. “Immigration and Wages: Evidence from Construction.” *Economic Journal*, 122(565): 1177–1205.

Brinatti, Agostina, and Nicolas Morales. 2021. “Firm Heterogeneity and the

Impact of Immigration: Evidence from German Establishments." Unpublished.

Brücker, Herbert, and Elke J. Jahn. 2011. "Migration and Wage-setting: Reassessing the Labor Market Effects of Migration." *Scandinavian Journal of Economics*, 113: 286–317.

Bruns, Benjamin, and Kai Priesack. 2019. "The Impact of Immigrants on Native Wages and Employment: An Analysis of Refugee Inflows in the Early 1990s." PhD Dissertation, HU Berlin.

Burdett, Kenneth, and Dale T. Mortensen. 1998. "Wage Differentials, Employer Size, and Unemployment." *International Economic Review*, 39(2): 257–273.

Burstein, Ariel, Gordon Hanson, Lin Tian, and Jonathan Vogel. 2020. "Tradability and the Labor-Market Impact of Immigration: Theory and Evidence from the U.S." *Econometrica*, 88(3): 1071–1112.

Caldwell, Sydnee, and Nikolaj Harmon. 2019. "Outside Options, Bargaining, and Wages: Evidence from Coworker Networks." Unpublished.

Caldwell, Sydnee, and Oren Danieli. 2024. "Outside Options in the Labour Market." *Review of Economic Studies*, 91(6): 3286–3315.

Card, David. 2001. "Immigrant Inflows, Native Outflows and the Local Labor Market Impacts of Higher Immigration." *Journal of Labor Economics*, 19(1): 22–64.

Card, David. 2009. "Immigration and Inequality." *American Economic Review*, 99(2): 1–21.

Card, David, Jesse Rothstein, and Moises Yi. 2025. "Location, Location, Location." *American Economic Journal: Applied Economics*, 17(1): 297–336.

Card, David, Jörg Heining, and Patrick Kline. 2013. "Workplace Heterogeneity and the Rise of West German Wage Inequality." *Quarterly Journal of Economics*, 128(3): 967–1015.

Chassamboulli, Andri, and Theodore Palivos. 2014. "A Search-Equilibrium Approach to the Effects of Immigration on Labor Market Outcomes." *International Economic Review*, 55(1): 111–129.

Clemens, Michael A, and Ethan G. Lewis. 2022. "The Effect of Low-Skill Immigration Restrictions on US Firms and Workers: Evidence from a Randomized Lottery." NBER Working Paper No. 30589.

Combes, Pierre-Philippe, Gilles Duranton, and Laurent Gobillon. 2008.

"Spatial Wage Disparities: Sorting Matters!" *Journal of Urban Economics*, 63(2): 723–742.

Costas-Fernández, Julián, and Simón Lodato. 2024. "Distributional Effects of Immigration and Imperfect Labour Markets." *Economics Letters*, 242: 111832.

Cyrus, Norbert, and Ewa Helias. 1993. "Zur Situation Polnischer Werkvertragsarbeitnehmer in Berlin [On the Situation of Polish Contract Workers in Berlin]." Research Papers of the Berlin Institute for Comparative Social Research.

D'Amuri, Francesco, Gianmarco I.P. Ottaviano, and Giovanni Peri. 2010. "The Labor Market Impact of Immigration in Western Germany in the 1990s." *European Economic Review*, 54(4): 550–570.

Delgado-Prieto, Lukas. 2023. "Immigration and Worker Responses Across Firms: Evidence from Administrative Records in Colombia." Unpublished.

Delgado-Prieto, Lukas. 2024. "Immigration, Wages, and Employment under Informal Labor Markets." *Journal of Population Economics*, 37(2): 55.

De Matos, Ana Damas. 2017. "Firm Heterogeneity and Immigrant Wage Assimilation." *Applied Economics Letters*, 24(9): 653–657.

Di Addario, Sabrina, Patrick Kline, Raffaele Saggio, and Mikkel Sølvsten. 2023. "It Ain't Where You're From, It's Where You're At: Hiring Origins, Firm Heterogeneity, and Wages." *Journal of Econometrics*, 233(2): 340–374.

Dodini, Samuel, Katrine Vellesen Løken, and Alexander Willén. 2022. "The Effect of Labor Market Competition on Firms, Workers, and Communities." Unpublished.

Doran, Kirk, Alexander Gelber, and Adam Isen. 2022. "The Effects of High-skilled Immigration Policy on Firms: Evidence from Visa Lotteries." *Journal of Political Economy*, 130(10): 2501–2533.

Dostie, Benoit, Jiang Li, David Card, and Daniel Parent. 2023. "Employer Policies and the Immigrant–native Earnings Gap." *Journal of Econometrics*, 233(2): 544–567.

Drenik, Andres, Simon Jäger, Pascuel Plotkin, and Benjamin Schoefer. 2023. "Paying Outsourced Labor: Direct Evidence from Linked Temp Agency-Worker-Client Data." *Review of Economics and Statistics*, 105(1): 206–216.

Dustmann, Christian, and Albrecht Glitz. 2015. "How Do Industries and

Firms Respond to Changes in Local Labor Supply?" *Journal of Labor Economics*, 33(3): 711–750.

Dustmann, Christian, Attila Lindner, Uta Schönberg, Matthias Umkehrer, and Philipp vom Berge. 2021. "Reallocation Effects of the Minimum Wage." *The Quarterly Journal of Economics*, 137(1): 267–328.

Dustmann, Christian, Hyejin Ku, and Tetyana Surovtseva. 2024. "Real Exchange Rates and the Earnings of Immigrants." *Economic Journal*, 134(657): 271–294.

Dustmann, Christian, Johannes Ludsteck, and Uta Schönberg. 2009. "Revisiting the German Wage Structure." *Quarterly Journal of Economics*, 124(2): 843–881.

Dustmann, Christian, Sebastian Otten, Uta Schönberg, and Jan Stuhler. 2023. "The Effects of Immigration on Places and Individuals – Identification and Interpretation." Working Paper, University College London.

Dustmann, Christian, Tommaso Frattini, and Ian P. Preston. 2012. "The Effect of Immigration Along the Distribution of Wages." *Review of Economic Studies*, 80(1): 145–173.

Dustmann, Christian, Uta Schoenberg, and Jan Stuhler. 2016. "The Impact of Immigration: Why do Studies Reach Such Different Results." *Journal of Economic Perspectives*, 30(4): 31–56.

Dustmann, Christian, Uta Schoenberg, and Jan Stuhler. 2017. "Labor Supply Shocks, Native Wages, and the Adjustment of Local Employment." *Quarterly Journal of Economics*, 123(1): 435–483.

Eckert, Fabian, Teresa C. Fort, Peter K. Schott, and Natalie J. Yang. 2020. "Imputing Missing Values in the US Census Bureau's County Business Patterns." NBER Working Paper No. 26632.

Edo, Anthony. 2015. "The Impact of Immigration on Native Wages and Employment." *The B.E. Journal of Economic Analysis and Policy*, 15(3): 1151–1196.

Edo, Anthony, and Hillel Rapoport. 2019. "Minimum Wages and the Labor Market Effects of Immigration." *Labour Economics*, 61: 101753.

Fitzenberger, Bernd, Aderonke Osikominu, and Robert Völter. 2006. "Imputation Rules to Improve the Education Variable in the IAB Employment Subsample." *Schmollers Jahrbuch: Journal of Contextual Economics*, 126(3): 405–436.

Foged, Mette, Linea Hasager, and Giovanni Peri. 2024. "Comparing the Effects of Policies for the Labor Market Integration of Refugees." *Journal of Labor Economics*, 42(S1): S335–S377.

Glitz, Albrecht. 2012. "The Labor Market Impact of Immigration: Quasi-Experimental Evidence." *Journal of Labor Economics*, 30(1): 175–213.

Glitz, Albrecht. 2014. "Ethnic Segregation in Germany." *Labour Economics*, 29(C): 28–40.

Gould, Eric. 2019. "Explaining the Unexplained: Residual Wage Inequality, Manufacturing Decline, and Low-Skilled Immigration." *Economic Journal*, 129(619): 1281–1326.

Gruhl, Anja, Alexandra Schmucker, and Stefan Seth. 2012. "The Establishment History Panel 1975-2010." FDZ-Datenreport 04/2012 EN, IAB.

Gyetvay, Sam, and Sekou Keita. 2023. "Competition, Mobility and Immigration." Unpublished.

Hirsch, Boris, and Elke J. Jahn. 2015. "Is There Monopsonistic Discrimination Against Immigrants?" *ILR Review*, 68(3): 501–528.

Hotchkiss, Julie L., and Myriam Quispe-Agnoli. 2013. "The Expected Impact of State Immigration Legislation on Labor Market Outcomes." *Journal of Policy Analysis and Management*, 32(1): 34–59.

Hsieh, Chang-Tai, and Peter J. Klenow. 2009. "Misallocation and Manufacturing TFP in China and India." *Quarterly Journal of Economics*, 124(4): 1403–1448.

Jaeger, David A., Joakim Ruist, and Jan Stuhler. 2018. "Shift-Share Instruments and the Impact of Immigration." NBER Working Paper No. 24285.

Jäger, Simon, Christopher Roth, Nina Roussille, and Benjamin Schoefer. 2024. "Worker Beliefs about Outside Options." *Quarterly Journal of Economics*, 139(3): 1505–1556.

Jäger, Simon, Shakked Noy, and Benjamin Schoefer. 2022. "The German Model of Industrial Relations: A Primer." *Journal of Economic Perspectives*, 36(4): 53–80.

Lachowska, Marta, Alexandre Mas, Raffaele Saggio, and Stephen A Woodbury. 2022. "Wage Posting or Wage Bargaining? A Test Using Dual Jobholders."

Journal of Labor Economics, 40(S1): S469–S493.

Lachowska, Marta, Alexandre Mas, Raffaele Saggio, and Stephen A Woodbury. 2023. "Do Firm Effects Drift? Evidence from Washington Administrative Data." *Journal of Econometrics*, 233(2): 375–395.

Lehmer, Florian, and Johannes Ludsteck. 2015. "Wage Assimilation of Foreigners: Which Factors Close the Gap? Evidence From Germany." *Review of Income and Wealth*, 61(4): 677–701.

Mahajan, Parag. 2024. "Immigration and Business Dynamics: Evidence from U.S. Firms." *Journal of the European Economic Association*, 22(6): 2827–2869.

Malchow-Moller, Nikolaj, Jakob R. Munch, and Jan R. Skaksen. 2012. "Do Immigrants Affect Firm-Specific Wages?" *Scandinavian Journal of Economics*, 114(4): 1267–1295.

Manning, Alan. 2010. "The Plant Size-Place Effect: Agglomeration and Monopsony in Labour Markets." *Journal of Economic Geography*, 10(5): 717–744.

Manning, Alan. 2021. "Monopsony in Labor Markets: A Review." *ILR Review*, 74(1): 3–26.

Melitz, Marc J. 2003. "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity." *Econometrica*, 71(6): 1695–1725.

Mitaritonna, Cristina, Gianluca Orefice, and Giovanni Peri. 2017. "Immigrants and Firms' Outcomes: Evidence from France." *European Economic Review*, 96: 62–82.

Monras, Joan. 2020. "Immigration and Wage Dynamics: Evidence from the Mexican Peso Crisis." *Journal of Political Economy*, 128(8): 3017–3089.

Monras, Joan, Javier Vázquez-Grenno, and Ferran Elias. forthcoming. "Understanding the Effects of Granting Work Permits to Undocumented Immigrants." *Journal of Labor Economics*.

Muñoz, Mathilde. 2023. "Trading Nontradables: The Implications of Europe's Job-Posting Policy." *Quarterly Journal of Economics*, 139(1): 235–304.

Naidu, Suresh, Yaw Nyarko, and Shing-Yi Wang. 2016. "Monopsony Power in Migrant Labor Markets: Evidence from the United Arab Emirates." *Journal of Political Economy*, 124(6): 1735–1792.

Nanos, Panagiotis, and Christian Schluter. 2014. "The Composition of Wage

Differentials between Migrants and Natives." *European Economic Review*, 65: 23–44.

Orefice, Gianluca, and Giovanni Peri. forthcoming. "Immigration and Firm-Worker Matching." *Review of Economics and Statistics*.

Ortega, Javier, and Gregory Verdugo. 2022. "Who Stays and Who Leaves? Immigration and the Selection of Natives Across Locations." *Journal of Economic Geography*, 22(2): 221–260.

Rogerson, Richard, Robert Shimer, and Randall Wright. 2005. "Search-Theoretic Models of the Labor Market: A Survey." *Journal of Economic Literature*, 43: 959–988.

Silliman, Mikko, and Alexander Willén. 2024. "Worker Power, Immigrant Sorting, and Firm Dynamics." CESifo Working Paper 11281.

Song, Jae, David J. Price, Fatih Guvenen, Nicholas Bloom, and Till Von Wachter. 2019. "Firming up Inequality." *Quarterly Journal of Economics*, 134(1): 1–50.

Syverson, Chad. 2019. "Macroeconomics and Market Power: Context, Implications, and Open Questions." *Journal of Economic Perspectives*, 33(3): 23–43.

Townsend, Wilbur, and Corey Allan. 2024. "How Restricting Migrants' Job Options Affects Both Migrants and Existing Residents." Unpublished.

Vom Berge, Philipp, Anja Burghardt, and Simon Trenkle. 2014. "Sample of Integrated Labour Market Biographies: Regional-File 1975-2010." IAB.

Walters, Christopher. 2024. "Empirical Bayes Methods in Labor Economics." In *Handbook of Labor Economics Vol. 5.* , ed. Christian Dustmann and Thomas Lemieux, 183–260. Elsevier.

Wang, Xuening. 2021. "US Permanent Residency, Job Mobility, and Earnings." *Journal of Labor Economics*, 39(3): 639–671.

Werner, Heinz. 1996. "Befristete Zuwanderung von ausländischen Arbeitnehmern." *Mitteilungen aus der Arbeitsmarkt-und Berufsforschung*, 29(1): 36–53.

Willis, Sébastien. 2025. "Workplace Segregation and the Labour Market Performance of Immigrants." *Labour Economics*, 93: 102652.

Winter-Ebmer, Rudolf, and Josef Zweimüller. 1996. "Immigration and the Earnings of Young Native Workers." *Oxford Economic Papers*, 48(3): 473–491.

Supplemental Appendices

A Equilibrium in baseline model

In this appendix, we derive equations (8) and (9), which summarize the equilibrium low-pay sector share ϕ. We begin by deriving profits for firms which offer w_0 and w_1, and then solve for equilibrium. We also derive (10), which underpins Proposition 4.

A.1 Profit function

As Section 2.1 explains, firms will only offer one of two wages: the migrant reservation w_0 or the native reservation w_1. If a firm offers w_0, it will face a labor inflow of $\frac{\lambda}{k} u_M \mu n$ and outflow of $\delta l(w_0)$, where $l(w)$ is the firm's steady-state labor force. Equating the two, and using (6), we have: $l(w_0) = \frac{n}{k} \cdot \frac{\lambda\mu}{\delta+\lambda}$. The associated profit is then:

$$\pi(w_0) = (p - w_0)\, l(w_0) = \frac{n}{k} \cdot \frac{\mu\lambda}{\delta+\lambda} \cdot \frac{(r+\delta)(p - b_M) + (1-\phi)\lambda(p - b_N)}{r + \delta + (1-\phi)\lambda} \tag{A1}$$

Similarly, if a firm offers w_1, it will have inflow $\frac{\lambda}{k}\left[u_M \mu + u_N (1-\mu)\right] n$ and outflow $\delta l(w_1)$. Equating the two, and using (5) and (6), the steady-state labor force is: $l(w_1) = \frac{n}{k}\left[\frac{\mu\lambda}{\delta+\lambda} + \frac{(1-\mu)\lambda}{\delta+(1-\phi)\lambda}\right]$. So the associated profit is:

$$\pi(w_1) = (p - w_1)\, l(w_1) = \frac{n}{k}\left[\frac{\mu\lambda}{\delta+\lambda} + \frac{(1-\mu)\lambda}{\delta + (1-\phi)\lambda}\right](p - b_N) \tag{A2}$$

A.2 Equilibrium

As Rogerson, Shimer and Wright (2005) show, there is a unique equilibrium which can take one of three forms: (i) $\pi(w_1) > \pi(w_0)$ and all firms offer w_1 (i.e. $\phi = 0$); (ii) $\pi(w_1) = \pi(w_0)$, and firms offer different wages ($0 < \phi < 1$); and (iii) $\pi(w_1) < \pi(w_0)$ and all firms offer w_0 (i.e. $\phi = 1$). To derive (8) and (9), we study each case in turn.

Case 1: $\pi(w_1) > \pi(w_0)$ **and** $\phi = 0$

Using equations (A1) and (A2), and imposing $\phi = 0$, $\pi(w_1) > \pi(w_0)$ implies:

$$\frac{n}{k}\left[\frac{\lambda\mu}{\delta+\lambda} + \frac{\lambda(1-\mu)}{\delta+\lambda}\right](p - b_N) > \frac{n}{k} \cdot \frac{\lambda\mu}{\delta+\lambda} \cdot \frac{(r+\delta)(p - b_M) + \lambda(p - b_N)}{r+\delta+\lambda} \tag{A3}$$

After rearranging, we have $\tilde{\mu} < \frac{r+\delta+\lambda}{r+\delta}$, with $\tilde{\mu}$ defined by (9). This is the $\phi = 0$ case of equation (8).

Case 2: $\pi(w_1) = \pi(w_0)$ **and** $0 < \phi < 1$

Using equations (A1) and (A2), $\pi(w_1) = \pi(w_0)$ implies:

$$\frac{n}{k}\left[\frac{\mu\lambda}{\delta+\lambda} + \frac{(1-\mu)\lambda}{\delta+(1-\phi)\lambda}\right](p-b_N) = \frac{n}{k}\cdot\frac{\mu\lambda}{\delta+\lambda}\cdot\frac{(r+\delta)(p-b_M)+(1-\phi)\lambda(p-b_N)}{r+\delta+(1-\phi)\lambda} \tag{A4}$$

After rearranging:

$$\phi = \frac{\delta+\lambda}{\lambda}\left[1 - \frac{r}{(r+\delta)\tilde{\mu} - (\delta+\lambda)}\right] \tag{A5}$$

with $\tilde{\mu}$ defined by (9). Since ϕ lies between 0 and 1, it follows that:

$$0 < \frac{\delta+\lambda}{\lambda}\left[1 - \frac{r}{(r+\delta)\tilde{\mu} - (\delta+\lambda)}\right] < 1 \tag{A6}$$

which implies that $\tilde{\mu} \in \left(\frac{r+\delta+\lambda}{r+\delta}, \frac{\delta+\lambda}{\delta}\right)$. This is the $\phi \in (0,1)$ case of equation (8).

Case 3: $\pi(w_1) < \pi(w_0)$ **and** $\phi = 1$

Using equations (A1) and (A2), and imposing $\phi = 1$, $\pi(w_1) < \pi(w_0)$ implies:

$$\frac{n}{k}\left[\frac{\lambda\mu}{\delta+\lambda} + \frac{\lambda(1-\mu)}{\delta}\right](p-b_N) < \frac{n}{k}\cdot\frac{\lambda\mu}{\delta+\lambda}(p-b_M) \tag{A7}$$

This implies $\tilde{\mu} > \frac{\delta+\lambda}{\delta}$, with $\tilde{\mu}$ defined by (9). This is the $\phi = 1$ case of equation (8).

A.3 Derivation of equation (10)

Using the $l(w_0)$ and $l(w_1)$ expressions from Section A.1, mean firm size can be written as:

$$\bar{l} = \phi l(w_0) + (1-\phi)l(w_1) = \frac{n}{k}\left[\mu\frac{\lambda}{\delta+\lambda} + (1-\mu)\frac{\lambda(1-\phi)}{\delta+\lambda(1-\phi)}\right] \tag{A8}$$

Differentiating this with respect to migrant share μ, holding the worker-firm ratio $\frac{n}{k}$ fixed, yields equation (10) from the main text.

B Model with on-the-job search

Here, we allow for on-the-job search, as in Burdett and Mortensen (1998): *all* workers draw offers at rate λ, not just the unemployed. Unlike the baseline model, the low-pay sector contains a continuous distribution of wage offers (between b_M and b_N), as firms compete directly for employees. Similarly, the high-pay sector contains a continuous distribution of offers exceeding b_N. However, the key propositions are unaffected.

B.1 Wage distributions for native and migrant workers

Employed workers accept any offer which exceeds their current wage. And since the offer rate λ is invariant with employment status, the unemployed accept any offer which exceeds their current utility flow: i.e. b_N for natives, and b_M for migrants.

Let $F(w)$ be the distribution of wage offers across firms. In equilibrium, no firm will pay less than the migrant unemployment flow utility b_M (as no workers would accept such an offer); but firms may potentially set wages below the native flow utility b_N. For the purposes of this appendix, let ϕ denote the share of firms offering less than b_N (as opposed to the share offering w_0, as in the main text): i.e. $\phi \equiv F(b_N)$.

Let $G_N(w)$ be the wage distribution across employed natives, and $G_M(w)$ across employed migrants. Consider the group of firms paying wages less than w. The inflow of workers to this group must equal the outflow in equilibrium. For natives, we have:

$$\begin{aligned} u_N \lambda \left[F(w) - F(b_N)\right](1-\mu)n = {} & \delta(1-u_N) G_N(w)(1-\mu)n \\ & + \lambda(1-F(w))(1-u_N) G_N(w)(1-\mu)n \end{aligned} \tag{A9}$$

where μ is the migrant share, $(1-\mu)n$ is the stock of natives, and u_N is their unemployment rate. The native inflow to this group of firms (on the left-hand side) consists of unemployed natives who meet firms offering between b_N and w. The outflow on the right-hand side is composed of: (i) natives employed at wages below w who are separated to unemployment (at rate δ), and (ii) natives employed at wages below w who meet firms offering wages exceeding w. The parallel expression for migrants is:

$$u_M \lambda F(w) \mu n = \delta(1-u_M) G_M(w) \mu n + \lambda(1-F(w))(1-u_M) G_M(w) \mu n \tag{A10}$$

where we have imposed $F(b_M) = 0$ (no firms offer below b_M).

The steady-state native and migrant unemployment rates are identical to (5) and (6) in the main text. Substituting these into (A9) and (A10), and rearranging:

$$G_N(w) = \frac{1}{\phi} \cdot \frac{\delta\left[F(w) - \phi\right]}{\delta + \lambda\left[1 - F(w)\right]} \tag{A11}$$

$$G_M(w) = \frac{\delta F(w)}{\delta + \lambda\left[1 - F(w)\right]} \tag{A12}$$

B.2 Firms' employment

We now derive $l(w)$, the employment of a firm paying wage w. Let $R(w)$ be the flow of workers recruited by this firm, and let $S(w)$ be the flow of workers who leave. A steady-state equilibrium requires $R(w) = S(w)$, where $S(w)$ is equal to:

$$S(w) = [\delta + \lambda(1 - F(w))]\, l(w) \tag{A13}$$

i.e. workers can leave through exogenous separation (at rate δ) or by meeting a firm offering a wage exceeding w. The recruitment flow is given by:

$$R(w) = I[w \geq b_N] \left\{ \frac{\lambda}{k} u_N + \frac{\lambda}{k}(1 - u_N) G_N(w) \right\} (1 - \mu) n + \left\{ \frac{\lambda}{k} u_M + \frac{\lambda}{k}(1 - u_M) G_M(w) \right\} \mu n \tag{A14}$$

The first term describes the native inflow, and the second the migrant inflow. I is an indicator function taking 1 if $w \geq b_N$: firms only recruit natives if their offer exceeds b_N. $\frac{\lambda}{k} u_N$ and $\frac{\lambda}{k} u_M$ are inflows of workers from unemployment, and $\frac{\lambda}{k}(1 - u_N) G_N(w)$ and $\frac{\lambda}{k}(1 - u_M) G_M(w)$ are inflows from firms paying less than w. Using (5), (6), (A11) and (A12), this expression can be simplified to:

$$R(w) = \frac{n}{k} \cdot \frac{\delta\lambda \{(1 - \mu) I[w \geq b_N] + \mu\}}{\delta + \lambda(1 - F(w))} \tag{A15}$$

Imposing the steady-state condition $R(w) = S(w)$ then yields:

$$l(w) = \frac{n}{k} \cdot \frac{\delta\lambda \{(1 - \mu) I[w \geq b_N] + \mu\}}{[\delta + \lambda(1 - F(w))]^2} \tag{A16}$$

B.3 Equilibrium size of low-pay sector

As Burdett and Mortensen (1998) show, on-the-job search yields a non-degenerate distribution of wage offers. In our version, firms can either locate in the "high-pay sector" (offering $w \geq b_N$) or "low-pay sector" (offering $w < b_N$). If the high-pay sector exists (i.e. $\phi < 1$), the lowest offer in that sector must be b_N: otherwise, the lowest-paying firm (in that sector) could increase their profit by cutting their offer to b_N (with no employment loss). Similarly, if the low-pay sector exists (i.e. $\phi > 0$), the lowest offer must be b_M.

Just as in the baseline model, equilibrium can take one of three forms, identical to those specified in Section 2.1: (i) $\pi(b_N) > \pi(b_M)$ with $\phi = 0$; (ii) $\pi(b_N) = \pi(b_M)$ with $0 < \phi < 1$; and (iii) $\pi(b_N) < \pi(b_M)$ with $\phi = 1$. Using (A16), the profit from offering b_N and b_M can be written as:

$$\pi(b_N) = (p - b_N)\, l(b_N) = \frac{n}{k} \cdot \frac{\delta\lambda (p - b_N)}{[\delta + (1-\phi)\lambda]^2} \tag{A17}$$

and

$$\pi(b_M) = (p - b_M)\, l(b_M) = \frac{n}{k} \cdot \frac{\mu\delta\lambda (p - b_M)}{(\delta + \lambda)^2} \tag{A18}$$

The equilibrium ϕ can then be derived by inserting (A17) and (A18) into the three cases listed above:

$$\phi = \begin{cases} 0 & \text{if } \tilde{\mu} \leq 1 \\ \frac{\delta+\lambda}{\lambda}\left(1 - \frac{1}{\tilde{\mu}}\right) & \text{if } \tilde{\mu} \in \left(1, \frac{\delta+\lambda}{\delta}\right) \\ 1 & \text{if } \tilde{\mu} \geq \frac{\delta+\lambda}{\delta} \end{cases} \tag{A19}$$

where $\tilde{\mu}$ is now defined as:

$$\tilde{\mu} = \left[\mu\left(1 + \frac{b_N - b_M}{p - b_N}\right)\right]^{\frac{1}{2}} \tag{A20}$$

B.4 Equilibrium offers within high- and low-pay sectors

(A19) and (A20) summarize the equilibrium low-pay sector share ϕ. For given ϕ, we now derive the offer distribution *within* the high- and low-pay sectors. Since firms are identical, they must earn the same profit. In the high-pay sector, the bottom firm offers b_N; so this implies $\pi(w) = \pi(b_N)$ for all $w \geq b_N$ in the support of F. Inserting (A16) into the profit functions, it follows that the share of offers between b_N and any given $w \geq b_N$ is:

$$F(w) - \phi = \left(1 - \phi + \frac{\delta}{\lambda}\right)\left[1 - \left(\frac{p - w}{p - b_N}\right)^{\frac{1}{2}}\right] \tag{A21}$$

We now apply the same logic to the low-pay sector. If it exists, its bottom firm offers b_M. Since firms earn identical profit, we have $\pi(w) = \pi(b_M)$ for all $w \geq b_M$ in the support of F. Applying (A16) and rearranging, the share of offers below $w < b_N$ can be expressed as:

$$F(w) = \frac{\delta + \lambda}{\lambda}\left[1 - \left(\frac{p - w}{p - b_M}\right)^{\frac{1}{2}}\right] \tag{A22}$$

Putting together (A21) and (A22), we have:

$$F(w) = \begin{cases} I[\phi > 0] \cdot \frac{\delta+\lambda}{\lambda}\left[1 - \left(\frac{p-w}{p-b_M}\right)^{\frac{1}{2}}\right] & \text{if } w \in [b_M, b_N) \\ I[\phi < 1] \cdot \left\{\phi + \left(1 - \phi + \frac{\delta}{\lambda}\right)\left[1 - \left(\frac{p-w}{p-b_N}\right)^{\frac{1}{2}}\right]\right\} & \text{if } w \in [b_N, p) \end{cases} \tag{A23}$$

B.5 Implications for Propositions 1-4

We now revisit the propositions of Section 2.2. Proposition 1 states that migrants concentrate in low-pay firms. This still holds: only migrants accept offers below b_N.

Proposition 2 states that a larger migrant share μ induces firms to cut offers at the bottom of the pay distribution. This remains true: the low-pay sector share ϕ is increasing in μ, and this effect is increasing in the $\frac{b_N - b_M}{p - b_N}$ ratio: see (A19) and (A20).

Proposition 3 states that immigration induces firms to shed native employment at the bottom of the pay distribution. This remains true: as μ increases, firms drop into the low-pay sector (ϕ increases), and native unemployment u_N grows: see (5).

Proposition 4 states that a larger migrant share μ may cause a reduction in average firm size. Equation (A16) shows that μ has a positive "composition effect" on firms' employment in the low-pay sector: holding wage offers fixed, only migrants accept low-wage offers. But (A16) also shows that μ has a negative "wage-setting effect": as more firms drop into the low-pay sector, they lose access to native labor. Just as in the baseline model, either effect may dominate – depending on the parameter values.

The four propositions are therefore robust to on-the-job search. But unlike in the baseline model, immigration now also generates a negative effect on natives' *realized* wages. As firms drop into the low-pay sector (i.e. as ϕ increases), this reduces competition in the high-pay sector, so firms are able to extract greater rents from natives. This is visible in equation (A11): at any given wage $w \geq b_N$, the share of natives earning wages below w (i.e. $G_N(w)$) is increasing in ϕ.

C Model with endogenous contact rate

Matching function and free entry

In this appendix, we allow for free firm entry and an endogenous contact rate λ. To ensure that firms retain wage-setting power (despite free entry), we impose a fixed cost c which firms must pay to produce any quantity of output.

Suppose the total flow of worker-firm meetings is determined by a Cobb-Douglas matching function:

$$m(\bar{u}n, k) = \lambda_0 (\bar{u}n)^{\alpha} k^{1-\alpha} \tag{A24}$$

where:

$$\bar{u} = \mu u_M + (1-\mu)\, u_N \tag{A25}$$

is the mean unemployment rate across natives and migrants (so $\bar{u}n$ is total unemployment), and k is the (now endogenous) stock of firms. It is useful to define labor market tightness θ as:

$$\theta \equiv \frac{k}{\bar{u}n} \tag{A26}$$

Using the matching function, the contact rate for workers λ can then be written as:

$$\lambda = \lambda_0 \theta^{1-\alpha} \tag{A27}$$

Equilibrium

Free entry ensures that $\pi(w) = c$ in equilibrium, for any wage offer w (since firms are identical). Consider an equilibrium where at least some firms offer the high wage w_1 (such that $\phi < 1$): this must be true if at least some natives are employed. Replacing profit with $\pi(w_1)$ from equation (A2), the free entry condition can then be expressed as:

$$\frac{n}{k}\left[\frac{\mu\lambda}{\delta+\lambda} + \frac{(1-\mu)\,\lambda}{\delta+(1-\phi)\,\lambda}\right](p-b_N) = c \tag{A28}$$

Using (A25), (A26) and (A27), this can be re-written as:

$$\frac{\lambda_0}{\delta}(p-b_N) = c\theta^{\alpha} \tag{A29}$$

(A29) shows that market tightness θ is fully determined by $\frac{\lambda_0}{\delta}$, $p-b_N$ and the operating cost c. Intuitively, profits are increasing in $\frac{\lambda_0}{\delta}$ (more hires relative to separations) and $p-b_N$ (greater profit per hire). To ensure that profit equals c in equilibrium, these must be offset by larger tightness θ, which increases competition over workers.

Notice however that market tightness θ is independent of the migrant share μ: see (A29). This is because native wages are fixed at their reservation b_N. Consequently, the migrant share does not affect the profit of *individual* firms offering w_1; and since all firms must earn the same profit in equilibrium (firms are identical), μ does not enter equation (A29). Since μ does not affect market tightness θ, it does not affect the contact rate λ; so the implications for wage offers (Proposition 2) and native employment (Proposition 3) are identical to the baseline model.

Though the contact rate λ is insensitive to migrant share μ, the stock of firms k

is not. From equation (8) in Section 2.1, a larger μ increases the low-pay sector share ϕ; and from (A28), this implies a larger k. Intuitively, immigration can sustain more firms in equilibrium, as profits increase. But this does not affect the contact rate λ, as the aggregate unemployment rate $\bar{u}$ grows proportionally with k.

D Model with heterogeneous firms

In this appendix, we permit firms to vary by productivity, building on Albrecht and Axell (1984). Let $H(p)$ denote the share of firms with productivity below p: i.e. there is a limited stock of high-quality firms (e.g. constrained by the supply of entrepreneurial talent), similar in spirit to Melitz (2003). Firms are either active (if they can operate profitably) or inactive (if not). Firms can only operate profitably if their productivity p exceeds the migrant reservation wage w_0, so the active share of firms is $1 - H(w_0)$. It remains true that firms will offer either w_0 or w_1, for the reasons given in Section 2.1. For this analysis, we restrict attention to equilibria with wage dispersion: i.e. at least some firms offer w_1 and others offer w_0 ($0 < \phi < 1$).

Equilibrium

Let p^* denote the productivity of the marginal firm (endogenous in the model) which is indifferent between offering w_1 and w_0. That is, p^* satisfies:

$$\pi(w_0|p^*) = \pi(w_1|p^*) \tag{A30}$$

where $\pi(w|p)$ is the profit earned by a productivity p firm offering wage w. In equilibrium, all firms with $p > p^*$ will offer the high wage w_1, and those with $p < p^*$ will offer w_0. Intuitively, high-p firms benefit disproportionately from offering higher wages, because they profit more from larger employment.

After inserting the profit functions (A1) and (A2), equation (A30) yields:

$$\phi = \frac{\delta + \lambda}{\lambda}\left[1 - \frac{r}{(r+\delta)\frac{\mu}{1-\mu} \cdot \frac{b_N - b_M}{p^* - b_N} - (\delta + \lambda)}\right] \tag{A31}$$

We call this the "wage-setting equation". It is identical to (8) in the main text, except productivity p has been replaced by p^*: since firms are no longer identical, only the marginal firm must satisfy equal profits. Equation (A31) describes a *negative* equilibrium relationship between ϕ and p^*. Intuitively, if the marginal firm is more productive (p^* larger), it will care relatively more about employment (compared to profit per worker). All else equal, this will incline the firm to offer w_1 instead of w_0. To ensure indifference, ϕ must therefore be smaller in equilibrium: this diminishes the native unemployment pool, which makes recruitment harder for high-wage firms.

To solve for equilibrium, we require one more equation. This comes from the definition of ϕ, the share of *active* firms which offer w_0:

$$\phi = \frac{H(p^*) - H(w_0)}{1 - H(w_0)} \tag{A32}$$

We call this the "active firm condition". Holding the migrant reservation w_0 fixed, (A32) describes a *positive* relationship between ϕ and p^*: if the marginal firm is more productive (p^* larger), the share of active firms offering w_0 (i.e. ϕ) must mechanically be larger. However, this relationship is amplified through changes in the migrant reservation w_0. Based on (4), w_0 is decreasing in ϕ, since a larger ϕ reduces access to high-wage firms. If so, a larger p^* implies a smaller w_0: this causes $H(w_0)$ to contract (there are more active firms, offering w_0), so ϕ in (A32) increases even more.

To summarize, the wage-setting equation (A31) describes a negative relationship between ϕ and p^*, and the active firm condition (A32) describes a positive relationship. Putting these together, we have a unique equilibrium in ϕ and p^*.

Impact of immigration

A larger migrant share μ induces a shift in the wage-setting equation (A31): the low-pay sector share ϕ expands for any given p^*. But μ does not enter the active firm condition (A29). Therefore, a larger μ will reduce ϕ and increase p^* in equilibrium. Since ϕ expands, the migrant reservation w_0 and native employment will also contract; so the effects of immigration are *qualitatively* unchanged from the baseline model.

Quantitatively though, the effects of immigration are amplified in this model by the activation of low-quality firms. Intuitively, a larger supply of migrants with low reservations sustains the existence of low-quality firms (offering w_0), which would otherwise be unable to operate profitably. These firms account for a growing share of wage offers to the labor force, and this reinforces the effect on ϕ.[37]

[37] To see how this formally, consider the active firm condition (A32). In the baseline model,

Table A1: Employment and immigrant shares by industry

Industry	Share of employment in 1988 (%)	Foreign share within industry		Change in foreign share 1988-95 (pp)	Post-1988 foreign share in 1995 (%)
		in 1988 (%)	in 1995 (%)		
	(1)	(2)	(3)	(4)	(5)
[1] Agriculture and forestry	0.9	7.6	14.6	7.0	10.1
[2] Energy	1.2	1.7	2.3	0.6	0.6
[3] Mining	1.0	14.2	14.3	0.0	1.8
[4] Chemical industry	3.0	8.0	8.7	0.8	2.4
[5] Plastics	1.8	16.1	16.8	0.7	5.6
[6] Pit and quarry	0.9	9.7	11.6	1.9	5.2
[7] Ceramic and glass	0.6	11.8	14.8	3.0	4.9
[8] Metal production and processing	3.8	15.5	17.1	1.6	5.5
[9] Manufacturing	4.9	9.1	9.8	0.7	2.5
[10] Vehicle manufacturing	6.4	12.3	12.4	0.1	3.8
[11] IT, electronics, optics	8.0	10.7	11.7	1.0	3.4
[12] Musical instruments, jewelry, toys	0.2	7.8	9.8	2.1	4.6
[13] Wood and wood products	1.9	7.4	9.4	2.0	4.4
[14] Printing and paper processing	1.8	10.3	11.8	1.5	3.5
[15] Leather and textile	2.6	12.8	14.4	1.6	4.8
[16] Food and tobacco	3.3	7.0	11.7	4.6	5.9
[17] Construction	6.7	11.0	14.4	3.3	7.7
[18] Trading	13.6	4.6	7.3	2.7	4.0
[19] Transportation, communication	4.7	7.4	9.9	2.4	4.0
[20] Credit and insurance	4.1	1.9	2.9	1.0	1.2
[21] Hospitality	2.2	21.7	32.4	10.7	21.8
[22] Healthcare and welfare	7.0	5.7	7.9	2.2	3.7
[23] Business-related services	5.0	6.9	10.5	3.6	6.1
[24] Educational services	3.0	5.4	6.4	1.0	2.9
[25] Recreational services	1.2	6.5	7.7	1.2	3.3
[26] Household services	1.2	9.3	14.8	5.5	9.6
[27] Social services	2.4	5.0	6.6	1.6	3.0
[28] Public administration	6.7	3.3	3.7	0.4	1.1

Notes: Shares computed using SIAB. Post-1988 migrants entered in or after 1989.

E Evidence on migrants' labor market integration

E.1 Distribution of migrants across industries

Column 1 of Table A1 reports the share of total employment in each of 28 industries in 1988, and column 2 reports foreign shares within these industries. Migrants were concentrated in mining, plastics, metal, ceramic and glass, leather and textile production and processing, as well as vehicle manufacturing, construction and hospitality.

Column 3 reports foreign share by industry in 1995, and column 4 the change since

all firms have productivity above w_0, so the denominator of (A32) collapses to 1. The positive relationship between ϕ and p^* in (A32) then becomes shallower; and therefore, the overall (positive) impact of migrant share μ on ϕ is smaller in the baseline model.

1988. It increased by 10.7 pp in hospitality, reaching more than 30% in 1995, and also grew strongly in agriculture and household services. Though it increased just 3.3 pp in construction, column 5 shows the share of post-1988 migrant arrivals was significantly larger (7.7% in 1995): i.e. new migrants replaced previous cohorts. Moreover, social security and other data sources exclude subcontracted "posted workers" from foreign firms: they numbered around 90,000 in 1993, of whom two thirds were employed in construction (Werner, 1996). The share of new arrivals was also high in many light manufacturing industries. As the sectoral distribution of migrants is potentially endogenous to demand, we do not use this variation for identification.

E.2 Migrant wage differentials: 1980s placebo

In Section 4.1, we documented a large wage gap (about 10%) between natives and new migrants in the early 1990s, conditional on age, education, gender and occupation. In Table A2, we show this gap was much smaller in the early 1980s. The table follows the same structure as Table 2 in the main text, except we now restrict the sample to 1980-6 (instead of 1990-6), and new migrants are defined as arriving since 1978 (instead of 1988). Unconditionally, previous migrants earned 12% more than natives, and new migrants earned 25% less (column 1). However, this gap can be entirely explained by differences in observables (columns 2 and 3). We do find a small gap for the restricted sample in column 4 (firms containing both natives and migrants); but as in our main analysis, this gap is explained (in this case, entirely) by differential sorting between firms, rather than wage gaps within them (columns 5 and 6).

These findings suggest that migrants' reservation wages differ across settings. To the extent that reservation wages determine the labor market impact of immigration (as our model suggests), this impact will then vary significantly by context.

E.3 Correcting firm wage premia for measurement error

In Section 4.2, we compare firm-specific wage premia for natives and migrants. However, measurement error may generate downward bias in the Table 3 estimates. To correct for this, we follow two approaches: (i) split-sample IV and (ii) empirical Bayes.

(i) Split-sample IV. We begin by splitting native workers into two random

Table A2: Migrant wage differentials: 1980s placebo

	Basic sample			Firms with natives and migrants		
	(1)	(2)	(3)	(4)	(5)	(6)
Previous migrants	0.120***	-0.013***	0.019***	-0.021***	-0.015***	-0.015***
	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
New migrants	-0.252***	0.073***	0.008**	-0.048***	0.018***	0.029***
	(0.005)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)
Year fixed effects	Y	Y	Y	Y	Y	Y
Edu × age × sex FEs		Y	Y	Y	Y	Y
Edu × age × sex × occ FEs			Y	Y	Y	Y
Firm FEs					Y	Y
Firm × occ FEs						Y
Observations (mil.)	2.472	2.386	2.344	0.995	0.955	0.955
R^2	0.662	0.868	0.900	0.674	0.767	0.814

SIAB, individuals aged 16-65 in years 1980-86. "Previous" migrants entered employment before 1979, "new" migrants in or after 1979. Standard errors clustered at the establishment level, * p<0.10, ** p<0.05, *** p<0.01.

groups ("A" and "B"), and separately estimate firm wage premia for each: we denote these as η_j^A and η_j^B for firm j. A regression of η_j^B on η_j^A yields a coefficient of 0.50 (with a standard error of 0.02): this confirms that our premia estimates are noisy.

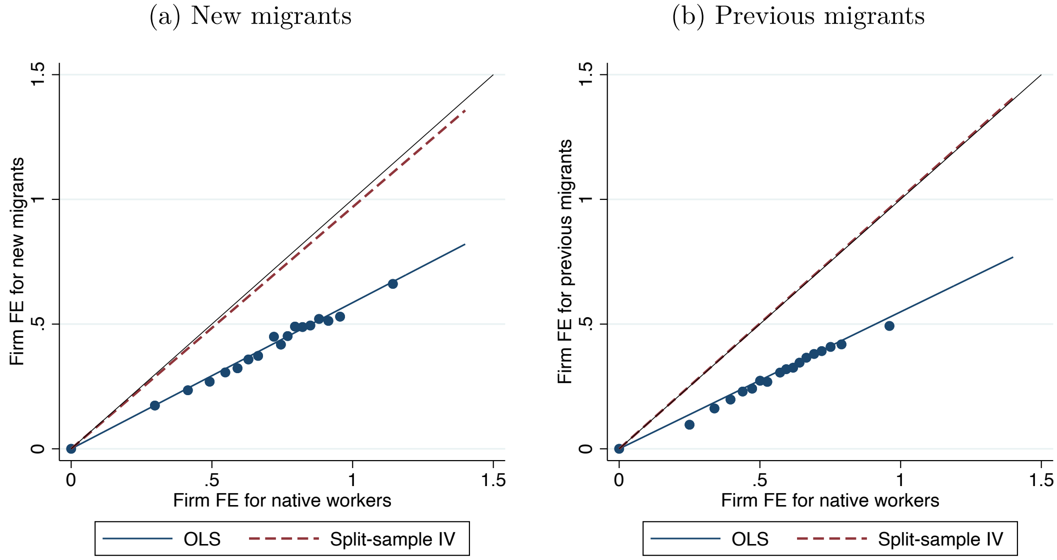
To correct for the influence of measurement error, we regress the migrant firm premia on the native premia η_j^A from group A, using the group B premia η_j^B as an instrument. Figure A1 illustrates the results. The blue dots show the mean firm premia for new migrants (Panel a) or previous migrants (Panel b) across ventiles of the native firm premia distribution (with the bottom ventile normalized to zero for both groups), with the blue lines showing linear fits: $\hat{\beta}_{new} = 0.586$ and $\hat{\beta}_{previous} = 0.549$ (see Table 3). The dashed red lines show the split-sample IV estimates that adjust for measurement error: $\hat{\beta}_{new} = 0.969$ and $\hat{\beta}_{previous} = 1.005$. We conclude that firm premia are similar for natives and migrants, once we account for measurement error.

(ii) Empirical Bayes. A more efficient approach is to shrink the variance of the native firm premia. This allows us to preserve the full sample, but we must assume the native firm premia are normally distributed: $\eta_j \sim N\left(\mu_\eta, \sigma_\eta^2\right)$. Given this restriction, the posterior mean for the firm j premium is:

$$\eta_j^* = \frac{\sigma_\eta^2}{\sigma_\eta^2 + s_j^2}\hat{\eta}_j + \frac{s_j^2}{\sigma_\eta^2 + s_j^2}\mu_\eta \tag{A33}$$

This is a weighted average, which shrinks the premia estimates $\hat{\eta}_j$ towards the mean

Figure A1: Firm-level pay premia for natives and migrants



SIAB, years 1990-96. Blue dots show mean firm premia for new migrants (panel a) or previous migrants (panel b) across ventiles of the native firm premia distribution (with the bottom ventile normalized to zero for both groups). Blue lines show linear fits: $\hat{\beta}_{new} = 0.586$ and $\hat{\beta}_{previous} = 0.549$ (see Table 3). Dashed red lines show split-sample IV estimates that adjust for measurement error: $\hat{\beta}_{new} = 0.969$ and $\hat{\beta}_{previous} = 1.005$. To aid interpretation, we show a 45 degree line (in black). "Previous" migrants entered employment before 1989, and "new" migrants in or after 1989.

μ_η. The weights depend on the relative size of σ^2_η (the variance of the firm premia distribution) and s^2_j (the variance of the $\hat{\eta}_j$ estimate). The expected premium μ_η can be estimated as $\hat{\mu}_\eta = \frac{1}{J}\sum_j \hat{\eta}_j$, and its variance as $\hat{\sigma}^2_\eta = \frac{1}{J}\sum_j \left[(\hat{\eta}_j - \hat{\mu}_\eta)^2 - s^2_j\right]$. Plugging these into (A33), we compute a posterior mean η^*_j for every firm j. We then regress the estimated migrant firm premia on the (shrunk) native posteriors. As Table 3 shows, this yields a coefficient close to 1, just like split-sample IV.

E.4 Differential wage premia: Longitudinal evidence

In the analysis in Table 3, we cannot condition on worker fixed effects when estimating the native and migrant firm premia (as we do not have access to full count data). Consequently, one might worry the estimates in Table 3 are driven by correlations in unobserved heterogeneity between native and migrant employees, across firms.

To address this concern, similar to Aslund et al. (2021), we now study what happens to the wages of *individual* workers (separately for natives and migrants) as they transition between low and high-paying firms (as proxied by the AKM firm

Table A3: Worker-level wage effects of AKM

	Basic estimates		Worker fixed effects	
	(1)	(2)	(3)	(4)
AKM	1.038***	1.043***	0.905***	0.897***
	(0.006)	(0.006)	(0.004)	(0.004)
AKM × Previous migrant		-0.047***		0.105***
		(0.007)		(0.012)
AKM × New migrant		-0.020**		0.020
		(0.008)		(0.015)
Year fixed effects	Y	Y	Y	Y
Edu × age × sex FEs	Y	Y	Y	Y
New/previous migrant FEs	Y	Y		
Worker FEs			Y	Y
Observations (mil.)	2.312	2.312	2.260	2.260
R^2	0.601	0.601	0.901	0.901

SIAB, years 1990-96, for individuals aged 16-65. "Previous" migrants entered employment before 1989, "new" migrants in or after 1989. AKM firm fixed effects are estimated by Card, Heining and Kline (2013), using universe of employment records. Standard errors clustered at establishment level, * p<0.10, ** p<0.05, *** p<0.01.

premia estimates of Card, Heining and Kline, 2013). That is, we estimate simple models for log wages of individuals i in firm j at time t, of the form:

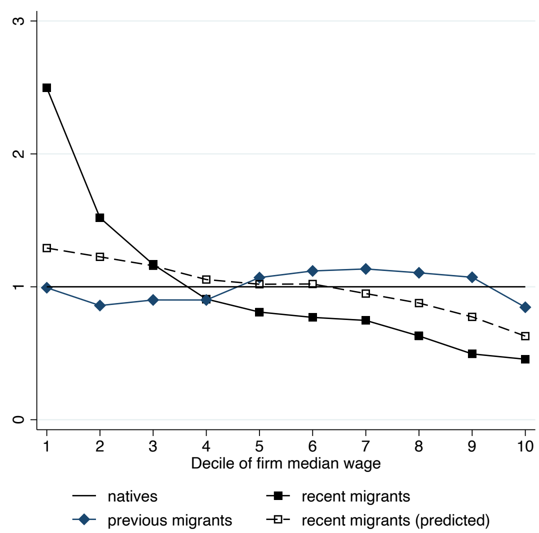
$$\log w_{ijt} = \beta AKM_j \cdot Migrant_i + X_{it}\beta_X + \beta_t + \beta_i + \varepsilon_{it} \tag{A34}$$

where AKM_j is the firm-level AKM premium, and $Migrant_i$ is an indicator taking 1 if worker i is a migrant. In the X_{it} vector, we control for interactions between education, sex and age (as in Table 2). We rely on data between 1990 and 1996, the period for which our (time-invariant) AKM_j premia are estimated.

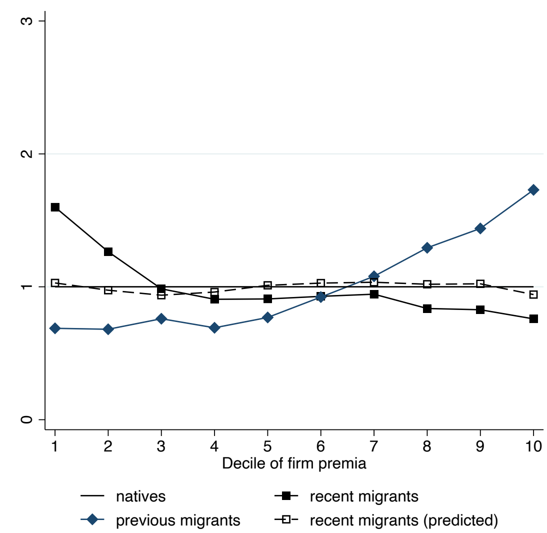
We present our estimates in Table A3. In columns 1-2, we control for previous/new migrant indicators instead of worker fixed effects β_i. The coefficient on the AKM_j premium in the first column is simply 1, unsurprisingly: the AKM premia are estimated with the same wage data. Of greater note, column 2 shows that natives and migrants benefit similarly from working in higher-AKM firms (consistent with Table 3). In columns 3 and 4, we now control for worker fixed effects β_i. That is, we study how individual wages change as workers *transition* from low to high-AKM firms. Column 4 shows that natives and migrants benefit similarly from these transitions; and if anything, migrants benefit slightly more.

Figure A2: Distribution of migrants across firm pay deciles

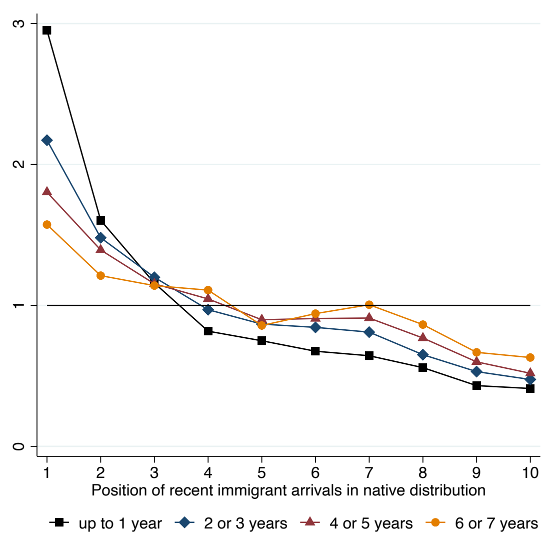
(a) by firm median wage



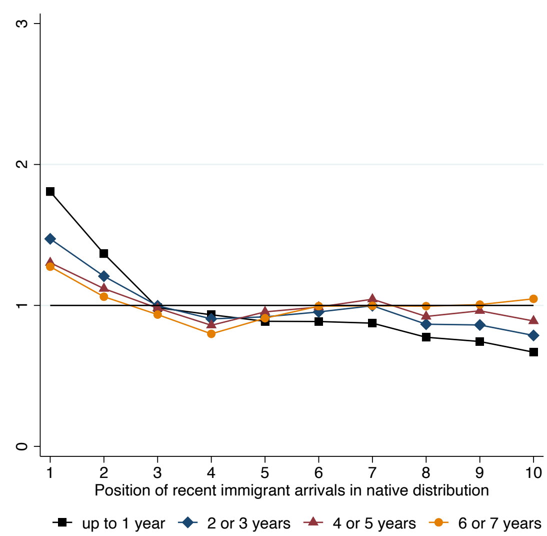
(b) by AKM firm wage premia



(c) over time, by firm median wage



(d) over time, by AKM firm wage premia



SIAB, years 1990-96, for individuals aged 16-65. “Previous” migrants entered employment before 1989, “new” migrants in or after 1989.

E.5 Distribution of migrants across firm pay deciles

Figure A2 plots the density of new (post-1988) and previous migrants across the firm pay distribution, relative to natives, using SIAB data for the years 1990-6. In Panel a, we rank firms by their median wage. Firms are weighted by native employment, so the density of natives is fixed at 1 by construction. In comparison, new migrants are heavily overrepresented in low-wage firms, while previous migrants look similar to natives. The presentation of these figures is analogous to Dustmann, Schoenberg and Stuhler (2016), though the support here is firm pay rather than individual wages.

The concentration of new migrants in low-wage firms cannot merely be explained by sorting on observable skills. For illustration, the dashed line in Panel a predicts the distribution of new migrants, based on how comparable natives (with the same age, education and gender) are allocated across the firm deciles.[38] Sorting on observable skills explains only a small fraction of migrants' overrepresentation in low-wage firms: this is consistent with Swedish evidence from Aslund et al. (2021).

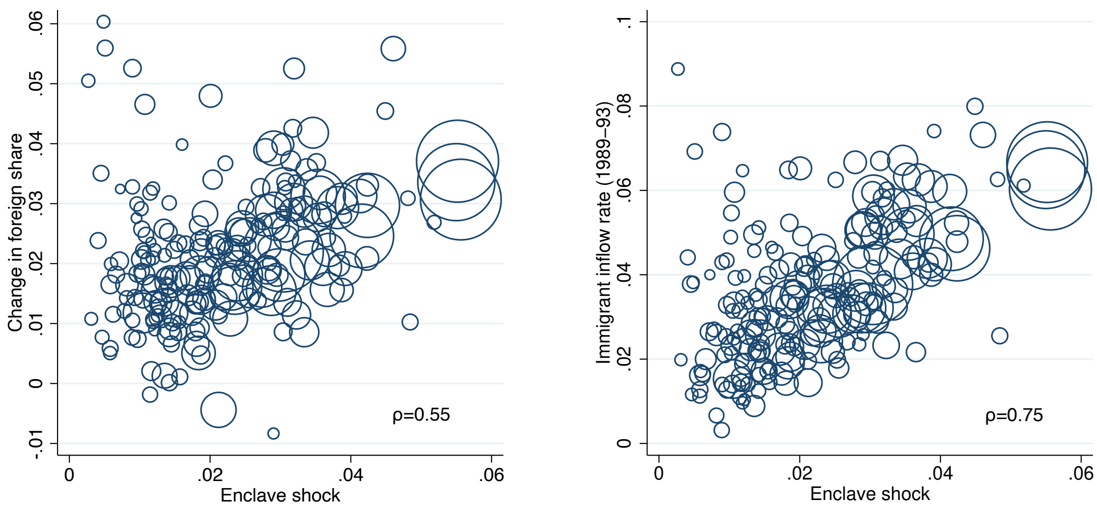
Panel b repeats this exercise, but ordering firms by pre-compiled AKM wage premia (from Card, Heining and Kline, 2013), which control for worker composition. New migrants are again overrepresented at the bottom of the distribution, though the pattern is less pronounced than for median firm wages. This can partly be attributed to measurement error in the AKM premia (especially in low-paying firms, which are typically small), which will blur any genuine distributional differences. As before, the dashed line shows these patterns cannot be attributed to sorting on observables. Previous migrants are now overrepresented at the top end, possibly because earlier "guest worker" cohorts often worked for large high-premium manufacturing firms.

Panels c and d illustrate how the migrant distribution changes with time in Germany. While new arrivals are heavily concentrated in low-pay firms, migrants transition to better-paying firms over time. By the 6th year, much of the gap with natives is eliminated. These patterns are in line with Lehmer and Ludsteck (2015), Arellano-Bover and San (2020) and Dustmann, Ku and Surovtseva (2024), and are consistent with the on-the-job search extension to our model (Section 2.4): new migrants do work their way up the firm distribution, but this process takes time.

[38]We implement this exercise by re-weighting native employment within age-education-gender cells, to replicate the distribution of new migrants' observables. The dashed line in Panel a shows how these re-weighted natives are allocated across the firm deciles.

Figure A3: First stage relation

(a) Change in foreign share (BHP) (b) Foreign arrival rate (SIAB)



Panel a shows local changes in foreign employment share between 1988 and 1993 against the enclave shock (i.e. the predicted change defined by (12)), using BHP data. Panel b shows the foreign arrival rate between 1989 and 1993 (using SIAB data), also against the enclave shock. Marker size is proportional to total regional employment in 1988.

F First stage estimates and potential confounders

F.1 First stage scatter relation

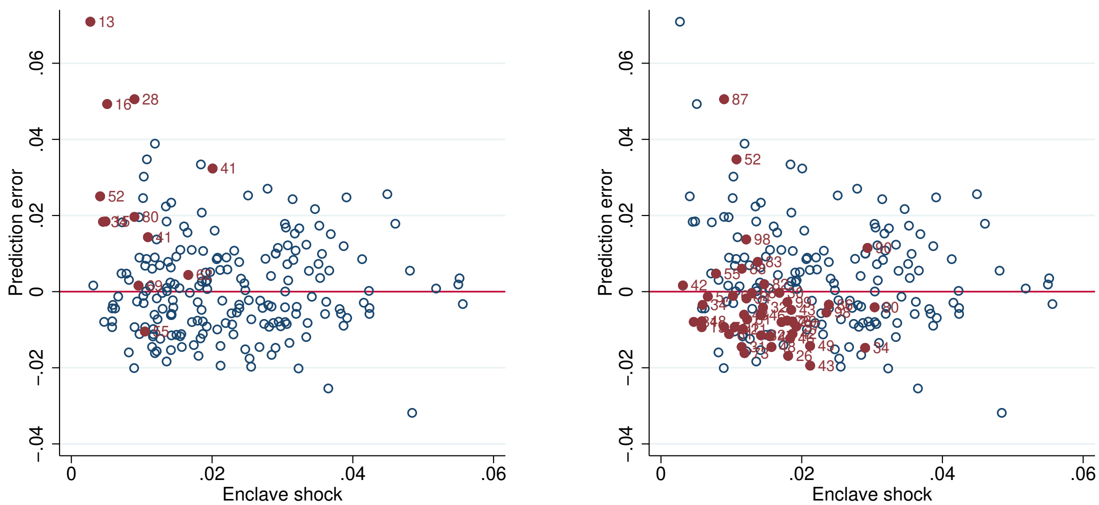
The maps in Figure 3 illustrate the predictive power of the enclave shock Δm_r for changes in foreign employment share. Figure A3a shows this relation in a scatter plot. The correlation is even tighter when the outcome is the migrant arrival *rate*[39] (i.e. the number of post-1988 foreign workers in 1993, relative to total regional employment in 1988), rather than changes in overall foreign shares: see panel b. The difference between the two reflects the exit of previous migrant cohorts from the regional sample, whether due to reduced employment rates, out-migration, or retirement.

From the perspective of our model, the recent arrivals are likely to play the crucial role in any potential adverse wage-setting effects, as they appear to have significantly lower reservation wages than natives or previous migrants (see Section 4).

[39]Note we can only observe migrants' year of arrival (and hence arrival rates) in the SIAB worker panel, and not in the BHP establishment panel.

Figure A4: Prediction error in first stage

(a) vs. Czech border (b) vs. inner German border



SIAB. Both panels plot prediction errors from a regression of the 1988-93 foreign arrival rate on the enclave shock Δm_r, across local labor markets r. In Panel a, local labor markets in the German-Czech border region are marked in red and labeled with their distance to the German-Czech border (in km). In Panel b, local labor markets close to the inner German border are labeled with their distance to the inner German border (in km).

F.2 Prediction errors in first stage

Figure A4 plots prediction errors from the first stage regression of the migrant arrival rate on the enclave shock. As Panel a shows, the most extreme under-predictions are in regions close to the Czech border, which are marked red and labeled with their distance from the border (in km). This was due to a policy allowing Czech workers to commute to Germany: see Dustmann, Schoenberg and Stuhler (2017).

At the same time, Panel b shows that the enclave shock overpredicts foreign inflows to regions close to the former East-West German border (again, marked in red). As discussed in Section 5.2, new migrants likely avoided these areas to escape labor market competition with East Germans. To partial out this effect, we control for log distance to the former border in our empirical specification.

F.3 Reunification and inflows from East Germany

A key challenge is the potential conflation of international migration with East German inflows. Our proposed solution is to control for log distance to the former inner

Table A4: East German vs. changes in foreign shares

	East German population inflows 1991-93			
	(1)	(2)	(3)	(4)
△foreign share 1988-93				
actual	-0.044*	0.011		
	(0.021)	(0.017)		
predicted (enclave shock)			-0.031	0.031
			(0.025)	(0.022)
Distance E/W border (log)		-0.004***		-0.004***
		(0.000)		(0.000)
R^2	0.029	0.463	0.019	0.478
N	204	204	204	204

SIAB, regression estimates across 204 local labor markets. Enclave shock is defined in (12). Distance E/W is the log distance to the inner German border. * p<0.10, ** p<0.05, *** p<0.01.

German border, which predicts these inflows well (see Figure 4).

Table A4 provides additional empirical support for this strategy. The dependent variable is the local population inflow from East Germany between 1991 and 1993 (from the Federal Statistical Office), expressed as a share of population in 1988: since residents have to register by law, these are reliable statistics. Column 1 shows that East German inflows are negatively correlated with changes in foreign share, consistent with the pattern observed in Figures 3 and 4. However, this correlation is small and disappears when controlling for distance to the inner German border. Columns 3 and 4 confirm a similar pattern for *predicted* changes in foreign share, i.e. the enclave shock Δm_r. In estimates not reported here, we also find similar results when using East German employment (rather than population) inflows as the dependent variable. To summarize, the log distance control can successfully partial out the small negative correlation between East German and foreign inflows.

F.4 Repatriation of ethnic Germans

A second potential concern is the repatriation of ethnic Germans. In 1990, nearly 400,000 ethnic Germans, mainly from the USSR, Poland, and Romania, exercised their right to move to Germany; and 225,000 arrived annually in subsequent years (Glitz, 2012). This could prove a challenge if the spatial distribution of ethnic Germans (who are coded as German nationals in our data) correlates with the distribution

Table A5: Ethnic German (*Aussiedler*) vs. changes in foreign shares

	Change in *Aussiedler* share (1988-93)			
	(1)	(2)	(3)	(4)
△foreign share 1988-93				
actual	-0.111	-0.120		
	(0.074)	(0.074)		
predicted (enclave shock)			-0.173***	-0.200**
			(0.065)	(0.065)
Distance E/W border (log)		0.001		0.002
		(0.001)		(0.001)
R^2	0.023	0.025	0.078	0.089
N	204	204	204	204

SIAB, regression estimates across 204 local labor markets. Enclave shock is defined in (12). Distance E/W is the log distance to the inner German border. * p<0.10, ** p<0.05, *** p<0.01.

of foreign nationals. Though the government aimed to ensure an equal distribution of ethnic Germans across the country (relative to local population), these efforts were largely ineffective until 1996 when restrictions were tightened (Glitz, 2012).

Following Brücker and Jahn (2011), we identify recently arrived ethnic Germans by receipt of special language courses and other integration subsidies targeted at this group (reported in the SIAB). Using this information, we construct changes in ethnic German employment shares between 1988 and 1993 for each local labor market, and relate these to changes in foreign share in Table A5. The two variables are negatively correlated (columns 1-2), but the relationship is weak and statistically insignificant. The effect of the enclave shock is slightly more pronounced (columns 3-4), but it still explains less than 10% of the spatial variation in ethnic German inflows. Furthermore, this negative effect could be interpreted as part of the impact we aim to capture, if ethnic Germans avoided regions more exposed to foreign inflows.

G Additional evidence on impact of enclave shock

G.1 Contribution of entrants to native crowd-out

Figure 5b shows a negative effect of the enclave shock on native employment. One key margin of adjustment is the inflow from non-employment: i.e. natives who were

Table A6: Robustness of regional employment, firm size and wage effects

	Robustness to controls			Sample and weighting	
	No controls	+ Log distance to E/W border	+ Bartiks and projected pop	Excl. top 3 regions	Unweighted estimates
	(1)	(2)	(3)	(4)	(5)
A. Post-1988 foreign share (1995)	1.073***	0.970***	1.023***	0.952***	0.846***
	(0.056)	(0.061)	(0.063)	(0.086)	(0.109)
B. Change in log native emp (1995 v 1988)	-2.234***	-1.946***	-1.377***	-1.253***	-1.101***
	(0.299)	(0.311)	(0.292)	(0.374)	(0.353)
C. Change in log emp rate (1995 v 1988)	-1.424***	-1.311***	-1.535***	-1.402***	-1.317***
	(0.217)	(0.224)	(0.234)	(0.396)	(0.324)
D. Change in log firm size (1995 v 1988)	-1.292***	-1.287***	-1.020***	-1.411***	-1.351***
	(0.362)	(0.390)	(0.287)	(0.464)	(0.437)
E. Change in mean AKM (1993-99 v 1985-92)	-0.625***	-0.764***	-0.723***	-0.703***	-0.654***
	(0.085)	(0.115)	(0.134)	(0.112)	(0.121)

Table explores robustness of estimated effects of enclave shock Δm_r, for various outcomes along table rows. Column 1 shows estimates with no controls. Column 2 includes only log distance to inner German border. Column 3 shows our baseline estimates, after including all remaining controls (employment and wage Bartiks, and projected population growth). Column 4 uses full set of controls, but excludes the regions with the three largest enclave shocks (Frankfurt, Munich and Stuttgart). Column 5 estimates our basic specification without weighting observations by employment. * p<0.10, ** p<0.05, *** p<0.01.

employed in region r in year t, but not employed in any region in 1988. To assess this margin, we use the number of native entrants in year t (relative to native employment in 1988) as the dependent variable in equation (11). Though more exposed regions show similar pre-trends in total native employment (see Figure 5b), inflow rates do differ before treatment. To address this challenge, we control for average inflows in the pre-period (1985-88), in addition to our usual set of control variables.

We plot our estimates in Figure 5b: the inflow rate in exposed regions decreased significantly (relative to pre-treatment levels), and this effect explains most of the reduction in native employment in the initial years of the immigration wave.

G.2 Robustness of regional employment and wage effects

In Table A6, we explore the robustness of the enclave shock effects, for various outcomes displayed along the rows of the table: the new (post-1988) migrant share in 1995 (from Figure 5a), changes in log native employment between 1988 and 1995 (Figure 5b), changes in the log native employment rate (Figure 5c), changes in log mean firm size (from column 2, Table 6), and changes in the mean regional AKM firm wage premia (from column 1, Table 7). For the latter outcome, we rely on pre-compiled AKM premia from Bellmann et al. (2020).

Column 1 shows estimates with no controls. Column 2 includes only log distance to the inner German border. Column 3 shows our baseline estimates, after including all remaining controls (the employment and wage Bartiks, and projected population growth). In column 4, we use the full set of controls, but exclude the regions with the three largest enclave shocks (Frankfurt, Munich and Stuttgart). And in column 5, we estimate our basic specification without weighting observations by employment.

The estimates are mostly robust to these specification choices. In particular, controlling for distance to the inner German border (column 2) makes little difference. And reassuringly, the unweighted estimates (column 5) also look similar: this confirms that the effects are not merely driven by a small number of high-employment regions.

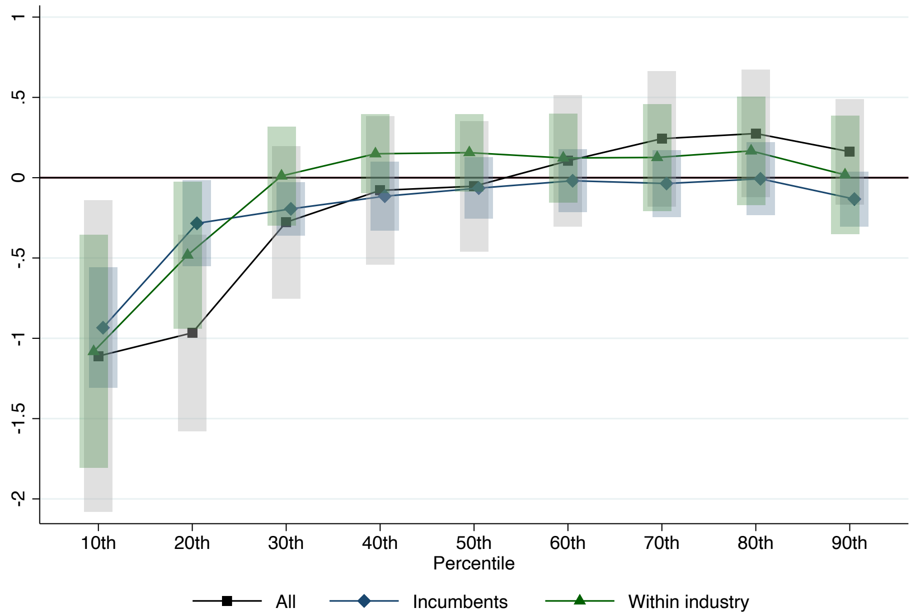
Interestingly, log native employment in row B does show some sensitivity. The inclusion of the column 3 controls reduces the coefficient on the enclave shock Δm_r from -1.95 to -1.38. This is mainly due to the population projection control, which predicts local population growth using regional variation in pre-treatment population pyramids (from the 1987 census). This control is strongly predictive of local employment growth, but it happens to correlate negatively with the enclave shock Δm_r. As we explain in Section 5.3, there are good *conceptual* reasons to include this control (arising from the fertility transition). In practice, it matters more for "scale" variables such as total native employment: the employment *rate* in row C is less sensitive.

G.3 Firm wage effects by percentile

In Figure 8, we estimated the impact of immigration across the local distribution of AKM firm premia. In Figure A5, we repeat this exercise for firms' median native wages, instead of AKM premia. Similar to the AKM evidence, the negative effects are concentrated at the bottom of the firm pay distribution.

The black line in Figure A5 shows effects across the full firm sample, and the blue line among incumbent firms (present in both 1988 and 1995): both look similar. The green line shows the impact on wage residuals, after purging detailed industry effects (97 categories) interacted with time effects. This too makes little difference: i.e. the

Figure A5: Changes in firm native median wage (by percentile)



BHP, regression estimates for 1988-95 interval, based on equation (11), across 203 local labor markets.

distributional effects manifest mostly within industries, rather than between them.

G.4 Origin-specific immigration shocks

According to our model, migrants' low reservation wages are responsible for the adverse labor market effects. But migrants of different origins are likely to differ in their reservation wages (Dustmann, Ku and Surovtseva, 2024, or Costas-Fernández and Lodato, 2024); and this heterogeneity offers an additional test of our hypothesis.

We divide migrant origins o into two groups (of equal size), according to the mean AKM premia (as computed by Card, Heining and Kline, 2013) of their employers. The idea is that migrants with lower reservation wages are more likely to accept jobs at low-premium firms. For this exercise, we focus on new (post-1988) migrants in the SIAB worker-level data between 1990 and 1996. The low-premia group consists of the Americas (excluding US and Canada), Asia, Czechoslovakia, Greece, Italy, Poland, Romania, Russia and Yugoslavia. The high-premia group consists of Africa, Spain/Portugal, Turkey, US/Canada/Australia, other EU, and other non-EU.

Table A7: Impact of origin-specific immigration shocks, 1988-95

	Post-1988 migrant shares		Change in log	Change in mean
	High-AKM	Low-AKM	native emp	AKM premia
	(1)	(2)	(3)	(4)
Immigration shock:	1.295***	-0.189	0.147	-0.232
High-AKM origins	(0.116)	(0.126)	(0.628)	(0.206)
Immigration shock:	0.056	0.941***	-1.864***	-0.887***
Low-AKM origins	(0.047)	(0.076)	(0.342)	(0.148)
R^2	0.778	0.659	0.623	0.459
N	204	204	204	203

This table presents estimates of equation (A37). Columns 1 and 2 report effects on post-1988 migrant shares in 1995, by origin group, using SIAB data (for 204 regions). Column 3 reports effects on log native employment growth between 1988 and 1995, also using SIAB data. Column 4 reports effects on changes in mean AKM firm wage premia (as computed by Bellman et al., 2020) between the periods 1985-92 and 1993-99, using BHP data (203 regions). * p<0.10, ** p<0.05, *** p<0.01.

We then construct new enclave shocks which predict migrant inflows from high-AKM origins ($o \in H$) and low-AKM origins ($o \in L$) respectively. Using the notation from Section 5.2, these are:

$$\Delta m_{Hr} = \frac{\sum_{o \in H} s_{or80} \left(n_{o93} - n_{o88} \right)}{n_{r80}} \tag{A35}$$

$$\Delta m_{Lr} = \frac{\sum_{o \in L} s_{or80} \left(n_{o93} - n_{o88} \right)}{n_{r80}} \tag{A36}$$

Note that Δm_{Hr} and Δm_{Lr} sum to the basic enclave shock in (12): i.e. $\Delta m_r = \Delta m_{Hr} + \Delta m_{Lr}$. We then replace the aggregate shock Δm_r with the two origin-specific shocks in our empirical specification:

$$\Delta y_r = \alpha + \beta_H \Delta m_{Hr} + \beta_L \Delta m_{Lr} + \gamma X_r + \varepsilon_r \tag{A37}$$

where Δy_r is the change in some area r outcome between 1988 and 1995, and X_r is our standard set of controls. This strategy is similar to Amior (2020), who disaggregates an enclave shock into Latin American and non-Latin components, using US data.

We present our estimates in Table A7. Columns 1 and 2 show the impact on shares of post-1988 migrants (measured in 1995) from high and low-AKM origins, respectively. The enclave shocks offer sufficient power to disentangle the inflows from each origin group: the high-AKM shock only elicits inflows from high-AKM origins (conditional on the low-AKM shock), and the low-AKM shock only from low-AKM

Table A8: Employment and wage effects by industry

		Post-1988 migrant share (1)	Change in log native emp (2)	Change in mean AKM premia (3)
A.	Tradables	0.720***	-2.390***	-0.827***
		(0.084)	(0.351)	(0.226)
B.	Construction	2.453***	-1.580*	-1.079***
		(0.303)	(0.902)	(0.123)
C.	Trade, transport, finance	1.039***	-1.080**	-0.741***
		(0.063)	(0.416)	(0.191)
D.	Other services	1.154***	-0.432***	-0.474***
		(0.076)	(0.357)	(0.115)

This table estimates effects of the enclave shock Δm_r on employment and wage outcomes (along the table columns), for different industry groups (table rows). Column 1 reports effects on post-1988 migrant share in 1995. Column 2 shows effects on log native employment changes between 1988 and 1995. Column 3 shows effects on changes in mean AKM firm wage premia (as computed by Bellman et al., 2020) between the periods 1985-92 and 1993-99. * p<0.10, ** p<0.05, *** p<0.01.

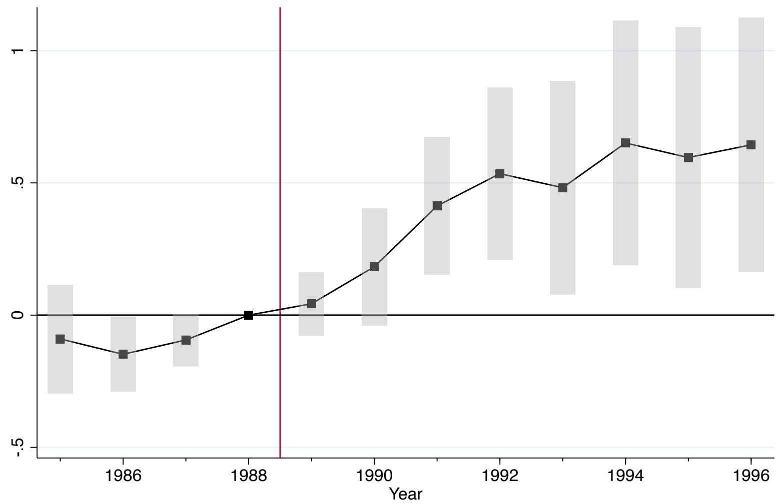
origins. These results offer strong validation for the identification strategy.

In columns 3 and 4, we estimate the impact of these shocks on (i) log native employment and (ii) mean AKM firm premia (as computed by Bellmann et al., 2020). In the main text (in Figure 5b and Table 7), we showed that both outcomes respond negatively to the aggregate enclave shock Δm_r. But Table A7 shows that the low-AKM origins are mostly responsible for the negative effects. This is consistent with our claim that migrants with low reservation wages drive the adverse labor market effects. However, it is worth stressing that the (statistically insignificant) effect of the high-AKM origins does have a large standard error in column 3.

G.5 Employment and wage effects by industry

In Table A8, we study sectoral heterogeneity in the impact of the enclave shock. We focus on three outcomes: the new (post-1988) migrant share in 1995 (as in Figure 5a), changes in log native employment between 1988 and 1995 (Figure 5b), and changes in mean AKM firm wage premia (as in column 1, Table 7). Along the table rows, we show effects separately for four broad sectors. Row A (tradables) includes agriculture,

Figure A6: Impact on workplace segregation



BHP, regression estimates based on equation (11) across 203 local labor markets with 95% CIs. Dependent variable is regional change in index of dissimilarity between 1988 and indicated year.

energy, mining and manufacturing (industries 1-16 in Table A1), row B is construction (industry 17), row C includes industries 18-20, and row D includes industries 21-28.

Column 1 shows that the post-1988 migrants are well-represented across all four sectors, and especially construction. The native employment effects are consistently negative, but largest in tradables. The effects on wage premia are also consistently negative, though somewhat smaller in the "other services" category.

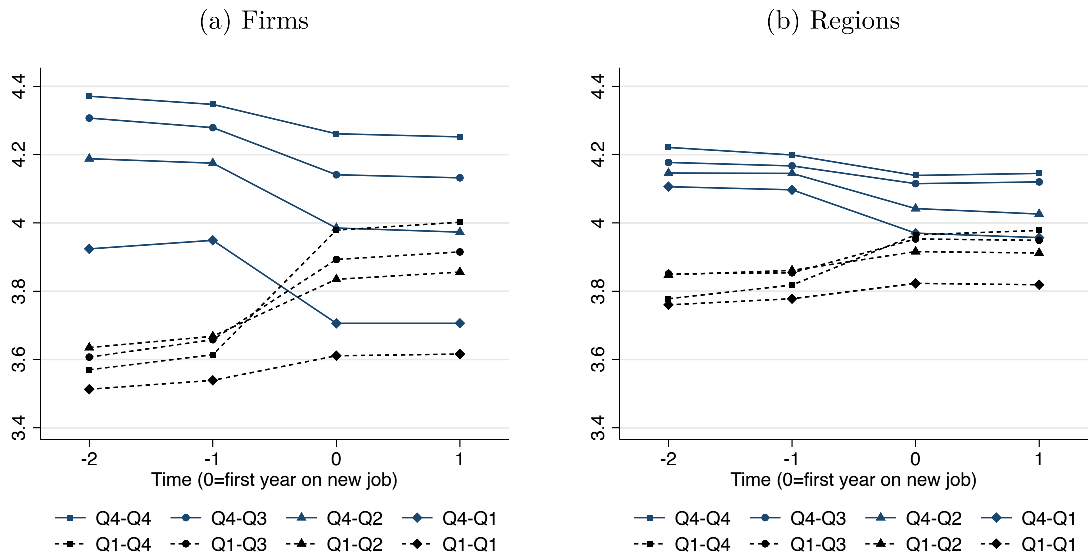
G.6 Impact on workplace segregation

As low-paying firms hire migrant labor and forgo natives, workplace segregation must increase. Figure A6 shows the impact of immigration on the index of dissimilarity, a popular measure of segregation:

$$ID_r = \frac{1}{2}\sum_{j \in r}\left|\frac{\text{Migrants}_j}{\sum_{j \in r}\text{Migrants}_j} - \frac{\text{Natives}_j}{\sum_{j \in r}\text{Natives}_j}\right| \qquad \text{(A38)}$$

where j denotes firms in region r. The index compares shares of the migrant and native workforce (within region r) employed in each establishment, and varies from 0 (no segregation) to 1 (perfect segregation). Segregation grew strongly in affected regions in the early 1990s, reflecting both the clustering of new migrants in low-pay firms (Figure 6) and crowd-out of native workers from those same firms (Figure 7).

Figure A7: Validation of firm and region wage premia



SIAB, mean wages of workers who change region (panel a) or firm (panel b) during 1986-88 interval, and who do not change region (or firm) in previous or subsequent year. Each job is classified into quartiles based on estimated fixed effects for regions or firms, respectively.

G.7 Validation of firm and regional AKM wage premia

To identify wage premia for firms (as in Section 8) and regions (Appendix G.9 below), we use a "movers design". This requires an "exogenous mobility" assumption, that the sequence of wage innovations (the ε_{it} in equation (13)) is orthogonal to worker i's firm (or location) choices. In this appendix, we offer evidence in support of this assumption. Following Card, Heining and Kline (2013) and Card, Rothstein and Yi (2025), we group firms/regions into four quartiles, according to their estimated wage premia. And in Figure A7, we show that workers moving between low- and high-premium firms/regions have similar (close to flat) pre-trends before the move. The results support the assumption that wage changes associated with a move capture firm or regional wage premia, rather than individual differences in wage trajectories.

G.8 Decomposing the change in AKM wage premia

This section shows how mean changes in AKM wage premia (at the region level) can be decomposed into contributions from incumbent firms, entrants and exiters. We denote the pre- and post-treatment periods with the subscripts $0, 1$, and define:

- $\eta_{r,t}$: mean AKM in area r and period t
- $\eta_{r,t}^{inc}$: mean AKM in period t, among incumbent firms (active in both periods)
- $\eta_{r,1}^{ent}$: mean post-period AKM, among entrant firms (active only in post-period)
- $\eta_{r,0}^{ex}$: mean pre-period AKM, among exiting firms (active only in pre-period)
- $N_{r,t}$: no. firms in area r and period t
- N_r^{inc}: no. firms in area r active in both periods

Using this notation, we can write the mean pre- and post-treatment wage premia as:

$$\eta_{r,0} = \frac{N_r^{inc}}{N_{r,0}}\eta_{r,0}^{inc} + \left(1 - \frac{N_r^{inc}}{N_{r,0}}\right)\eta_{r,0}^{ex} = \eta_{r,0}^{inc} + \left(1 - \frac{N_r^{inc}}{N_{r,0}}\right)\left(\eta_{r,0}^{ex} - \eta_{r,0}^{inc}\right) \tag{A39}$$

$$\eta_{r,1} = \left[\frac{N_r^{inc}}{N_{r,1}}\eta_{r,1}^{inc} + \left(1 - \frac{N_r^{inc}}{N_{r,1}}\right)\eta_{r,1}^{ent}\right] \tag{A40}$$

Putting these together, we have:

$$\eta_{r,1} - \eta_{r,0} = \underbrace{\frac{N_r^{inc}}{N_{r,1}}\left(\eta_{r,1}^{inc} - \eta_{r,0}^{inc}\right)}_{\text{Incumbents}} + \underbrace{\left(1 - \frac{N_r^{inc}}{N_{r,1}}\right)\left(\eta_{r,1}^{ent} - \eta_{r,0}^{inc}\right)}_{\text{Entrants}} - \underbrace{\left(1 - \frac{N_r^{inc}}{N_{r,0}}\right)\left(\eta_{r,0}^{ex} - \eta_{r,0}^{inc}\right)}_{\text{Exiters}} \tag{A41}$$

In Table 7, we estimate the response of each component of (A41) to the enclave shock.

G.9 Direct estimates of regional wage premia

For Table 7, we compute regional wage premia using regional averages of pre-compiled firm AKM premia. An alternative approach is to replace the firm fixed effect $\eta_{j(i,t)}$ in equation (13) with a region fixed effect $\eta_{r(i,t)}$:

$$y_{it} = \alpha_t + \eta_{r(i,t)} + \theta_i + \gamma X_{it} + \varepsilon_{irt} \tag{A42}$$

where the $r(i,t)$ subscript denotes the region r in which individual i worked in year t. This specification is similar to Combes, Duranton and Gobillon (2008), and we are able to estimate it ourselves in our 2% SIAB worker panel. The estimated η_r premia may be biased, if regional movers change their position in the local firm

Table A9: Mean changes in regional wage premia

	Movers				Raw wage	Residualized
	1993-99 v 1985-92 (1)	1983-85 v 1986-88 (2)	1991-93 v 1986-88 (3)	1994-96 v 1986-88 (4)	1994-96 v 1986-88 (5)	1994-96 v 1986-88 (6)
All workers	-0.739***	-0.110	-0.326	-0.827***	-0.360	0.186
	(0.138)	(0.334)	(0.220)	(0.220)	(0.301)	(0.230)
Natives only	-0.751***	-0.060	-0.301	-0.944***	0.121	0.264
	(0.127)	(0.340)	(0.209)	(0.241)	(0.284)	(0.219)

SIAB, regression estimates based on equation (11) across 204 local labor markets. Columns 1-4 report estimated effects on (mover-identified) regional wage premia η_r, as described by Appendix G.9. Columns 5-6 report effects on raw wages and residualized wages (controlling for age-education-gender interactions, but not individual fixed effects). * p<0.10, ** p<0.05, *** p<0.01.

hierarchy (Card, Rothstein and Yi, 2025); but for our purposes (estimating responses to local shocks), the bias appears not to be consequential. Importantly, it gives us the flexibility to define our own subsamples – unlike the pre-compiled AKM premia.

Similar to the AKM premia, we require an "exogenous mobility" assumption: the sequence of ε_{it} innovations must be orthogonal to the sequence of worker i's location choices. We offer empirical support for this assumption in Figure A7b: as for firm movers, the wage trends of workers moving between low- and high-premia regions are parallel (and approximately flat) before the move.

In Table A9, we estimate the impact of the enclave shock Δm_r on changes in the regional premia η_r, between various intervals (along the table columns), and for different worker samples (along the rows). For comparison with Section 8.2, column 1 shows changes in η_r between the same intervals as Bellmann et al. (2020), i.e. 1985-92 and 1993-99. This yields a coefficient of -0.74: reassuringly, this is very close to the column 1 estimate of Table 7. In row 2, we exclude migrants from our sample (when estimating the η_r premia): this makes little difference to the results.

Though the Bellmann et al. intervals do closely match our pre- and post-treatment periods, it is not a perfect fit. For the remaining columns, we re-estimate the η_r premia for finer three-year intervals, using 1986-88 as our baseline period. In column 2, to test for pre-trends, we compare our baseline period against 1983-85. Our estimates show no differential pre-trends for the full sample (row 1) or native workers (row 2): regional premia evolved similarly in more and less exposed areas before the shock.

We next turn to the post-treatment effects. Column 3 shows a negative impact for 1991-93, but not statistically significant. But the estimates become more negative and significant by 1994-96, with a 1 pp immigration shock decreasing native wage premia by 0.9%. This suggests that immigration did reduce wages for workers of fixed characteristics; but this effect is concealed by crowd-out of low-wage natives in standard wage regressions (such as in Figure 5d). To illustrate this problem more explicitly, column 5 shows what happens if we use simple regional means of log wages as our dependent variable (instead of mover-identified wage premia). And in column 6, we residualize wages using observable education-gender-age interactions in the X_{it} vector (a common strategy in studies which rely on cross-sectional data). As the results show, these "naive" specifications do not capture the negative wage effects: we conclude that they do not adequately control for compositional shifts.

G.10 Effects across the native worker distribution

Guided by our model, the main text explores differential effects across the distribution of *firms*. In this appendix, we offer estimates by *worker type*, similar to the existing literature. In conventional models, this heterogeneity can be attributed to differential changes in workers' marginal products. Though our model takes marginal products as given, we do not discount the possibility of such effects – and hence this analysis.

We present our estimates in Table A10. Each column reports wage and employment effects for different groups of workers. We focus on (i) changes in regional native wage premia, using the "regional movers" design described in Appendix G.9, and comparing the periods 1994-96 (post-treatment) and 1986-1988 (pre-treatment), and (ii) changes in log native employment between 1988 and 1995.

As a benchmark, column 1 shows effects for the full sample: as in the main text, we see large negative effects. Columns 2-3 estimate these by gender. The wage effects are slightly more negative (and more precisely estimated) for men. But the reduction in native employment is much larger for women, consistent with them having more elastic labor supply: see also Borjas and Edo (2021).

Columns 4-6 show the wage effects are largest for under-30s, among whom the new migrants are heavily concentrated (see Table 1); but employment effects are largest for 30-49s.[40] Both are close to zero for older workers (aged 50+), but these effects

[40] A natural interpretation is that 30-49s have higher reservation wages, so are less willing to accept the reduced wage offers. A similar pattern – with wage and employment effects showing

Table A10: Native wage and employment effects across worker distribution

	Full	Gender		Age		
	sample	Men	Women	16-29	30-49	50-65
	(1)	(2)	(3)	(4)	(5)	(6)
Δlog native wage (movers)	-0.944***	-0.991***	-0.742	-1.237***	-0.250	-0.079
1994-96 v 1986-88	(0.241)	(0.265)	(0.468)	(0.420)	(0.293)	(0.794)
Δlog native employment	-1.364***	-0.808**	-2.225***	-1.530***	-2.607***	0.229
1995 v 1988	(0.292)	(0.346)	(0.292)	(0.366)	(0.371)	(0.940)
	Education		Worker wage FE			
	Low	Mid/high	Q1	Q2	Q3	Q4
	(7)	(8)	(9)	(10)	(11)	(12)
Δlog native wage (movers)	-2.397*	-0.659**	-1.655***	-0.988**	-0.677**	-0.621
1994-96 v 1986-88	(1.292)	(0.264)	(0.558)	(0.475)	(0.296)	(0.417)
Δlog native employment	-1.907***	-1.905***	-2.279***	-0.903**	-0.273	-0.338
1995 v 1988	(0.455)	(0.347)	(0.589)	(0.419)	(0.386)	(0.701)

SIAB, regression estimates based on equation (11) across 204 local labor markets. Dependent variable in row 1 is changes in regional wage premia for natives between the periods 1986-88 (pre-treatment) and 1994-96 (post-treatment), estimated using a "regional movers" design (as in Appendix G.9). Row 2 shows log native employment changes between 1988 and 1995.* p<0.10, ** p<0.05, *** p<0.01.

are estimated with vast standard errors – so should be interpreted with caution.

Columns 7-8 show the wage effects are more negative for low-educated workers, but employment effects are similar. Whether migrants compete with low or high-educated natives is not obvious in our setting, due to the young age of the migrant arrivals and the important role of vocational training in the German labor market: while most migrants have "low" education at arrival (see Table 1), many enter trainee positions that lead to a vocational qualification corresponding to "mid/high" education.

Until now, we have focused on observable characteristics. But in columns 9-12, we split natives into four quartiles by their individual fixed effects[41]: in practice, these fixed effects will identify a mixture of workers' skill and the pay policies of their employers. The estimated wage effects are monotonically decreasing, from a peak of -1.7 in the bottom quartile to -0.6 at the top.[42] We also find very large native

inverse patterns across age groups – is reported by Dustmann, Schoenberg and Stuhler (2017).

[41]We regress log wages between 1980 and 2000 on regional fixed effects, individual fixed effects and education-gender-age interactions. We then split workers into quartiles by their individual effects.

[42]This distributional pattern is similar to Dustmann, Frattini and Preston (2012), but our wage estimates are considerably more negative on average. This could reflect differences in the setting, or our use of panel data to eliminate the influence of compositional changes.

employment effects at the bottom (reaching -2.3 in column 9). Both the wage and employment effects are statistically insignificant in the top quartile.

To summarize, wage effects fall mostly on young and low-paid natives, and the low-paid also face the largest employment losses. These results are broadly consistent with canonical factor proportions models, which predict that adverse effects of immigration are concentrated among "similar" natives. But interestingly, the differences are most pronounced when classifying workers by their *wage* rather than education or age – and this is consistent with an important role for firms. Unsurprisingly, we also find an increase in aggregate wage inequality in exposed labor markets: a 10 pp immigration shock increases the standard deviation of log native wages by 0.061 (s.e. 0.015).

H US evidence on firm size effects

Here, we offer US evidence on firm size effects of immigration. Though firm size is an unusual outcome in the immigration literature, it is a natural focus of our model (see Proposition 4 in Section 2.2); and it is simple to measure in many contexts. We provide these US estimates as a point of comparison for our main analysis.

We rely on spatial variation between 1980 and 2020, expanding the analysis of Amior (2020). Unlike our German setting, we do not exploit a one-off immigration event, but instead rely on decadal changes identified by an enclave shock. Amior (2020) finds large crowd-out in population across commuting zones, and even more in employment, such that local employment rates contract. We keep the same data structure as Amior (2020), but replace the dependent variable with changes in mean firm size. Just as in our German setting, we find negative effects on firm size; but the US effects are smaller in magnitude.

Empirical specification

Similar to equation (11) in the main text, we rely on a "reduced form" specification:

$$\Delta y_{rt} = \alpha_t + \beta \Delta m_{rt}^{US} + \gamma_t X_{rt} + \varepsilon_{rt} \tag{A43}$$

where Δy_{rt} is the change in some outcome of interest in area r corresponding to 722 commuting zones (CZs) between time $t-1$ and t. Time observations are each a decade apart (1980, 1990, 2000 and 2010), and Δm_{rt}^{US} is an enclave shock:

$$\Delta m_{rt}^{US} = \frac{\sum_o s_{ort-1} \left(n_{ot} - n_{ot-1}\right)}{n_{rt-1}} \tag{A44}$$

which predicts changes in migrant share between $t-1$ and t, based on local shares s_{ort-1} of 77 origin groups o at $t-1$, similar to equation (12). X_{rt} is a vector of local controls, which includes current and once-lagged Bartik industry shift-shares, as well as various fixed amenities[43] interacted with time effects. The enclave and Bartik shift-shares are constructed using US census and American Community Survey samples.

Establishment size data

To measure local establishment size, we rely on publicly accessible data from the Census Bureau's County Business Patterns (CBP). This is an annual dataset, based on the Business Register. It covers all industries except agricultural production, railroad, public administration and household employment. For every county-industry cell, the CBP reports total employment and total establishments.

The CBP suppresses employment counts in some county-industry cells (1-3% of total employment each year) to preserve confidentiality, and it also changes industry classifications periodically. To create stable panels, we rely on the files created by Eckert et al. (2020). They impute suppressed employment counts by exploiting constraints implied by geographical and industrial hierarchies, and they use official industry crosswalks to produce consistent series.

Empirical estimates

We present estimates of (A43) in Table A11. Columns 1-4 explore the effect of the enclave shock Δm_{rt}^{US} on the foreign-born population share: this can be interpreted as a "first stage". In column 1, which conditions on year effects only, the coefficient is about 0.3; and this is little affected by amenity and Bartik controls (column 2). In column 3, we control for CZ fixed effects: since (A43) is already in first differences, this removes area-specific linear *trends* in amenities or labor demand. This is a demanding

[43] Presence of coastline, climate (maximum January/July temperatures, mean July relative humidity), log population density in 1900, and an index of CZ isolation (log distance to closest CZ).

Table A11: US establishment size effects

	Δ Migrant population share				Δ Log mean firm size			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Decadal enclave shock	0.292***	0.233***	0.388***	0.574***	-0.154***	-0.213***	-0.404***	-0.414***
	(0.031)	(0.034)	(0.060)	(0.047)	(0.054)	(0.037)	(0.113)	(0.091)
Enclave shock: Lag				-0.400***				0.235**
				(0.039)				(0.111)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bartik, amenity controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
CZ fixed effects	No	No	Yes	No	No	No	Yes	No
Observations	2,166	2,166	2,166	2,166	2,166	2,166	2,166	2,166

This table presents estimates of equation (A43), for three decadal observations (1980-2010) across 722 CZs. In columns 1-4, the dependent variable is decadal changes in migrant (foreign-born) population share; and columns 5-8 show changes in log mean firm size. Robust standard errors, clustered by state, are in parentheses. Observations are weighted by lagged local population share. *** p<0.01, ** p<0.05, * p<0.1.

specification for such a short panel, but we still find a precise positive effect. Unlike our German setting (where we study a one-off immigration event), migrant inflows to US CZs are heavily serially correlated (Jaeger, Ruist and Stuhler, 2018), and this may bias our estimates if there is dynamic adjustment. To address this concern, we control for a lagged enclave shock Δm^{US}_{rt-1} in column 4: the coefficient on the contemporaneous shock now increases to 0.57, offset by a (smaller) negative coefficient on Δm^{US}_{rt-1} (-0.40). Intuitively, local expansions in migrant share are diffused through the country in the decade following the shock.

In columns 5-8, we estimate the same specifications for changes in log mean firm size (i.e. a "reduced form" specification). Firm size responds negatively in column 5 (year effects only), and including the amenity and Bartik controls only strengthens the effect: the coefficient in column 6 is -0.21. CZ fixed effects in column 7 increase the impact still further. And in the dynamic specification (column 8), we see a mean reverting effect which perfectly reflects changes in migrant share in column 4: the initial local shock reduces firm size (with a coefficient of -0.41), but this effect is partly offset (0.24) in the subsequent decade as the shock diffuses nationally.

Though qualitatively similar, these firm size effects are smaller in magnitude than in our German setting: for comparison, we have a coefficient of -1 in Table 6. This is despite a similar response of the migrant share to the enclave shock: compare Table A11 to Figure 5a (black line) in the main text. One possible interpretation is that the "wage-setting" effect (in Proposition 4 of the model) is more dominant in our German setting, due to lower migrant reservation wages.