Immigration and Monopsony: Evidence Across the Distribution of Firms

[Preliminary and incomplete]

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Abstract

We argue that immigration can strengthen the monopsony power of firms. Using German data, we show that firms respond to an immigration shock by cutting both pay and employment. We interpret this as a movement down their labor supply curves, as they forego native employment to exploit cheaper migrant labor. The wage cuts are driven by low-paying firms, where new migrants disproportionately concentrate. We find a similar negative impact on firm size in the US. These adverse labor market effects are not inevitable, and may be ameliorated through policies which constrain monopsony power.

1 Introduction

The labor market impact of immigration is traditionally interpreted in a competitive framework, where workers earn their marginal product. In this paper, we consider an alternative

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model where firms have monopsonistic power. If new migrants have low reservation wages, firms can exploit immigration by offering lower wages to migrants and natives alike – even with productivity unchanged (Amior and Manning 2020). These insights are crucial for designing effective immigration policy. Our contribution is to explore the implications for pay and employment across the distribution of firms, both theoretically and empirically.

Our basic insight is simple. In a competitive labor market, any adverse wage effect should be accompanied by an *expansion* of firms’ employment, as firms move down their labor demand curves (due to diminishing returns). But under monopsony, wage cuts may reflect movement down firms’ *supply* curves, as they forego native employment to exploit cheaper migrant labor. The lower are migrants’ reservation wages, the more aggressively firms will price out native labor; and they may even profit by *reducing* their employment overall. These effects may be amplified by selection of firms and exit of natives from the labor market. We formalize these ideas using the wage-posting models of [Albrecht and Axell 1984] and [Burdett and Mortensen 1998].

To test these predictions, we study a large sudden influx of predominantly low-educated migrants from Eastern Bloc countries to Germany in the early 1990s, following the collapse of the Iron Curtain. We are not the first labor economists to study this event (see e.g. [Angrist and Kugler 2003], [D’Amuri, Ottaviano and Peri 2010], [Brücker and Jahn 2011], [Dustmann and Glitz 2015] and [Bruns and Priesack 2019]), but we pose different questions and rely on different variation. The influx was accompanied by a fierce political debate on “wage dumping” (“Lohndumping”). [Cyrus and Helias 1993], for example, report that Polish contract workers received less than half the typical going rate. The setting is therefore well suited to study how access to “cheap” migrant labor affects firm behavior and labor markets.

To estimate the impact of the shock, we exploit spatial variation in migrant inflows, identified by pre-existing migrant enclaves (as in [Altonji and Card 1991]; [Card 2001]). The availability of detailed administrative registers for both workers and establishments allow us to address selection and other potential threats to identification. As the model predicts, the new migrants disproportionately concentrate in small low-paying firms. These firms cut pay and shed native workers. On average, firm size contracts. These findings are difficult to rationalize in a competitive labor market, but are broadly consistent with a monopsonistic environment where migrants have low wage demands.

Of course, our estimates speak to a particular time and place; and it is important to

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1 See e.g. *Frankfurter Allgemeine Zeitung*, 20/08/1993 (“Streit um die Werkverträge”)
2 Though these practices were forbidden in principle, firms found means of bypassing the rules.
establish whether our claims have broader relevance. In the final part of the paper, using (publicly accessible) local-area data, we show that immigration has similar negative effects on firm size in the US. This is consistent with evidence from Amior and Manning (2020), who identify adverse effects of immigration on wage mark-downs (using aggregate-level variation across skill groups).

One cannot conclude from these results that immigration is generally harmful for native labor. Under monopsony, our model suggests the impact of immigration depends heavily on migrants’ reservation wages and institutional context (and not just on migrants’ skill mix, as in competitive models). This may help explain why different studies reach different conclusions: for example, Dustmann, Schoenberg and Stuhler (2017) find that Czech commuters displaced German workers almost one-for-one; and this may be attributed to the Czech workers having very low reservations. Moreover, since the wage cuts are driven by firms’ monopsony power, the policy implications are very different from competitive models. The potentially harmful effects of immigration may be mitigated through policies which target monopsony power directly (rather than by restricting immigration itself), such as a minimum wage (see e.g. Edo and Rapoport, 2019; Dustmann et al., 2020) or a regularization policy (e.g. Monras, Vázquez-Grenno and Elias, 2020; Amior and Manning, 2020). These considerations are especially important for European governments, as they seek to absorb a large number of refugees into the labor market over the coming years.

Our paper builds on various strands of the migration literature. First, there is growing consensus that migrants typically have low reservation wages. Several papers show (like us) that migrants concentrate in smaller and/or lower-paying firms (Aydemir and Skuterud, 2008; De Matos, 2017; Dustmann, Ku and Surovtseva, 2019; Arellano-Bover and San, 2020; Dostie et al., 2020). Others offer evidence that firms impose larger mark-downs on migrants’ wages (Nanos and Schluter, 2014; Hirsch and Jahn, 2015; Caldwell and Danieli, 2018; Amior and Manning, 2020). Low reservations may be rationalized in different ways. Migrants may face greater liquidity constraints and more restricted access to welfare benefits. They may base their reference points on their country of origin (Constant et al., 2017; Akay, Bargain and Zimmermann, 2017), whether for psychological reasons or because of remittances (Albert and Monras, 2018; Dustmann, Ku and Surovtseva, 2019). And they may discount their time in the host country more heavily, perhaps because they intend to eventually return (Amior, 2017; Adda, Dustmann and Görlach, 2021), or because of binding visa time limits

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3When a minimum wage was finally introduced in German in 2015, Dustmann et al. (2020) find that low-wage workers benefited partly by moving to larger higher-paying firms (at no cost to total employment).
or deportation risk.

A handful of studies explore the implications of low migrant reservations for the broader labor market. These arrive at different conclusions, depending on the model applied. Chassamboulli and Palivos (2013, 2014), Chassamboulli and Peri (2015) and Battisti et al. (2017) assume firms bargain with individual workers over wages ex post (i.e. after meeting): this protects natives from direct competition from migrant labor. In contrast, Malchow-Moller, Munch and Skaksen (2012), Naidu, Nyarko and Wang (2016), Amior (2017), Amior and Manning (2020) and Albert (forthcoming) do allow for direct competition. Our contribution is to explore the implications of monopsony power across the distribution of firms, both theoretically and empirically.

Others have previously explored the impact of immigration on firms. Much of this literature has focused on high skilled immigration (e.g. Kerr, Kerr and Lincoln, 2015; Mitaritonna, Orefice and Peri, 2017; Beerli et al., 2021) and typically finds improvements in firm productivity and native outcomes, driven by skill complementarities. Dustmann and Glitz (2015) show that firms absorb immigration shocks partly through changes in relative skill intensities. We rely on firm-level wage and employment data to identify monopsonistic wage mark-down effects.

Our findings are also pertinent to the broader question of the distributional effects of immigration. In particular, Dustmann, Frattini and Preston (2012) study the local effects of immigration along the native wage distribution; and Card (2009) and Gould (2019) estimate effects on residual inequality. In our paper, we draw attention to differential wage mark-down effects along the distribution of firms.

In the next section, we set out our theoretical model. Section 3 describes the labor market experience of early 1990s immigrants in Germany, and describes the identification of regional immigration shocks. Section 4 tests the predictions of the model, using this regional variation. Finally, in Section 5, we turn to the US evidence, based on local-area aggregates.

2 Model

Based on the framework of Albrecht and Axell (1984), we set out a frictional labor market model with monopsonistic wage posting and heterogeneous reservation wages. The model is not new: our contribution is to apply it to the question of immigration, and explore the associated comparative statics. We begin with the minimal ingredients required to describe our basic hypothesis, and we explore a range of extensions afterwards. We do not seek to
estimate or calibrate the model: instead, we derive qualitative predictions, which we test with German and US data.

Suppose there are \( n \) workers and \( k \) firms. Firms produce a homogeneous output good whose price is normalized to 1, and labor is 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). Each firm chooses its wage \( w \) to maximize profit, trading off profit per worker with labor force size.

For now, we assume only the unemployed search for work: they randomly meet firms at rate \( \lambda \), and accept a wage offer if it exceeds their reservation. At rate \( \delta \), workers leave employment through random separations to unemployment. Workers are risk neutral and discount the future at rate \( r \).

A fraction \( \mu \) of the labor force are migrants. Natives and migrants are productively identical, but differ in their unemployment utility flow: natives receive \( b_N \) when unemployed, and migrants \( b_M \), where \( b_N > b_M \). One might motivate this assumption by the existing literature (see above), and we also present context-specific evidence below.

### 2.1 Equilibrium in baseline model

For a given distribution \( F \) of wage offers, unemployed migrants will have some reservation wage which represents the minimum acceptable offer: we denote this as \( w_0 \). And unemployed natives will have their own reservation, which we denote \( w_1 \), where \( w_1 > w_0 \). In equilibrium, no firm will offer a wage other than \( w_0 \) 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 \((w_0, w_1, \phi)\), where \( \phi \) is the share of firms which offer \( w_1 \).

Let \( U_N \) and \( U_M \) denote the present discounted values of unemployed natives and migrants. In equilibrium, these can be expressed as:

\[
r U_N = b_N + \lambda \phi [E_N (w_1) - U_N]
\]

\[
r U_M = b_M + \lambda (1 - \phi) [E_M (w_0) - U_M] + \lambda \phi [E_M (w_1) - U_M]
\]

Equation (2) has one additional term, since only migrants accept \( w_0 \) wage offers \( E_N (w) \) and...
\( E_M (w) \) denote the values of employed natives and migrants earning wage \( w \):

\[
    rE_X (w) = w + \delta [U_X - E_X (w)]
\]

(3)

for \( X = \{N, M\} \). Since \( w_1 \) is the native reservation, we have \( E_N (w_1) = U_N \). Looking at (1), this means that natives enjoy no surplus from finding work, and no loss from an exogenous separation. Using (1) and (3), this implies the native reservation is equal to:

\[
    w_1 = b_N
\]

(4)

where \( b_N \) is the native unemployment utility flow. Similarly, since \( w_0 \) is the migrant reservation, we have \( E_M (w_0) = U_M \). Using this, (2) and (3), we can solve for \( w_0 \):

\[
    w_0 = \frac{(r + \delta) b_M + \lambda \phi b_N}{r + \delta + \lambda \phi}
\]

(5)

which is a weighted average of the native and migrant unemployment utility flows, i.e. \( b_N \) and \( b_M \). The steady-state native and migrant unemployment rates are given by:

\[
    u_N = \frac{\delta}{\delta + \lambda \phi}
\]

(6)

and

\[
    u_M = \frac{\delta}{\delta + \lambda}
\]

(7)

respectively, where \( \phi \) is the share of firms which offer \( w_1 \). Native unemployment \( u_N \) exceeds migrant unemployment \( u_M \) if some firms offer \( w_0 \): i.e. if \( \phi < 1 \).

It remains to solve for \( \phi \). To this end, we turn to the firm’s problem. Consider a firm which offers \( w_0 \). This firm will face a labor inflow of \( \frac{\lambda}{k} u_M \mu n \) and outflow of \( \delta l (w_0) \), where \( l (w_0) \) is the firm’s steady-state labor force. Equating the two, and using (2), we have:

\[
    l (w_0) = \frac{n}{k} \cdot \frac{\lambda \mu}{\delta + \lambda}.
\]

The associated profit is then:

\[
    \pi (w_0) = (p - w_0) l (w_0)
\]

\[
    = \frac{n}{k} \cdot \frac{\lambda \mu}{\delta + \lambda} \cdot \frac{(r + \delta) (p - b_M) + \lambda \phi (p - b_M)}{r + \delta + \lambda \phi}
\]

(8)

Similarly, consider a firm which offers \( w_1 \). The firm will have inflow \( \frac{\lambda}{k} [u_M \mu + u_N (1 - \mu)] n \) and outflow \( \delta l (w_1) \). Equating the two, and using (1) and (2), the steady-state labor force
is: \( l(w_1) = \frac{n}{k} \left[ \frac{\lambda \mu}{\delta + \lambda} + \frac{\lambda (1 - \mu)}{\delta + \lambda \phi} \right] \). So the associated profit is:

\[
\pi(w_1) = (p - w_1) l(w_1) = \frac{n}{k} \left[ \frac{\lambda \mu}{\delta + \lambda} + \frac{\lambda (1 - \mu)}{\delta + \lambda \phi} \right] (p - b_N)
\] (9)

As Rogerson, Shimer and Wright (2005) show, there is a unique equilibrium which can take one of three forms:

1. \( \pi(w_1) = \pi(w_0) \), and firms offer different wages (i.e. \( 0 < \phi < 1 \))
2. \( \pi(w_1) > \pi(w_0) \) and all firms offer \( w_1 \) (i.e. \( \phi = 1 \))
3. \( \pi(w_1) < \pi(w_0) \) and all firms offer \( w_0 \) (i.e. \( \phi = 0 \))

The equilibrium form depends on the parameters. As we show in Appendix A, the equilibrium \( \phi \) can be expressed as:

\[
\phi = \min \left\{ \max \left\{ 0, \tilde{\phi} \right\}, 1 \right\}
\] (10)

where \( \tilde{\phi} \) is a “latent” \( \phi \):

\[
\tilde{\phi} = \frac{\delta}{\lambda} \cdot \frac{\delta + \lambda}{\delta} - \left[ \frac{\mu}{1 - \mu} \cdot \frac{b_N - b_M}{p - b_N} \right] - \frac{\delta + \lambda}{\delta + \lambda}
\] (11)

where \( \phi = 0 \) if \( \tilde{\phi} < 0 \), and \( \phi = 1 \) if \( \tilde{\phi} > 1 \). The latent \( \tilde{\phi} \) is decreasing in \( \frac{\mu}{1 - \mu} \cdot \frac{b_N - b_M}{p - b_N} \).

Intuitively, firms are less likely to offer \( w_1 \) if (i) there are many migrants (\( \mu \) large) and (ii) if the migrant reservation \( b_M \) is small relative to \( b_N \). Both these conditions ensure it is profitable to price out native labor.

### 2.2 Comparative statics

We now consider the impact of immigration on a range of outcomes. Though we rely on the Albrecht and Axell (1984) framework, these results are new. Note that, all else equal, equilibrium wages and employment rates are invariant to \( \frac{n}{k} \), the ratio of workers to firms. Our strategy is to study changes in the migrant share \( \mu \), holding the ratio \( \frac{n}{k} \) fixed. In practice, one might expect \( \frac{n}{k} \) to change in response to immigration; and we consider this possibility in an extension below.

**Proposition 1.** Migrants concentrate in low-paying firms.
Since migrants have a low unemployment utility flow (\(b_M < b_N\)), their reservation wage \(w_0\) is lower than the native reservation \(w_1\); see (5). Therefore, as long as some firms offer \(w_0\) (i.e. if \(\phi < 1\)), only migrants will accept these low offers.

**Proposition 2.** A larger migrant share \(\mu\) induces firms to reduce offers at the bottom of the distribution. This effect is increasing in the \(\frac{b_N - b_M}{p - b_N}\) ratio.

A larger \(\mu\) reduces the latent \(\tilde{\phi}\) (see equation (11)), so the share of firms offering \(w_1\) (i.e. \(\phi\)) must decrease (if it changes at all); and this effect is increasing in \(\frac{b_N - b_M}{p - b_N}\). Intuitively, immigration is more likely to induce firms to price out native labor if migrant labor can be purchased more cheaply (i.e. if \(\frac{b_N - b_M}{p - b_N}\) is large). A smaller \(\phi\) also reduces the migrant reservation \(w_0\) (see (5)), since migrants are now less likely to receive \(w_1\). However, the native reservation \(w_1\) remains fixed at \(b_N\); so as long as \(\phi > 0\), high-wage firms continue to offer (and employed natives continue to earn) \(w_1\). As we show below, native wages may contract under different assumptions; but more generally, it remains true that immigration will reduce wage offers more than natives’ realized wages. Note this distinction between offered and realized wages (for workers of given productivity) does not exist in a competitive model.

**Proposition 3.** A larger migrant share \(\mu\) induces firms to shed native labor at the bottom of the distribution. This effect is increasing in the \(\frac{b_N - b_M}{p - b_N}\) ratio.

Equation (6) shows that native unemployment \(u_N\) is decreasing in \(\phi\). And therefore, given Proposition 2, it must be (weakly) increasing in the migrant share \(\mu\); and this effect is increasing in \(\frac{b_N - b_M}{p - b_N}\). Intuitively, since native labor is elastically supplied at \(w_1 = b_N\), native workers exit employment rather than accepting the lower wages on offer. Note there is no effect on native employment in firms which continue to offer \(w_1\), since they do not drop below the native reservation \(b_N\).

**Proposition 4.** A larger migrant share \(\mu\) may induce firms to reduce their employment overall, and with certainty if the initial \(\mu\) is sufficiently small.

Average firm employment can be expressed as \(\frac{(1 - \bar{u})n}{k}\), where \(\bar{u} = \mu u_M + (1 - \mu) u_N\) is the average unemployment rate (across all workers), and \(u_N\) and \(u_M\) are the native and migrant unemployment rates respectively. Taking the worker-firm ratio \(\frac{n}{k}\) as given, the elasticity of firm employment is therefore equal to the elasticity of \(1 - \bar{u}\), which can be expressed as:

\[
\frac{d \log (1 - \bar{u})}{d \mu} = \frac{u_N - u_M}{1 - \bar{u}} \cdot \frac{d \log u_N}{d \mu} - (1 - \mu) \cdot \frac{u_N}{1 - \bar{u}} \cdot \frac{d \log u_N}{d \mu} \tag{12}
\]
The sign of this elasticity 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 $\mu$ increases firm employment, because migrants (with low reservations) accept more offers than natives.

The second is a negative “wage-setting effect”: a larger $\mu$ induces firms to cut their offers from $w_1$ to $w_0$, which reduces native employment and hence employment overall (all else equal). This effect arises from the wage-employment trade-off, which is the essential feature of monopsony. For the marginal firm which drops from $w_1$ to $w_0$, the larger profit per worker they gain by cutting wages must be offset by an employment loss. Since the wage-setting effect is particular to monopsony, an overall reduction of firm employment must be attributed to monopsony power.

The wage-setting effect will dominate (and firm size will contract on average) if the initial migrant share $\mu$ is sufficiently small. This ensures $\phi$ is close to 1 (few firms offer $w_0$), so native unemployment $u_N$ is close to migrant unemployment $u_M$, and the composition effect is close to zero: see equation (12).

### 2.3 Theoretical extensions

The model we present above clarifies our main theoretical points, but it is very stylized. We now consider a number of theoretical extensions. Some of these amplify the effects we describe above, and some diminish them.

(i) **Heterogeneous native reservations.** The baseline model rules out any impact on realized native wages. This is because natives supply labor perfectly elastically at $w_1$ (which is fixed at their reservation, $b_N$). But this need not bear out under more general assumptions. For example, suppose some fraction of natives share the same unemployment utility flow as migrants, i.e. $b_M$. Then, the impact of immigration on native employment will be smaller (some natives will accept $w_0$ offers), and their wages will also contract on average (for the same reason). Having said that, there may be significant institutional constraints on wage-setting in certain labor markets (see e.g. Dustmann et al., 2014, on Germany), which limit the flexibility of native wages. If these constraints are not properly enforced for migrant labor (see e.g. Angrist and Kugler, 2003; Cyrus and Helias, 1993), then the basic model with all natives demanding $b_N$ (and migrants $b_M < b_N$) may offer a reasonable fit.

(ii) **On-the-job search.** In the baseline model, we rule out on-the-job search. But as we show in Appendix we can account for this by applying the framework of Burdett and Mortensen (1998). Rather than a single low wage $w_0$ and a single high wage $w_1$, we then
have a “low-wage sector” (with offers below $b_N$) and a “high-wage sector” (above $b_N$), each of which contain a continuous distribution of wage offers (as firms compete directly with one another for employees). The basic propositions above are unaffected. However, we do now see a native wage effect, even in the basic case with perfectly differentiated reservations (i.e. with all migrants receiving $b_M$ in unemployment, and all natives $b_N$): when firms drop into the low-wage sector (following an immigration shock), this increases monopsony power in the high-wage sector, so firms are able to extract greater rents from natives (whose wages converge towards $b_N$).

(iii) Differential discount rates $r$. Above, we assume that natives and migrants share the same discount rate, $r$. However, one might expect migrants to discount their time in the host country more heavily: for example, they may intend to return to their country of origin, or face some deportation risk (if they are undocumented). This amplifies the effects on wage offers (Proposition 2) and native employment (Proposition 3), since the migrant reservation $w_0$ will now be lower: for $b_M < b_N$, \[5\] shows that $w_0$ is decreasing in $r$.

(iv) Differential contact rates $\lambda$. Above, we have assumed that natives and migrants differ only in their reservations. But they may also might meet firms at different rates $\lambda$. For example, Caldwell and Danieli (2018) find that migrants in Germany have fewer outside job options than natives. If migrants have a lower $\lambda$ (e.g. because of language difficulties or poor integration into the labor market), they are less likely to meet high-wage firms; and if $b_M < b_N$, their reservation $w_0$ will therefore be lower: see equation \[5\]. However, a low migrant contact rate $\lambda$ also makes it harder for firms to access them, which will diminish competition between natives and migrants.

(v) Downward-sloping labor demand. In the baseline model, we assume the marginal product of labor is fixed at $p$. But suppose instead there are diminishing returns to labor, perhaps because of a rigid capital stock. Any growth in firm employment (as in Proposition 4) will then be accompanied by downward pressure on wages, and vice versa. In a competitive model (where there is no wage-setting effect), any contraction in wages must then be accompanied by an expansion of firm employment.

(vi) Endogenous $\frac{n}{k}$ and contact rate $\lambda$. In the baseline model, we take the ratio of workers $n$ to firms $k$ as given. But there are reasons to believe this ratio might change. First, $\frac{n}{k}$ may contract if the stock of firms $k$ is rigid, and immigration causes the labor force $n$ to expand: all else equal, this will contribute to a mechanical expansion of firm size. On the other hand, if firms are free enter, the growth of monopsony rents may cause $k$ to expand in equilibrium relative to $n$; and this may also shift the contact rate $\lambda$ (if it is endogenous
to market tightness). We explore this possibility more formally in Appendix C. We show the introduction of free entry (and endogenous contact rates $\lambda$) makes no difference to the impact of immigration in the basic model above. Once we account for on-the-job search however, an elastic supply of firms does moderate the adverse effects of immigration, though Propositions 1-4 are qualitatively unaffected.

(vii) **Heterogeneous firms.** In the baseline model, we assume all firms have identical productivity $p$. But suppose instead that firms vary in their productivity. As we show in Appendix D, the impact of immigration on wages and employment are qualitatively unchanged, but the effects are amplified. As in Albrecht and Axell (1984), less productive firms will offer lower wages in equilibrium: this is because they maximize profit at lower levels of employment; and lower wages are sufficient to achieve this. This also means they will will drop from $w_1$ to $w_0$ much more readily, in response to immigration; and this amplifies any impact on wages offers and native employment. In an environment with 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. This selective entry will amplify the wage and employment effects still further; and since the new entrants are less productive (and hence smaller), any negative impact on mean firm size will also be amplified.

(viii) **Native exit.** In parallel to selective entry of firms, we might also expect selective exit of workers. The baseline model predicts that native labor suffers a contraction of employment. In response, natives may exit the labor force (e.g. early retirement) or relocate elsewhere (if the immigration shock is spatially concentrated). This reduces the share of high-reservation workers in the labor force, and the migrant share $\mu$ expands further. This encourages more firms to drop into the low-wage sector, so even more natives exit, and so on: the labor market becomes ever less competitive, and empties out its workforce. These effects may be reinforced further by selective entry of low-quality firms. See also Manning (2010), who attributes the concentration of low-quality firms in smaller cities to local monopsony power.

(ix) **Wage discrimination and efficiency.** Until now, we have assumed individual firms are unable to pay different wages to natives and migrants (doing identical work). This is a source of inefficiency: firms forego native employment (in response to immigration), even though natives are willing to work at a wage below their marginal product $p$. But to the extent that firms can wage discriminate, any impact on wage offers and native employment

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4See Dustmann et al. (2020) for evidence on how a larger minimum wage forces low-quality firms out of the market.
is diminished; and in the case of perfect discrimination, the effects are entirely eliminated (see Amior and Manning, 2020). In a monopsony model like ours, this would involve firms recruiting migrants at \( w_0 \), while retaining their native employees (doing identical work to the new migrant hires) at \( w_1 \). Alternatively, perfect discrimination may arise 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, 2013; Chassamboulli and Peri, 2015; Albert, forthcoming): this form of bargaining protects natives from any direct competition with migrant labor. Ultimately, our estimates below will clarify whether perfect discrimination offers an adequate description of the labor market in practice.

3 German immigration shock

In this section, we provide a detailed account of the immigration shock that affected the German labor market in the late 1980s and early 1990s. We first describe national trends in the composition of the workforce and compare the characteristics of recent immigrant arrivals to earlier migrants and native workers. We then describe the spatial distribution of migrants and discuss potential confounders of our empirical strategy, which exploits variation in immigrant arrivals across local labor markets.

3.1 Data

Our two main data sources are the Sample of Integrated Labour Market Biographies (SIAB) and the Establishment History Panel (BHP), both provided by the Institute for Employment Research (IAB) in Nuremberg. We use weakly anonymized versions of these data sets, which can be accessed during on-site stays at a Research Data Center of the IAB or via remote data execution. We augment our analysis with aggregate, complete-count information on the distribution of foreign nationals across German districts provided by the Federal Employment Agency’s statistical service (Bundesagentur für Arbeit Statistik) as well as information on internal population flows provided by the Federal Statistical Office of Germany. For our main analysis, we aggregate all data sources to 204 local labor markets. For robustness tests, we also repeat our analysis on the finer district level (Landkreise and kreisfreie Städte), with similar results.
3.1.1 Sample of Integrated Labour Market Biographies (SIAB)

To study the individual characteristics of migrant and native workers, we use the Sample of Integrated Labour Market Biographies (SIAB 7510), a 2% subsample of the universe of all dependent employees subject to social security contributions [Vom Berge, Burghardt, and Trenkle, 2014]. The data are representative for about 80% of the German workforce, but exclude civil servants, the self-employed, full-time students, and the military. The SIAB integrates information from different administrative sources to provide complete labor market biographies of sampled workers, starting in 1975. This panel information is a key advantage compared to cross-sectional data sources, as used in the majority of migration studies.

We restrict our sample to individuals aged 16-65 in West Germany (excluding West Berlin). The analysis of wages is restricted to all full-time workers, including trainees. For the analysis of employment we consider both full- and part-time employed. Our employment variables refer to an individual’s employment status on June 30 of the respective year. Locations are defined based on place of work rather than place of residence. Wages are identified by the average daily wage in the employment spell that contains this reference date. Following [Dustmann, Ludsteck and Schönberg, 2009], we impute censored wages under the assumption that the error term is normally distributed, while allowing for a different residual variance by gender and year.

The data contain nationality rather than place of birth. To account for naturalizations, we identify foreign workers based on the first observed working spell of each worker. Following [Brücker and Jahn, 2011] and [Bruns and Priesack, 2019], we identify Ethnic Germans based on information contained in the SIAB on the receipt of special language courses and other integration programs. As East Germans migrating from East to West Germany cannot be separately identified in the SIAB, we augment our analysis using information on internal population flows between districts (Kreiswanderungsmatrix) from the German Federal Statistical Office. These data are reliable since residents are required by law to (de-)register with the local population registration office, and both tenants and landlords have to submit information.

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5 Most importantly, we can control for individual fixed effects to address compositional changes, which have been documented to bias wage estimates from repeated cross-sections [Bratsberg and Raaum, 2012, Dustmann, Schoenberg and Stuhler, 2017, Ortega and Verdugo, 2021, Borjas and Edo, 2021]. The ability to track workers further allows us to distinguish recent arrivals from previous migrants, and to compare their labor market experiences to native workers.

6 Naturalizations were infrequent in our analysis period, but due to legislative changes became frequent after 1998.
3.1.2 Establishment History Panel (BHP)

To study the impact of migration across the distribution of firms, we use the Establishment History Panel (BHP 7510), a panel that covers half of the universe of establishments subject to social security (Gruhl, Schmucker and Seth 2012). For presentational purposes, we use the terms establishments and firms interchangeably. For each establishment and year, the BHP contains detailed information on employment and the composition of the workforce in terms of skill, demographics and nationality, and the distribution of wages within each establishment. Compared to the SIAB, the BHP offers two key advantages. First, our focus is on establishment-level outcomes, and the BHP contains complete information on an establishment’s entire workforce while the SIAB only contains information on sampled workers. Second, the SIAB only covers 2% of employees, while the BHP contains 50% of all establishments, and therefore enables more precise analysis of the regional evolution of wages and employment.

3.2 National trends in immigration

Germany experienced strong immigration during the early 1990s, triggered by the fall of the Iron Curtain as well as other political developments in Europe. As shown in Figure 1a, between 1988 and 1993 the share of foreign nationals in regular employment increased from 9.5 to 12 percent, corresponding to approximately half a million additional workers. In addition, Germany experienced an inflow of “posted workers” from abroad and other forms of irregular employment not covered by social security (Werner, 1996). Figure 1b illustrates that a large share of the overall inflow is due to migration from Eastern Europe, in particular from Yugoslavia and Poland. Other important source countries include Turkey, Greece and Romania. As these inflows were triggered by political events or “push factors” (Llull, 2017) unrelated to local economic conditions in Germany, such as the fall of the Iron Curtain, the Yugoslavian war, or the Kurdish-Turkish conflict, the setting shares similarities with quasi-experimental settings such as Card (1990) or Dustmann, Schoenberg and Stuhler (2017). However, because the location choice of immigrants within Germany could be affected by

---

7We use version 7510 of the BHP, which in contrast to more recent versions disaggregates employment by nationality.
8However, it is possible to merge establishment characteristics from the BHP to individual records in the SIAB (BHP Additional Variables). This allows us to merge the establishment median wages to construct comparable definitions of the firm wage distribution for both SIAB and BHP, and to merge (AKM) establishment fixed effects as estimated on the universe of employment records by Card, Heining and Kline (2013).
9See also Bruns and Priesack (2019), who provide a comprehensive account of these immigrant inflows.
Figure 1: Foreign share in employment

(a) Foreign share

(b) Change relative to 1988

Notes: SIAB, change in employment shares of different nationalities.

local economic trends, we instrument for those location choices based on past settlements (see Section 3.3).\textsuperscript{10}

As shown in Table 1, recent migrants were less likely to be educated than natives, and much younger than natives or previous migrants. They also tended to work in smaller firms: their average establishment size is little more than half of natives’. The contrast is even more striking when comparing recent to previous migrants (which includes the guest worker generation), who often worked in large establishments in manufacturing or other tradable industries.

On average, the wage of recent migrants were 42 log points lower than for natives. Controlling for age, gender, education and occupation reduces this wage gap to 9 log points: i.e. foreign workers receive lower wages than native workers even conditional on their qualifications and occupational position. Moreover, while these estimates refer to foreign workers in regular jobs subject to social security, contemporaneous reports suggest that wages were much lower among other foreign not covered by social security, such as “posted” workers (Cyrus and Helias, 1993). Indeed, the excessively low pay among foreign workers fueled a public and political debate on Lohndumping (“wage dumping”), a neologism that received

\textsuperscript{10}Other studies that combine exogenous push factors with the past settlement instrument include Aydemir and Kirdar (2017), Edo (2020) and Delgado-Prieto (2021).
Table 1: Characteristics of immigrants

<table>
<thead>
<tr>
<th></th>
<th>Natives</th>
<th>Migrants</th>
<th>Migrants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Female</td>
<td>0.417</td>
<td>0.297</td>
<td>0.357</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>low</td>
<td>0.106</td>
<td>0.418</td>
<td>0.379</td>
</tr>
<tr>
<td>medium</td>
<td>0.802</td>
<td>0.530</td>
<td>0.562</td>
</tr>
<tr>
<td>high</td>
<td>0.093</td>
<td>0.052</td>
<td>0.059</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>below 30</td>
<td>0.311</td>
<td>0.170</td>
<td>0.641</td>
</tr>
<tr>
<td>30-49</td>
<td>0.469</td>
<td>0.602</td>
<td>0.331</td>
</tr>
<tr>
<td>50 and above</td>
<td>0.219</td>
<td>0.228</td>
<td>0.028</td>
</tr>
<tr>
<td>Establishment size</td>
<td>1423.7</td>
<td>2346.8</td>
<td>806.0</td>
</tr>
<tr>
<td>Wage level</td>
<td>4.200</td>
<td>4.246</td>
<td>3.780</td>
</tr>
<tr>
<td>gap, raw</td>
<td></td>
<td>0.046</td>
<td>-0.420</td>
</tr>
<tr>
<td>gap, net of dem/edu/occ</td>
<td>–</td>
<td>0.004</td>
<td>-0.088</td>
</tr>
</tbody>
</table>

Notes: SIAB, mean values for years 1988-95. We define “previous” migrants as those who entered employment before 1988, “recent” migrants entered in or after 1988.

widespread traction at that time. Ultimately, this debate led to the tightening of immigration restrictions and, in 1997, to the introduction of a minimum wage in the construction sector.

Table 2 illustrates that the increase in foreign employment shares was heavily concentrated in certain industries. The foreign share increased by more than 14 percentage points (by more than 50%) in hotels or restaurants in the hospitality sector, and also increased strongly in agriculture, household and business-related services, and construction. Few migrants entered the public sector or heavily contracting industries, such as mining. Non-tradable industries received a higher share of migrants than tradables, in contrast to earlier

---

11 According to Google Ngram, the term *Lohndumping* entered widespread use in the German language during the early 1990s, in the context of the migration flows considered in this paper. The neologism appears to be based on a misunderstanding of the English term “price dumping”, a form of predatory behavior in which products manufactured cheaply in one market are “dumped” en masse onto another market. The term “wage dumping” however sounds peculiar to native English speakers, for wages cannot be “dumped” in a figurative sense as products can (see also Sewell, 2010, https://translationpost.com/2010/02/11/lohndumping/).

12 The observed increase of the foreign share in construction was 4.7 percentage points, which is surprisingly low in light of media reports from the time. The likely explanation is that social security and many other data sources exclude subcontracted “posted workers” from foreign firms. Their number was around 90,000 in 1993, with approximately two thirds of the total working in construction (Werner 1996).
Table 2: Change in foreign share by industry (1988-95)

<table>
<thead>
<tr>
<th>Industry</th>
<th>pp. change</th>
</tr>
</thead>
<tbody>
<tr>
<td>[21] Hospitality</td>
<td>14.1%</td>
</tr>
<tr>
<td>[1] Agriculture and forestry</td>
<td>6.9%</td>
</tr>
<tr>
<td>[26] Household services</td>
<td>6.4%</td>
</tr>
<tr>
<td>[17] Construction</td>
<td>4.7%</td>
</tr>
<tr>
<td>[23] Business-related services</td>
<td>4.0%</td>
</tr>
<tr>
<td>[16] Food and tobacco</td>
<td>3.8%</td>
</tr>
<tr>
<td>[5] Plastics</td>
<td>3.5%</td>
</tr>
<tr>
<td>[6] Pit and quarry</td>
<td>3.4%</td>
</tr>
<tr>
<td>[15] Leather and textile</td>
<td>3.3%</td>
</tr>
<tr>
<td>[8] Metal production and processing</td>
<td>3.0%</td>
</tr>
<tr>
<td>[13] Wood and wood products</td>
<td>2.9%</td>
</tr>
<tr>
<td>[12] Musical instruments, jewelry, toys</td>
<td>2.8%</td>
</tr>
<tr>
<td>[7] Ceramic and glass</td>
<td>2.6%</td>
</tr>
<tr>
<td>[18] Trading</td>
<td>2.5%</td>
</tr>
<tr>
<td>[19] Transportation and communications</td>
<td>2.4%</td>
</tr>
<tr>
<td>[22] Healthcare and welfare</td>
<td>2.3%</td>
</tr>
<tr>
<td>[10] Vehicle manufacturing</td>
<td>2.2%</td>
</tr>
<tr>
<td>[14] Printing and paper processing</td>
<td>2.2%</td>
</tr>
<tr>
<td>[27] Social services</td>
<td>2.1%</td>
</tr>
<tr>
<td>[25] Recreational services</td>
<td>2.1%</td>
</tr>
<tr>
<td>[24] Educational services</td>
<td>2.0%</td>
</tr>
<tr>
<td>[11] IT, electronics, optics</td>
<td>1.9%</td>
</tr>
<tr>
<td>[9] Manufacturing</td>
<td>1.4%</td>
</tr>
<tr>
<td>[4] Chemical industry</td>
<td>1.2%</td>
</tr>
<tr>
<td>[3] Mining</td>
<td>0.9%</td>
</tr>
<tr>
<td>[28] Public administration</td>
<td>0.7%</td>
</tr>
<tr>
<td>[20] Credit and insurance</td>
<td>0.7%</td>
</tr>
<tr>
<td>[2] Energy</td>
<td>0.4%</td>
</tr>
<tr>
<td>** Tradable industries**</td>
<td>1.5%</td>
</tr>
<tr>
<td>** Nontradable industries**</td>
<td>3.3%</td>
</tr>
</tbody>
</table>

Notes: SIAB, change in foreign share by industry in percentage points between 1988-95.

migrant cohorts, which were overrepresented in mining, manufacturing and other heavy industries. As shown in Appendix Table A1, migrants earn less than natives in every industry, even after controlling for demographic characteristics and education.
3.3 Regional variation in the immigration shock

As described in Section 4.2, our empirical strategy exploits variation in immigrant arrivals across regions, using the spatial distribution of past immigrant settlements as a predictor for regional distribution of more recent arrivals.\footnote{Our identification strategy differs therefore from the strategy chosen in an earlier study of immigration in this period by Bruns and Priesack (2019), who use distance to the south and east German borders as instruments.} Our purpose here is to exclude local variation in labor demand shocks. Specifically, we predict the local change in foreign shares based on the distribution of foreign nationals at baseline (following Altonji and Card [1991]; Card [2001]):

\[
\Delta m_{r,93} = \frac{\sum_o s_{or,80} (n_{o,93} - n_{o,88})}{n_{r,88}},
\]

where \(n_{o,93} - n_{o,88}\) is the change between 1988 and 1993 in the number of migrant workers of nationality \(o\) at the national level, \(s_{or,80} = \frac{n_{or,80}}{n_{o,80}}\) is the share of migrants of nationality \(o\) located in region \(r\) in 1980, and the denominator \(n_{r,88}\) is employment in region \(r\) in the base year 1988.\footnote{The use of past immigrant shares in 1980 reduces potential bias from serial correlation in demand shocks, but the results remain similar when measuring the local shares \(s_{o}\) in other pre-treatment years or when using external statistics based on full-count employment data to construct the local shares (the latter addressing the potential influence of sampling error; see Aydemir and Borjas [2011]).} As with all shift-share instruments, identification may be motivated by exogeneity of the initial local nationality shares to omitted shocks (Goldsmith-Pinkham, Sorkin and Swift, 2020), or by exogenous aggregate-level (nationality-specific) migrant inflows (Borusyak, Hull and Jaravel, 2018).

Based on the BHP, Figure 2 plots the distribution of both the predicted change in the foreign share \(\Delta m_{r,93}\) and the actual change across 204 local labor market regions in Germany. Sub-figure (a) shows that immigrant arrivals are predicted to be concentrated in and around the largest cities (Hamburg, Cologne, Frankfurt, Munich and Stuttgart), but also in some other, less densely populated areas. The correlation between the past settlement instrument and population or economic density is a potential issue for our empirical strategy, which we discuss in the next section.\footnote{Similar issues apply to most other migration studies. For example, metropolitan areas in the US have experienced much greater migrant inflows than rural areas (Albert and Monras 2018).} Sub-figure (b) plots the actual change in foreign share. The actual and predicted change are highly correlated, as illustrated in sub-figure (a) of Figure 3.

As shown in Figure 3(b), this “first-stage” relation is even more pronounced when using the SIAB to construct immigrant arrival rates to capture the share of recently arrived immigrant workers rather than the change in migrant stocks. From the perspective of our

\[
\Delta m_{r,93} = \frac{\sum_o s_{or,80} (n_{o,93} - n_{o,88})}{n_{r,88}},
\]
model, these recent arrivals are likely to play a crucial role in any adverse wage-setting effects: based on the observable wage differentials in Table 1, they may have significantly lower reservation wages than natives or previous migrants. However, the change in stocks can be observed in both SIAB and BHP, while recent migrants can be identified only in the SIAB. We therefore use the predicted change in foreign share $\Delta m_{r93}$ as our instrument (and as our main explanatory variable, as we focus on reduced form estimates in this draft).

While the actual and predicted changes are highly correlated, two major exceptions are visible from a comparison of the two maps (Figure 2). First, the foreign share increases strongly close to the Czech border (in the South-East), in sharp contrast to the predictions based on the past settlement instrument. As described in Moritz (2011) and Dustmann, Schoenberg and Stuhler (2017), this strong inflow was caused by a special commuting policy.
Figure 3: First Stage

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

Notes: Sub-figure (a) plots the change in foreign share in each local labor market between 1988 and 1993 against the predicted share defined in (13) in the Establishment History Panel (BHP). Sub-figure (b) plots the foreign arrival rate between 1989-1993 against the corresponding predicted arrival rate in the Sample of Integrated Labour Market Biographies (SIAB). The size of each circle is proportional to total employment in 1988.

applying to Germany’s border regions, which allowed Czech workers to commute into the German labor market (but not to live in Germany). This pattern is illustrated further in Figure 4(a), which plots the prediction errors from the first stage regression against the past settlement instrument. The most extreme under-predictions are in regions close to the German-Czech border, which are marked red and labelled by their distance from the border (in km).

Second, very few foreign workers settle close to the inner German border (i.e. separating East from West Germany): while the past settlement instrument predicts an increase in the foreign share of 2 or 3 percentage points, the actual increase is close to zero. This pattern is illustrated further in sub-figure (b) of Figure 4, in which West German labor markets close to the inner German border are marked with their distance to that border (the change in foreign share is underpredicted in most of these regions). The likely cause is large labor inflows (both migrants and commuters) from East Germany to the West following reunification in 1990: we believe new foreign arrivals avoided these border regions to escape labor market competition with East Germans. We provide further evidence on this interpretation in the next section.
3.4 Potential confounders

Our setting offers important advantages: the external determinants of immigrant inflows (triggered by external events), their large size and spatial dispersion, their sharp onset, the stable pre-period in which foreign shares remained steady (allowing for a clean distinction into pre- and post-treatment periods), and the availability of high-quality panel data on both individual workers and establishments. However, Germany was subject to two other major events in our analysis period, which may confound our estimates: (i) German reunification and the accompanying inflow of East Germans into the Western labor market, and (ii) the repatriation of ethnic Germans from territories of the former Soviet Union (Glitz, 2012). Both East and Ethnic Germans had German citizenship, making it harder to identify these groups in our data.

Apart from these two specific issues, our empirical strategy is subject to a more general issue that arises in most studies of the labor market impact of migration. Migrant stocks are not randomly distributed, but correlated with local economic conditions which might be predictive of future economic trends. In particular, immigration is typically higher in dense
urban than in rural areas, which also applies to our setting here. A particular concern in our setting is the 1993 economic recession, which led to differential effects across industries and, potentially, regions.

3.4.1 Reunification and inflows from East Germany

German reunification led to a substantial inflow of East Germans to West German labor markets. While East Germans are not separately identified in the SIAB, we augment our employment data with information on internal population movements provided by the German Federal Statistical Office. These data contain detailed information on movements between districts in Germany for each year between 1991 and 1995, making it possible to identify East German population flows for each West German district or local labor market. Figure 5(a) plots these inflows as a share of population in 1988 against the local labor market’s distance to the former inner German border. The figure illustrates that distance is the primary determinant of the location choice of East German arrivals, with a correlation between their inflow rate and log distance of -0.67.\(^{16}\)

Figure 5(b) compares the size of East German and foreign inflows across local labor markets. Two observations stand out. First, foreign inflows are much more variable across regions than East German inflows. While the latter are a relatively smooth function of the distance to the inner German border, foreign inflows are highly variable and not very correlated with distance to that border. Foreign inflows are particularly low along a narrow corridor right at the former border, which was exposed to very large inflows, including commuting flows, from East Germany. Table 3 provides additional evidence. As shown in Columns (1)-(2), the East German inflow rate is negatively correlated with the actual change in foreign shares across local labor markets – consistent with the pattern observed in Figure 5b. However, this correlation is small, and becomes negligible when controlling for distance to the inner German border. Columns (3) and (4) confirm a similar pattern when considering the predicted change in the foreign share, as defined in (13), rather than the actual change. Moreover, we find a similar pattern when measuring employment rather than population inflows in the SIAB.\(^{17}\)

\(^{16}\)This result is in line with a similar analysis in Bruns and Priesack (2019), who show that distance to the Eastern German border (vs. inner German border) predicts the change in the share of East German immigrants in West German regions in the SIAB (as well as in the German Mikrozensus). Figure 5 shows that East German inflows are particularly high within an 80km strip from the former inner German border, which is indeed the range that Bruns and Priesack (2019) drop to confirm robustness of their main results.

\(^{17}\)In a robustness test, we identify as East German those workers whose first employment spell in the SIAB was located in an East German district. This definition is not very reliable, since the SIAB covers East
Figure 5: Comparing East German and Foreign Inflows

(a) East German Inflows

(b) East German and Foreign Inflows

Notes: Sample of Integrated Labour Market Biographies (SIAB). Sub-figure (a) plots the inflow rate of East Germans between 1991 and 1993 across local labor markets in West Germany against the distance to the inner German border. Sub-figure (b) plots the inflow rate of East Germans together with the inflow rate of foreign arrivals between 1989 and 1993.

Table 3: East German vs. Foreign Inflows

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>△ foreign share 1988-93</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>actual</td>
<td>-0.041</td>
<td>0.013</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.021)</td>
<td>(0.018)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>predicted</td>
<td></td>
<td></td>
<td>-0.049*</td>
<td>0.023</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.025)</td>
<td>(0.022)</td>
</tr>
<tr>
<td>Distance E./W.</td>
<td></td>
<td>-0.004***</td>
<td></td>
<td>-0.004***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.000)</td>
<td></td>
<td>(0.000)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.010***</td>
<td>0.028***</td>
<td>0.010***</td>
<td>0.028***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.002)</td>
<td>(0.001)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>r2</td>
<td>0.024</td>
<td>0.460</td>
<td>0.032</td>
<td>0.464</td>
</tr>
<tr>
<td>N</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>204</td>
</tr>
</tbody>
</table>

* p<0.10, ** p<0.05, *** p<0.01

Notes: Sample of Integrated Labour Market Biographies (SIAB), regression estimates across 204 local labor markets. The predicted change in foreign share is defined in 13. Distance E./W. is the log distance to the inner German border.

To address the small negative correlation between East German and foreign inflows, we

German employment only from 1992 onwards. We nevertheless find that this employment-based definition of East German inflows is highly correlated with population inflows from external sources.
Table 4: Ethnic German (Aussiedler) vs. Foreign Inflows

<table>
<thead>
<tr>
<th>Change in Aussiedler share 1988-93</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual △ foreign share 1988-93</td>
<td>-0.116</td>
<td>-0.125</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.076)</td>
<td>(0.076)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Predicted △ foreign share 1988-93</td>
<td>-0.155</td>
<td>-0.177*</td>
<td>(0.079)</td>
<td>(0.081)</td>
</tr>
<tr>
<td>Distance E./W.</td>
<td>0.001</td>
<td></td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td></td>
<td>(0.001)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.021***</td>
<td>0.017**</td>
<td>0.022***</td>
<td>0.016**</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.006)</td>
<td>(0.002)</td>
<td>(0.006)</td>
</tr>
<tr>
<td>r2</td>
<td>0.025</td>
<td>0.026</td>
<td>0.041</td>
<td>0.046</td>
</tr>
<tr>
<td>N</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>204</td>
</tr>
</tbody>
</table>

* p<0.10, ** p<0.05, *** p<0.01

Notes: Sample of Integrated Labour Market Biographies (SIAB), regression estimates across 204 local labor markets. The predicted change in foreign share is defined in 13. Distance E./W. is the log distance to the inner German border.

control for the log distance to the inner German border in all regressions. This control will also capture other distance-related consequences of German reunification, such as trade or structural changes in the spatial distribution of economic activity (due to market access or policy changes).

3.4.2 Repatriation of ethnic Germans

A second potential issue relates to the repatriation of ethnic Germans during our analysis period. After the end of World War II, about 15 million Germans fled from former territories of the German Reich. While most moved to Germany in the immediate postwar years, some remained in various regions outside Germany that subsequently became part of the Eastern Bloc. With the lifting of travel restrictions after the end of the Cold War, many of these ethnic Germans and their descendants returned to Germany. In 1990, nearly 400,000 individuals, mainly from the former Soviet Union, Poland, and Romania, arrived in Germany, reducing to 225,000 per year over the following years (Glitz, 2012).

The concern is that the spatial distribution of these newly arrived ethnic Germans (Spätaussiedler) might correlate with the distribution of foreign nationals as captured by our analysis. Though the government did work to ensure an equal distribution of ethnic Germans across the country (relative to local population), these efforts were ineffective until 1996 when restrictions were tightened (Glitz, 2012). To study their distribution, we follow...
Brücker and Jahn (2011) and Bruns and Priesack (2019) in exploiting administrative information contained in SIAB on the receipt of special language courses and other integration programs that were specially reserved for ethnic Germans.\footnote{Attendance in these courses correspond to specific values in the variables \textit{Leistungsart} contained in SIAB; see Brücker and Jahn (2011) and Bruns and Priesack (2019) for details.} Using this information, we construct the change in the share of ethnic Germans between 1988 and 1993 for each local labor market, and relate this change to the corresponding change in the foreign share. Table 4 reports the results, following the same structure as Table 3. We find that the inflow rate of Ethnic Germans is negatively correlated with both the actual change (columns 1-2) and the predicted change in foreign shares (columns 3-4), irrespective of whether we control for the distance to the inner German border. However, this relationship is weak, with less than 5% of the spatial variation in ethnic shares explained by foreign shares, and negligible in size compared to the overall displacement effects on native workers that we document below. Moreover, this negative relation can be interpreted as part of the impact we aim to capture, as ethnic Germans (like the native-born population) had an incentive to avoid those local labor markets that were more heavily exposed to foreign inflows (and vice versa).

### 3.4.3 Density and the 1993 recession

Finally, we are concerned that the (predicted) increase in foreign shares is greater in metropolitan as compared to less densely populated areas. This association is visible in Figure 2 and confirmed by a regression of the predicted change in foreign share $\Delta m_{t,93}$ on various local characteristics at baseline. While our empirical strategy abstracts from time-constant differences between regions, the concern is that differences in economic density are also predictive of future economic trends. To probe the sensitivity of our results to this issue, we also report regression estimates that condition on the density of each local labor market (defined as employment/area) in 1980. As we show below, the impact of the settlement instrument on changes in foreign employment shares, wages, firm size and employment rates are quite robust to this control, while effects on population and employment levels prove to be more sensitive.

A related issue is the 1993 recession, which led to large employment losses in manufacturing and smaller losses in other sectors. The timing of this recession is a concern, as it occurs shortly after the immigrant inflow reached its peak in 1991. To understand the potential effect of this recession on our estimates, we probed their sensitivity to the inclusion of Bartik (1991) shocks, which control for industry-specific demand shocks by interacting
Table 5: Descriptive Statistics (in 1988)

<table>
<thead>
<tr>
<th></th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establishments (#)</td>
<td>162,604</td>
<td>162,804</td>
<td>162,724</td>
<td>162,830</td>
</tr>
<tr>
<td>Median wage (log)</td>
<td>3.00</td>
<td>3.61</td>
<td>3.89</td>
<td>4.19</td>
</tr>
<tr>
<td>Employment in quartile</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment</td>
<td>478,111</td>
<td>1,119,9234</td>
<td>2,710,077</td>
<td>5,458,870</td>
</tr>
<tr>
<td>Skill shares</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low skilled</td>
<td>0.301</td>
<td>0.296</td>
<td>0.292</td>
<td>0.218</td>
</tr>
<tr>
<td>Medium skilled</td>
<td>0.567</td>
<td>0.613</td>
<td>0.626</td>
<td>0.661</td>
</tr>
<tr>
<td>High skilled</td>
<td>0.009</td>
<td>0.013</td>
<td>0.025</td>
<td>0.080</td>
</tr>
<tr>
<td>Establishment size</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean (firm-weighted)</td>
<td>2.9</td>
<td>7.4</td>
<td>16.7</td>
<td>33.5</td>
</tr>
<tr>
<td>mean (worker-weighted)</td>
<td>16.1</td>
<td>75.1</td>
<td>391.5</td>
<td>2141.0</td>
</tr>
<tr>
<td>share small (emp&lt;5)</td>
<td>0.852</td>
<td>0.646</td>
<td>0.466</td>
<td>0.415</td>
</tr>
<tr>
<td>share medium</td>
<td>0.147</td>
<td>0.347</td>
<td>0.508</td>
<td>0.530</td>
</tr>
<tr>
<td>share large (emp&gt;=100)</td>
<td>0.000</td>
<td>0.008</td>
<td>0.025</td>
<td>0.054</td>
</tr>
<tr>
<td>Share foreigners</td>
<td>0.089</td>
<td>0.072</td>
<td>0.079</td>
<td>0.068</td>
</tr>
</tbody>
</table>

Notes: Establishment History Panel in 1988, by quartiles of the median establishment wage (within local labor market and year). Skill shares are worker-weighted.

the pre-treatment industrial composition of each local labor market with industry-specific trends in employment on the national level. Our results generally remain robust, suggesting that distributional effects related to the 1993 recession do not affect the internal validity of our estimates.

4 Impact on firm-level outcomes

We next study the impact of migration across the distribution of firms, using the Establishment History Panel (BHP). As described in Section 3.1, the data covers half of the universe of all establishments subject to social security contributions.

To assess the impact of migration across the distribution of firms, we split establishments into four quartiles according to their median wage, separately for each region and year. Table 5 provides summary statistics for the year 1988 (pre-treatment). Wage levels differ substantially across quartiles: establishments in the bottom quartile pay 61 log points less than those in the second quartile, and 119 less than those at the top. Moreover, low-paying establishments tend to be smaller: the mean establishment size is just 2.9 workers in the bottom quartile compared to 33.5 workers at the top. Accordingly, the top quartile
accounts for 55% of all employment. This difference in firm size is consistent with standard monopsony models: firms which offer higher wages recruit more workers. Low-paying firms employ relatively more low skilled workers and fewer foreigners, but the differences are not very pronounced. The exception is the share of high-skilled workers, which is below 1% in low-pay compared to 8% in high-pay establishments.

4.1 Empirical strategy

Our empirical strategy exploits variation in immigrant arrivals across regions (spatial approach). Our baseline evidence is based on 204 local labor market regions (Arbeitsmarktre- gion) in West Germany. As an alternative specification, we consider finer variation across 326 districts (Landkreise and kreisfreie Städte), with similar results. We implement a generalized difference-in-differences model allowing for dynamic treatment effects, estimating separately for each year \( t \in \{1984, ..., 1998\} \):

\[
\Delta y_{rgt} = \alpha_{gt} + \beta_{gt} \Delta m_{r93} + \gamma_{gt} X_r + \varepsilon_{rgt}
\]

where \( \Delta y_{rgt} = y_{rgt} - y_{rg88} \) is the change in regional outcome such as wages or employment in region \( r \) for group \( g \) between year \( t \) and base year 1988, \( X_{r88} \) is a vector of region \( r \) controls, and \( \Delta m_{r93} \) is the predicted change in the foreign share between 1988 (just before migrant share begins to expand) and 1993 (when it stabilizes) as defined in equation (13) (see also Figure 1). We use \( \Delta m_{r93} \) as our main explanatory variable rather than as instrumental variable, such that the coefficients \( \beta_{gt} \) represent reduced-form rather than two-stage least square estimates.

As equation (14) is expressed in differences, we implicitly control for pre-treatment differences in the level of outcome \( y \) across regions (region fixed effects). To control for East-West migration flows related to German reunification, all regressions include region’s log distance to the inner German border as a control in the \( X_r \) vector (see Section 3.4.1). Our baseline (“raw”) specification contains no further controls. Motivated by the observation that foreign shares increase more strongly in dense metropolitan areas (see Figure 2), we present robustness tests that control for log density (employment in 1980/area) or industry-level demand shocks (Bartik shocks).

We estimate equation (14) separately for each year \( t \). For the post-treatment years \( t > 1988 \), the coefficients \( \beta_t \) represent the dynamic reduced-form impact of the predicted change in migration shares on outcome \( y \) in year \( t \). For the pre-treatment years \( t < 1988 \),
the coefficients $\beta_t$ represent falsification tests on the existence of pre-trends and the validity of our research design. These tests are informative in our setting, as the sudden and unexpected onset of the migration shock allows for a sharp distinction between pre- and post-treatment periods. The sharp increase in migration flows further implies that our estimates are not subject to dynamic spillovers from earlier migration shocks, which complicate the interpretation of spatial estimates in other settings (Amior and Manning 2018; Jaeger, Ruist and Stuhler 2018).

4.2 Estimation results

In this section, we estimate the labor market impact of migration across the firm distribution, exploiting spatial variation in line with our estimating equation (14). Our aim is to test Propositions 1-4 in Section 2.2. We begin by studying the variation in immigration across the distribution of firms.

4.2.1 Changes in foreign share

Figures (6) and (7) plot estimates of $\beta_{gt}$ based on equation (14), regressing the change in the regional foreign share on the past settlement instrument as defined in (13). The instrument does not predict the change in the local foreign share in the pre-treatment years between 1984 and 1988. Starting from 1989, the foreign share in exposed local labor markets starts rising until 1993, when the coefficient estimates stabilize at around 0.3. This relation becomes more pronounced when controlling for the density of local labor markets. The increase in the foreign share is most pronounced in 1991 and 1992 in either specification.

We next estimate the impact of the settlement instrument on foreign shares separately for each quartile of the firm-wage distribution (corresponding to groups $g$) using equation (14). As shown in Figure (7), the foreign share increased dramatically in low-wage firms but hardly changed in higher-paying firms. This finding is consistent with Proposition 1: *migrants concentrate in low-paying firms.*

This result is consistent with existing studies which show that a large part of native-migrant wage disparities can be explained by firm fixed effects: see e.g. Aydemir and Skuterud (2008); Dustmann, Ku and Surovtseva (2019); Arellano-Bover and San (2020); Dostie et al. (2020). Our model rationalizes this result by migrants having low reservation

\[^{19}\text{This evidence corresponds to the first stage of an instrumental variable estimator. We present reduced-form estimates below.}\]
Figure 6: Impact on foreign share

![Graph showing the impact on foreign share over years]

Notes: Establishment History Panel. Regression estimates based on equation (14) across 204 local labor markets. The dependent variable is the change in the local foreign share relative to 1988.

wages. This is key to understanding the wage-setting response of firms and the implications for native employment.

Table 6 reports the regression estimates corresponding to Figures 6 and 7 for changes in foreign share between 1988 and 1993. The past settlement instrument is a strong and highly significant predictor of the change in immigration shares across regions, explaining more than 40 percent of the spatial variation. We can use these first-stage estimates between predicted and actual migrant shares to scale the reduced-form estimates below.

4.2.2 Effect on firm wages

We next estimate the impact of migration on wages across the firm distribution, using equation (14). Specifically, our outcome $y_{rgt}$ is the mean of log median establishment wages in area $r$ and quartile $g$. As already mentioned, we report reduced-form rather than 2SLS estimates. Figure (8) plots the results. We observe a large contraction of firms’ wages in the bottom quartile of the firm wage distribution, and a milder effect in the second quartile; but there is no effect on high-wage firms. These effects are precisely estimated and consistent with Proposition 2: A larger migrant share induces firms to reduce offers at the bottom of
Figure 7: Impact on foreign share by firm wage quartile

Notes: Establishment History Panel. Regression estimates based on equation (14) across 204 local labor markets. The dependent variable is the change in the local foreign share relative to 1988. Quartiles are based on the distribution of median establishment wages by region and year.

The distribution.

To assess the size of these reduced-form estimates, we can scale them by the first-stage relation. Focusing on the bottom quartile, the reduced-form wage effect reaches -1.8 by 1995, which compares to a 0.3 increase in foreign share (Figure 6): i.e. a 1 pp. expansion of local migrant share decreases the median wage in low-wage firms by about 6%. Migrant share
Table 6: Predicting the change in foreign share

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>raw</td>
<td>dens</td>
<td>raw</td>
<td>raw</td>
<td>raw</td>
</tr>
<tr>
<td>Predicted change</td>
<td>0.293***</td>
<td>0.376***</td>
<td>1.528***</td>
<td>1.356***</td>
<td>0.312**</td>
</tr>
<tr>
<td>(Distance E.-W. (log))</td>
<td>(0.046)</td>
<td>(0.058)</td>
<td>(0.152)</td>
<td>(0.252)</td>
<td>(0.111)</td>
</tr>
<tr>
<td>Density (log)</td>
<td>0.008***</td>
<td>0.008***</td>
<td>0.020***</td>
<td>0.011***</td>
<td>0.009***</td>
</tr>
<tr>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.004)</td>
<td>(0.003)</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Regions</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>204</td>
</tr>
<tr>
<td>R-sq</td>
<td>0.426</td>
<td>0.447</td>
<td>0.548</td>
<td>0.525</td>
<td>0.259</td>
</tr>
</tbody>
</table>

Notes: Establishment History Panel, regression estimates based on equation (14). The predicted change in foreign share is defined in equation (13). Distance E.-W. defined as the region’s log distance to the inner German border. Density defined as log(employment/area).

increased by more than 2 pp. on average (see Figure [1]), which implies the immigration shock induced a wage contraction of 12% in low-wage firms on average (and an even larger contraction in high-migration regions).

These impacts are very large compared to more modest or even zero wage impacts that are typically found in the migration literature. But, it should be emphasized that bottom-quartile firms employ only a small fraction of the workforce (see Table 5). That is, the wage impact is heavily concentrated in a small corner of the labor market, which only becomes apparent when estimating effects along the distribution of firms. This interpretation is also consistent with our earlier finding that immigrant arrivals are heavily concentrated in low-wage firms, as shown in Figure [7]. The unequal effects of immigration across the firm wage distribution also relates to findings by Dustmann, Frattini and Preston (2012), who find that the wage effects of migration (in the UK) are most negative among the lowest-paid workers (specifically, the bottom decile).

Table [7] describes the estimated wage effects in greater detail. The top panel reports firm-weighted estimates from the BHP, while the bottom panel reports worker-weighted estimates from the SIAB. The first row reports the quartile-specific estimates of Figure 8, but also the overall change in firm-level wages in the entire sample. This overall effect is strongly negative and remains significant at the 5% level when controlling for density at baseline or pre-trends. The next two rows decompose the wage effect into adjustments within and

---

20 As shown in Figure 7, the increase in the foreign share in bottom-quartile establishments is approximately 5 times larger than the average increase in the labor market. This suggests that a 1 pp. increase in foreign share in bottom-quartile firms reduces wages by approximately 1.2 percent.

21 We control for pre-trends by including the 1984-88 trend in the local labor market as an additional
Figure 8: Firm wage effects by quartile

Notes: Establishment History Panel, regression estimates based on equation (14) across 204 local labor markets. The dependent variable is the mean change of establishment median wages between period $t$ and the base year 1988.

between industries, showing that the decline in establishment wages occurs primarily within industry, consistent with the mechanisms highlighted by our model. We observe significant wage declines in both tradable and non-tradable industries, consistent with the foreign share increasing significantly in both sectors.
Table 7: Firm wage effects (1988-95)

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>raw</td>
<td>dens</td>
<td>trend-adj.</td>
<td>raw</td>
<td>raw</td>
</tr>
<tr>
<td>Firm wage (BHP)</td>
<td>-0.753***</td>
<td>-0.414*</td>
<td>-0.731***</td>
<td>-1.866***</td>
<td>-0.813***</td>
</tr>
<tr>
<td></td>
<td>(0.167)</td>
<td>(0.174)</td>
<td>(0.159)</td>
<td>(0.253)</td>
<td>(0.165)</td>
</tr>
<tr>
<td>within industry</td>
<td>-0.640***</td>
<td>-0.401**</td>
<td>-0.645***</td>
<td>-1.871***</td>
<td>-0.782***</td>
</tr>
<tr>
<td></td>
<td>(0.127)</td>
<td>(0.129)</td>
<td>(0.125)</td>
<td>(0.228)</td>
<td>(0.102)</td>
</tr>
<tr>
<td>between industry</td>
<td>0.029</td>
<td>0.005</td>
<td>0.028</td>
<td>-0.097</td>
<td>-0.025</td>
</tr>
<tr>
<td></td>
<td>(0.038)</td>
<td>(0.043)</td>
<td>(0.043)</td>
<td>(0.088)</td>
<td>(0.087)</td>
</tr>
<tr>
<td>tradable</td>
<td>-0.724**</td>
<td>-0.516*</td>
<td>-0.735***</td>
<td>-1.809***</td>
<td>-0.913***</td>
</tr>
<tr>
<td></td>
<td>(0.222)</td>
<td>(0.248)</td>
<td>(0.218)</td>
<td>(0.388)</td>
<td>(0.176)</td>
</tr>
<tr>
<td>non-tradable</td>
<td>-0.551***</td>
<td>-0.360*</td>
<td>-0.551***</td>
<td>-1.953***</td>
<td>-0.776***</td>
</tr>
<tr>
<td></td>
<td>(0.150)</td>
<td>(0.168)</td>
<td>(0.151)</td>
<td>(0.261)</td>
<td>(0.164)</td>
</tr>
<tr>
<td>native</td>
<td>-0.393*</td>
<td>-0.060</td>
<td>-0.370*</td>
<td>-1.668***</td>
<td>-0.624***</td>
</tr>
<tr>
<td></td>
<td>(0.177)</td>
<td>(0.182)</td>
<td>(0.165)</td>
<td>(0.217)</td>
<td>(0.177)</td>
</tr>
<tr>
<td>low skilled</td>
<td>-0.992***</td>
<td>-0.550*</td>
<td>-1.014***</td>
<td>-1.729***</td>
<td>-0.496</td>
</tr>
<tr>
<td></td>
<td>(0.212)</td>
<td>(0.224)</td>
<td>(0.219)</td>
<td>(0.252)</td>
<td>(0.272)</td>
</tr>
<tr>
<td>medium skilled</td>
<td>-0.519**</td>
<td>-0.396</td>
<td>-0.524**</td>
<td>-1.743***</td>
<td>-0.669***</td>
</tr>
<tr>
<td></td>
<td>(0.184)</td>
<td>(0.222)</td>
<td>(0.181)</td>
<td>(0.237)</td>
<td>(0.152)</td>
</tr>
<tr>
<td>exclude small firms</td>
<td>-0.547***</td>
<td>-0.361*</td>
<td>-0.581***</td>
<td>-1.819***</td>
<td>-0.843***</td>
</tr>
<tr>
<td></td>
<td>(0.134)</td>
<td>(0.141)</td>
<td>(0.129)</td>
<td>(0.209)</td>
<td>(0.164)</td>
</tr>
<tr>
<td>incumbent firms</td>
<td>-0.622***</td>
<td>-0.510**</td>
<td>-0.618***</td>
<td>-1.584***</td>
<td>-0.750***</td>
</tr>
<tr>
<td></td>
<td>(0.128)</td>
<td>(0.153)</td>
<td>(0.129)</td>
<td>(0.174)</td>
<td>(0.167)</td>
</tr>
<tr>
<td>Individual wage (SIAB)</td>
<td>-1.125***</td>
<td>-0.549*</td>
<td>-1.050***</td>
<td>-2.125**</td>
<td>-2.029***</td>
</tr>
<tr>
<td></td>
<td>(0.211)</td>
<td>(0.275)</td>
<td>(0.208)</td>
<td>(0.739)</td>
<td>(0.574)</td>
</tr>
<tr>
<td>natives</td>
<td>-0.607**</td>
<td>-0.122</td>
<td>-0.547*</td>
<td>-1.964**</td>
<td>-1.394**</td>
</tr>
<tr>
<td></td>
<td>(0.228)</td>
<td>(0.294)</td>
<td>(0.221)</td>
<td>(0.725)</td>
<td>(0.533)</td>
</tr>
<tr>
<td>natives, w/ FEs</td>
<td>-1.224***</td>
<td>-0.817***</td>
<td>-1.170***</td>
<td>-3.240***</td>
<td>-1.839***</td>
</tr>
<tr>
<td></td>
<td>(0.141)</td>
<td>(0.190)</td>
<td>(0.143)</td>
<td>(0.497)</td>
<td>(0.301)</td>
</tr>
</tbody>
</table>

Notes: Regression estimates based on equation (14) across 204 local labor markets. Top panel: Dependent variable is the firm-weighted mean change of establishment median log wages between 1988 and 1995 (BHP). Bottom panel: Dependent variable is the mean change in individual log wages in the region between 1988 and 1995 (raw wages or net of individual fixed effects).

The fifth row considers the effects on the median firm wage for natives. Within quartiles, the estimated effect on the median wage of natives is nearly as negative as the effect on the median wage across all workers in the firm. This observation confirms that changes in the wage distribution are not a mechanical consequence of the foreign arrivals themselves earning low wages, but due to changes in the overall distribution that also affects native workers. This estimated impact on the distribution of native wages is shown in greater detail in Figure 22.

22 The BHP contains separate information on the median wage of all full-time workers and the median wage of native workers.
While the estimated effect within quartiles is similar irrespective of whether we consider all workers or only natives (columns 4-7), the estimated effect on natives overall (columns 1-3) is lower. A similar pattern emerges when considering the median wage of low and medium skilled workers: the estimated wage impacts within quartile are always similar, but the overall effect is more negative for low skilled workers. The likely explanation is that native and skilled workers are less likely to locate in the bottom quartile of the wage distribution, and are therefore less exposed to the quartile-specific shifts than other workers. In the final two rows of the top panel, we consider different sets of firms to probe the robustness of our results. When excluding small firms with less than five workers (in every annual cross-section) or focusing on incumbent establishments that existed in both 1988 (our base year) and 1995, we find similar or slightly less negative effects.

In the bottom panel of Table 7, we study the effect on the worker-weighted native wage by averaging individual-level wages from the SIAB across all full-time workers (in the respective quartiles of the firm wage distribution). It should be emphasized that the wage definitions in the two panels of Table 7 are not comparable: in the BHP, we only observe the median wage in firms; whereas our SIAB estimates are based on regional means. Nevertheless, the estimated effects are comparable in size across the two panels. Importantly, as the SIAB tracks workers over time, we can control for potential skill differences between workers by residualizing wages against individual fixed effects before collapsing them on the region × year level. We find a substantially more negative wage effect in these residualized wages net of individual fixed effects, consistent with evidence that naive comparisons of means in cross-sectional data understate the wage impact of migration because of selective employment responses along the wage distribution (Bratsberg and Raaum 2012; Dustmann, Schoenberg and Stuhler 2017; Ortega and Verdugo 2021; Borjas and Edo 2021). We next show that the employment effect of migration is also very unequal across the distribution of firms.

4.2.3 Effect on native and total employment

How did migration affect the employment of native workers and their allocation across firms?

To address this question, we estimate equation (14) using the change in log native employ-

---

23 As described in Section 3.1, we merge firm wages from the BHP to individual records in the SIAB to construct (firm-weighted) quartiles of the establishment wage distribution. The definition of quartiles are therefore comparable in the top and bottom panel of Table 7.

24 If the negative wage effects of immigration are concentrated in the lower parts of the individual wage distribution (as in Dustmann, Frattini and Preston 2012), we should expect a more negative response in the mean than the median wage.
ment as the dependent variable. Figure (9) plots our estimates across quartiles of the establishment wage distribution. We find a large and rapid reduction in native employment in low-wage firms, with a predicted 1 pp. increase in the regional foreign share reducing native employment by about 2% after three years, and further reductions in subsequent years. We observe similarly large native employment losses in the second quartile, mild employment losses in the third, and small or zero employment losses in the top quartile. These observations are in line with Proposition 3: A larger migrant share induces firms to shed native employment at the bottom of the distribution. Intuitively, firms willingly forego native labor to secure migrant employment at low wages.

Though the native employment effects in Figure (9) are concentrated at the bottom of the firm distribution, this concentration is not as extreme as for the wage effects (Figure (8)). For example, we do see significant native employment effects in the third quartile, but no wage effects. Though this is inconsistent with the basic version of the model (which predicts the wage and native employment effects should perfectly coincide), it can be rationalized by the “native exit” extension in Section 2.3. Intuitively, the reduction of wage offers (at the bottom of the distribution) induces natives to exit the labor force or relocate elsewhere; and this progressively causes the supply of natives to dry up further up the firm distribution, even with no change in wage offers. Indeed, the timing of the effects in Figure (9) is remarkably consistent with this story: native employment contracts immediately in Q1, but only later on in higher quartiles. This insight also supports our interpretation of the firm quartiles: they do not represent entirely distinct (skill-defined) labor markets, but rather (at least to some extent) differential wage offers facing similarly skilled workers.

In Figure 7 we now turn to the net effect of migration on total employment: this is a function of both the sharp increase in foreign employment (Figure 7) and the reduction in native employment (Figure (9)). According to Proposition 4, the latter “wage-setting effect” may in principle dominate: a larger migrant share may induce firms to reduce their employment overall. And indeed, this is what Figure (10) shows: the total employment effect is negative or close to zero in all four quartiles. Crucially, this cannot be explained by the standard competitive model, where a reduction in firm wages must necessarily be accompanied an expansion of total employment (to ensure a reduction in labor’s marginal product).

The magnitude of employment displacement in this setting is unusual in the literature. However, it is not unique: Dustmann, Schoenberg and Stuhler (2017) find that Czech commuters working in Germany (in the same period) also induce a large displacement effect.
Figure 9: Log native employment effects by quartile

Notes: Establishment History Panel, regression estimates based on equation (14) across 204 local labor markets. The dependent variable is the mean change of log native employment between period $t$ and the base year 1988.

Our model predicts that such effects ultimately depend on how migrants’ reservation wages compare to natives’; and this will vary substantially by context.

Table (8) provides more details on the employment and population effects overall and by quartile. The Q4 employment effects are sensitive to the density control (see also Figure 9); and this is reflected in the overall employment effects in columns 1-2 (since Q4 accounts for

36
Figure 10: Log total employment effects by quartile

Notes: Establishment History Panel, regression estimates based on equation (14) across 204 local labor markets. The dependent variable is the mean change of log total employment between period $t$ and the base year 1988.

more than half of employment). The same applies to the population effect (third row): while the raw estimates suggest that population declined in response to migration, the estimated impact becomes positive when controlling for the region’s density at baseline. However, the employment rate effects (log employment net of log population) are very stable across specifications (fourth row), as the inclusion of the density control affects the total employment
Table 8: Employment effects (1988-95)

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>raw</td>
<td>dens</td>
<td>trend-adj.</td>
<td>raw</td>
<td>raw</td>
</tr>
<tr>
<td>Native employment (log)</td>
<td>-2.228***</td>
<td>-1.044*</td>
<td>-2.569***</td>
<td>-2.806***</td>
<td>-3.534***</td>
</tr>
<tr>
<td></td>
<td>(0.327)</td>
<td>(0.420)</td>
<td>(0.282)</td>
<td>(0.591)</td>
<td>(0.550)</td>
</tr>
<tr>
<td>Total employment (log)</td>
<td>-1.821***</td>
<td>-0.538</td>
<td>-2.110***</td>
<td>-0.267</td>
<td>-1.646**</td>
</tr>
<tr>
<td></td>
<td>(0.328)</td>
<td>(0.419)</td>
<td>(0.274)</td>
<td>(0.635)</td>
<td>(0.535)</td>
</tr>
<tr>
<td>Population (log)</td>
<td>-0.553***</td>
<td>0.582**</td>
<td>-0.549***</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>(0.144)</td>
<td>(0.213)</td>
<td>(0.146)</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Employment rate (log)</td>
<td>-1.268***</td>
<td>-1.120**</td>
<td>-1.334***</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>(0.296)</td>
<td>(0.395)</td>
<td>(0.308)</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Numer of firms (log)</td>
<td>0.013</td>
<td>0.184</td>
<td>-0.272</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>(0.164)</td>
<td>(0.213)</td>
<td>(0.176)</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Notes: Establishment History Panel, regression estimates based on equation (14) across 204 local labor markets.

and population effects similarly. We find a very strong reduction in the employment rate in regions exposed to a greater increase in migrant share. Finally, the last row shows that the number of establishments does not increase in response to migration: indeed, taking into account a positive pre-trend in firm creation in regions exposed to migration, we find a small negative effect on the number of firms.

4.2.4 Effect on firm size

Table (8) shows that while total employment contracts, the stock of firms changes little. This implies a reduction in firm size, and this is indeed what we see. Table (9) reports coefficient estimates from equation (14), where the dependent variable is now changes in the relative share of establishments of the indicated size between 1988 and 1995. As in all other regressions, we and control for a region’s distance to the inner German border. In regions more heavily exposed to migration, we find a strong increase in the share of small establishments (below five workers) and a decrease in the share of larger firms.

Figure (11) presents more comprehensive evidence on the effect of migration on the mean log establishment size. When considering all firms (sub-figure a), the estimated effect is very pronounced in the “raw” specification, but also subject to potential bias from pre-trends. Once we control for density (the blue line), the pre-trend is eliminated; and the negative effect remains significant, though smaller in magnitude. When we drop very small firms (fewer than 5 employees) in sub-figure b, we see a similar negative effect (and no visible pre-trend) irrespective of the density control: a 1 pp. increase in the predicted immigration
Table 9: Establishment size (1988-95)

<table>
<thead>
<tr>
<th>Δ Share of firms with:</th>
<th>1-4</th>
<th>5-19</th>
<th>20-99</th>
<th>100+</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>△ foreign share (predicted)</td>
<td>0.303***</td>
<td>-0.160**</td>
<td>-0.128***</td>
<td>-0.015*</td>
</tr>
<tr>
<td>Controls</td>
<td>Distance</td>
<td>Distance</td>
<td>Distance</td>
<td>Distance</td>
</tr>
<tr>
<td>N</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>204</td>
</tr>
<tr>
<td>R-sq</td>
<td>0.184</td>
<td>0.037</td>
<td>0.188</td>
<td>0.045</td>
</tr>
</tbody>
</table>

Notes: Establishment History Panel, regression estimates based on equation (14) across 204 local labor markets. The dependent variable is the 1988-95 change in the relative share of establishments of the indicated size.

Figure 11: Mean log establishment size

(a) all firms   (b) ≥ 5 employees

Notes: Establishment History Panel, regression estimates based on equation (14) across 204 local labor markets. The dependent variable is the mean change of log establishment employment between period \( t \) and the base year 1988.

shock reduces mean firm size by about 0.5%.

Table 10 provides more detail on this result. The reduction in firm size is particularly pronounced in the third quartile of the wage distribution, but also visible in the second and top quartile. It is larger in the tradable sector, and is usually smaller when considering only incumbent firms rather than all firms in the local labor market. The reduction in firm size is more negative (but also less precise) when considering the log mean rather than mean log firm size.
Table 10: Establishment size effects (in 1995)

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>raw</td>
<td>dens</td>
<td>trend-adj.</td>
<td>raw</td>
<td>raw</td>
</tr>
<tr>
<td>Firm size (mean log)</td>
<td>-0.980***</td>
<td>-0.489**</td>
<td>-0.980***</td>
<td>-0.225</td>
<td>-0.612*</td>
</tr>
<tr>
<td></td>
<td>(0.149)</td>
<td>(0.163)</td>
<td>(0.149)</td>
<td>(0.257)</td>
<td>(0.267)</td>
</tr>
<tr>
<td>tradables</td>
<td>-0.828**</td>
<td>-0.578</td>
<td>-0.804**</td>
<td>0.943</td>
<td>0.216</td>
</tr>
<tr>
<td></td>
<td>(0.271)</td>
<td>(0.324)</td>
<td>(0.295)</td>
<td>(0.609)</td>
<td>(0.502)</td>
</tr>
<tr>
<td>non-tradables</td>
<td>-0.290</td>
<td>-0.153</td>
<td>-0.288</td>
<td>0.122</td>
<td>-0.564*</td>
</tr>
<tr>
<td></td>
<td>(0.162)</td>
<td>(0.209)</td>
<td>(0.164)</td>
<td>(0.230)</td>
<td>(0.278)</td>
</tr>
<tr>
<td>exclude small firms</td>
<td>-0.327**</td>
<td>-0.542***</td>
<td>-0.315**</td>
<td>0.024</td>
<td>-0.124</td>
</tr>
<tr>
<td></td>
<td>(0.115)</td>
<td>(0.123)</td>
<td>(0.119)</td>
<td>(0.403)</td>
<td>(0.254)</td>
</tr>
<tr>
<td>incumbent firms</td>
<td>-0.591***</td>
<td>-0.594*</td>
<td>-0.606***</td>
<td>-0.404</td>
<td>-0.091</td>
</tr>
<tr>
<td></td>
<td>(0.171)</td>
<td>(0.237)</td>
<td>(0.171)</td>
<td>(0.228)</td>
<td>(0.267)</td>
</tr>
<tr>
<td>Firm size (log mean)</td>
<td>-1.834***</td>
<td>-0.722</td>
<td>-1.852***</td>
<td>0.044</td>
<td>-1.350**</td>
</tr>
<tr>
<td></td>
<td>(0.410)</td>
<td>(0.548)</td>
<td>(0.384)</td>
<td>(0.578)</td>
<td>(0.498)</td>
</tr>
</tbody>
</table>

Notes: Establishment History Panel, regression estimates based on equation (14) across 204 local labor markets.

5 US evidence

Above, we have shown the German immigration shock causes a reduction in firm size. This is consistent with a monopsonistic framework where migrants have low reservation wages, but it is difficult to reconcile with a competitive model. We now show these effects are not confined to this particular setting, but rather have broader relevance. To this end, we study spatial variation in immigration across the US between 1980 and 2010. Unlike in the German case, we do not study a one-off immigration event, but instead rely on decadal changes identified by an enclave instrument. There is of course a long-standing literature which exploits this variation to estimate effects on native wage and employment rates: these are mostly (but not universally) found to be small and negative; see e.g. Jaeger, Ruist and Stuhler (2018) for recent evidence and a survey of the literature. Rather than relitigating these debates, we focus here on the impact on firm size: just as in Germany, we show that local increases in migrant share trigger a reduction in mean firm size.

5.1 Empirical specification and data

Similar to equation (14) above, we rely on a “reduced form” specification:

$$\Delta y_{rt} = \alpha_t + \beta \Delta m_{rt}^{US} + \gamma_t X_{rt} + \varepsilon_{rt}$$ (15)
where \( \Delta y_{rt} \) is the change in some outcome of interest in area \( r \), between time \( t - 1 \) and \( t \). Time observations are each a decade apart: 1980, 1990, 2000 and 2010. \( \Delta m_{rt}^{US} \) is an enclave instrument:

\[
\Delta m_{rt}^{US} = \sum_{o} s_{ort-1} \left( n_{ot} - n_{ot-1} \right) \frac{1}{n_{rt-1}}
\]

which predicts changes in migrant share between \( t - 1 \) and \( t \), based on local shares \( s_{ort-1} \) of origin groups \( o \) at \( t - 1 \), similar to equation (13). \( X_{rt} \) is a vector of local controls, which includes Bartik industry shift-shares and range of observable fixed amenities\(^{25}\) interacted with time effects (identical to those used by Amior and Manning (2020)). The enclave and Bartik shift-shares are constructed using US census extracts and American Community Survey samples (Ruggles et al. 2017). Areas \( r \) correspond to 722 commuting zones (CZs) in the Continental US. See Appendix E for further details on data construction.

To identify firm size, we rely on publicly accessible data from County Business Patterns (CBP). The CBP is based on the Business Register, which contains a record for each known establishment with paid employees, outside of agricultural production, railroad, public administration and household employment. Based on this information, the CBP reports employee and establishment counts within industry-county cells (which we aggregate further to CZ-level).

### 5.2 Empirical estimates

We present our basic estimates of (15) in Table 11. In columns 1-5, we study the effect of the enclave shock \( \Delta m_{rt}^{US} \) on the migrant population share (constructed using US census and ACS data): this can be interpreted as a “first stage”. In column 1, which conditions on year effects only, the coefficient on \( \Delta m_{rt}^{US} \) is about 0.3 (with a standard error of just 0.03); and this is little affected by the inclusion of observable amenities (column 2) and a Bartik shift-share (column 3). In column 4, we control for local fixed effects: since (15) is already expressed in first differences, this removes area-specific linear trends in amenities or labor demand. Despite this being a demanding specification for such a short panel, we continue to see a precisely estimated positive effect. Unlike our German setting (where we study a one-off immigration event), migrant inflows in US CZs are heavily serially correlated (Jaeger, Ruist and Stuhler 2018). This may bias our estimates if there are dynamics in migrant share responds dynamically. To address this possibility, we control for a lagged enclave shock

---

\(^{25}\)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 11: US establishment size effects

<table>
<thead>
<tr>
<th></th>
<th>∆ Migrant population share</th>
<th>∆ Log mean firm size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) (2) (3) (4) (5)</td>
<td>(6) (7) (8) (9) (10)</td>
</tr>
<tr>
<td>Enclave</td>
<td>0.294***</td>
<td>-0.156***</td>
</tr>
<tr>
<td></td>
<td>(0.032)</td>
<td>(0.055)</td>
</tr>
<tr>
<td>Enclave: Lagged</td>
<td>-0.397***</td>
<td>0.244***</td>
</tr>
<tr>
<td></td>
<td>(0.039)</td>
<td>(0.108)</td>
</tr>
<tr>
<td>Bartik</td>
<td>0.168***</td>
<td>0.895***</td>
</tr>
<tr>
<td></td>
<td>(0.037)</td>
<td>(0.127)</td>
</tr>
<tr>
<td>Bartik: Lagged</td>
<td>0.204***</td>
<td>-0.678***</td>
</tr>
<tr>
<td></td>
<td>(0.031)</td>
<td>(0.114)</td>
</tr>
</tbody>
</table>

| Year effects     | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Amenity controls | No  | Yes | Yes | Yes | Yes | No  | Yes | Yes | Yes | Yes |
| CZ fixed effects | No  | No  | No  | Yes | No  | No  | No  | Yes | No  | No  | Yes |
| Observations     | 2,166 | 2,166 | 2,166 | 2,166 | 2,166 | 2,166 | 2,166 | 2,166 | 2,166 | 2,166 | 2,166 | 2,166 |

*** p<0.01, ** p<0.05, * p<0.1.

$\Delta m_{r,t-1}^{US}$ in column 4: the coefficient on the contemporaneous shock now increases to 0.57, offset by a (smaller) negative coefficient on $\Delta m_{r,t-1}^{US}$ (-0.40). Intuitively, local expansions in migrant share are diffused through the country in the period following the shock: see Amior (2021).

In columns 6-10, we estimate the same specifications for changes in log mean firm size (i.e. a “reduced form” specification). Firm size responds negatively in column 6 (year effects only), and including the amenity and Bartik controls only strengthens the effect: the coefficient in column 8 is -0.31, with a standard error of just 0.04. This is even true of local fixed effects in column 9. And in the dynamic specification (column 10), we see a mean reverting effect which perfectly reflects changes in migrant share in column 5: the initial local shock reduces firm size (with a coefficient of -0.43), but this effect is partly offset (0.24) in the subsequent decade as the immigration shock diffuses nationally.

From the perspective of our model, the robust negative firm size effects are consistent with a negative “wage-setting” effect, as firms choose to impose larger mark-downs (and price our native labor). These findings are consistent with Amior and Manning (2020), who offer evidence for adverse mark-down effects in the US (though using aggregate-level variation across skill groups, rather than spatial variation). In terms of magnitude, the (positive) effects on migrant share are similar to the (negative) effects on log mean firm size. This suggests a 1 pp increase in migrant share triggers a 1% contraction in firm size. Though qualitatively similar, these effects are smaller than what we see in our German case study: e.g. the first stage effect is about 0.3 (Table 6), but the response of log mean firm
size (bottom row of Table 10) ranges from -0.7 to -1.8. Based on our model, this would suggest the “wage-setting” effect is substantially larger in Germany, a consequence perhaps of substantially lower migrant reservation wages.

In Table 12, we offer additional evidence on the nature of the firm size effect in the US. As our point of departure, we take column 8 of Table 11 (ignoring dynamics for simplicity). We begin by reproducing these estimates in column 1 of Table 12. In column 2, we re-estimate this specification after residualizing firm size changes by industry: the estimates change little, which suggests the bulk of the effect materializes within industries (similar to Germany); and columns 3 and 4 show the effects are similar in traded and non-traded industries. Columns 5-8 estimate effects on log shares of firms in various size categories: the share of small firms (fewer then 5 employees) grows, and the remaining categories contract (with larger responses for the larger size categories).

### 6 Conclusion

In this paper, we offer new evidence that immigration can strengthen the monopsony power of firms. Based on German immigration in the early 1990s, we show that firms respond to an immigration shock by cutting both pay and employment. We interpret this as a movement down their labor supply curves, as they forego native employment to exploit cheaper migrant labor. The wage cuts are driven by low-paying firms, where new migrants disproportionately concentrate. We find a similar negative impact on firm size in the US. These adverse labor market effects are not inevitable, and may be ameliorated through policies which constrain
monopsony power (such as minimum wages, properly enforced, or regularizations). In terms of the broader literature, our hypothesis can help account for conflicting results on the labor market effects of immigration: these effects will depend on migrants’ reservation wages (which are likely to vary substantially by context), and not just on their skill mix.

References


Dustmann, Christian, Bernd Fitzenerberger, Uta Schönberg, and Alexandra Spitz-


Kerr, Sari Pekkala, William R. Kerr, and William F. Lincoln. 2015. “Skilled Im-


A Derivation of equilibrium wage distribution

In this appendix, we derive the equilibrium $\phi$ (i.e. the share of firms offering the native reservation $w_1$) in the baseline model, as summarized by equations (10) and (11). As Rogerson, Shimer and Wright (2005) show, there is a unique equilibrium which can take one of three forms:

1. $\pi(w_1) = \pi(w_0)$, and firms offer different wages (i.e. $0 < \phi < 1$)
2. $\pi(w_1) > \pi(w_0)$ and all firms offer $w_1$ (i.e. $\phi = 1$)
3. $\pi(w_1) < \pi(w_0)$ and all firms offer $w_0$ (i.e. $\phi = 0$)

To derive (10) and (11), we consider each case in turn.
Case 1: \( \pi(w_1) = \pi(w_0) \)

Using equations (8) and (9), \( \pi(w_1) = \pi(w_0) \) implies:

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

(A1)

After rearranging, we have:

\[
\phi = \frac{\delta + \lambda - \left[ \frac{\mu}{1 - \mu} \cdot \frac{b_N - b_M}{p - b_N} \right]}{\frac{\mu}{1 - \mu} \cdot \frac{b_N - b_M}{p - b_N}} - \frac{\delta + \lambda}{r + \delta}
\]

(A2)

so in equilibrium, we have \( \phi = \tilde{\phi} \), where \( \tilde{\phi} \) is the “latent \( \phi \)” defined in (11).

Case 2: \( \pi(w_1) > \pi(w_0) \)

Using equations (8) and (9), and imposing \( \phi = 1 \), we have:

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

(A3)

After rearranging:

\[
\frac{\mu}{1 - \mu} \cdot \frac{b_N - b_M}{p - b_N} < \frac{r + \delta + \lambda}{r + \delta}
\]

(A4)

which is equivalent to \( \tilde{\phi} > 1 \).

Case 3: \( \pi(w_1) < \pi(w_0) \)

Finally, consider case (2), where all firms offer \( w_0 \) (i.e. \( \phi = 0 \)). Using equations (8) and (9), and imposing \( \phi = 0 \), we have:

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

(A5)

After rearranging:

\[
\frac{\mu}{1 - \mu} \cdot \frac{b_N - b_M}{p - b_N} > \frac{\delta + \lambda}{\delta}
\]

(A6)

which is equivalent to \( \tilde{\phi} < 0 \).
Equilibrium summary

Putting together (A2), (A4) and (A6), the equilibrium $\phi$ can then be summarized as:

$$
\phi = \min \left\{ \max \left\{ 0, \tilde{\phi} \right\}, 1 \right\}
$$

(A7)

where $\tilde{\phi}$ is the “latent $\phi$” defined in (11). This is equation (10) in the main text.

B Model with on-the-job search

In this appendix, we set out an alternative model with on-the-job search, as in Burdett and Mortensen (1998). All the model’s assumptions are identical, except all workers now draw offers at rate $\lambda$ (and not just the unemployed). Rather than a single low wage $w_0$ and a single high wage $w_1$ (as in the baseline model), we then have a “low-wage sector” (with offers below $b_N$) and a “high-wage sector” (above $b_N$), each of which contain a continuous distribution of wage offers (as firms compete directly with one another for employees). The basic propositions in the main text are unaffected.

In what follows, we first derive the equilibrium wage distribution $G$ across workers, and then the equilibrium offer distribution $F$ across firms. And we conclude by revisiting the four propositions from the main text.

B.1 Wage distributions for native and migrant workers

Assuming all workers draw offers at rate $\lambda$, accepting an offer does not limit a worker’s ability to continue searching, so workers optimally accept any offer which improves on their current utility flow. That is, employed workers accept any offer which exceeds their current wage, and the unemployed accept any offer which exceeds $b_N$ (for natives) or $b_M$ (for migrants): i.e. unlike in the baseline model, the bs are now reservation wages for all unemployed workers.

Clearly, no firm will offer a wage below $b_M$ (the migrant reservation, since no worker will accept such an offer) or above $p$ (labor productivity). Let $F(w)$ be the distribution of wage offers across firms. In equilibrium, we must therefore have: $F(b_M) = 0$. However, firms may choose to set wages below the native reservation $b_N$ in equilibrium, so $F(b_N)$ may exceed zero. For the purposes of this appendix, let $\phi$ denote the share of firms offering in excess of $b_N$ (as opposed to the share of firms offering $w_1$, as in the main text): i.e. $\phi \equiv 1 - F(b_N)$.

Now, let $G_N(w)$ be the distribution of wages across employed natives, and $G_M(w)$ the distribution across employed migrants. In steady-state, $G_N$ and $G_M$ will of course depend
on the offer distribution $F(w)$. In particular, 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, this gives:

$$u_N \lambda [F(w) - F(b_N)] (1 - \mu) n = \delta (1 - u_N) G_N(w) (1 - \mu) n + \lambda (1 - F(w)) (1 - u_N) G_N(w) (1 - \mu) n$$

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

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

where we have imposed: $F(b_M) = 0$. The steady-state native and migrant unemployment rates are

$$u_N = \frac{\delta}{\delta + \phi \lambda}$$

and

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

Substituting [A10] and [A11] into [A8] and [A9] respectively, we can solve for $G_N$ and $G_M$ in terms of the offer distribution $F$:

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

$$G_M(w) = \frac{\delta F(w)}{\delta + \lambda (1 - F(w))}$$

B.2 Firms’ employment

We now derive $l(w)$, the equilibrium employment of a firm paying wage $w$. This also comes out of a steady-state condition. Let $R(w)$ be the flow of type $b$ workers recruited to such a firm, and let $S(w)$ be the flow of workers who are separated from this firm. A steady-state equilibrium requires: $R(w) = S(w)$. Notice that $S(w)$ is simply equal to:
\[ S(w) = [\delta + \lambda (1 - F(w))] I(w) \]  
(A14)

i.e. workers can leave a firm through separation to unemployment or by meeting a firm offering a wage exceeding \( w \). For firms offering \( w \geq b_M \) (as all firms must in equilibrium), the recruitment flow is given by:

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

(A15)

The first term on the right-hand side describes the native inflow, and the second term the migrant inflow. \( I \) is an indicator function taking 1 if \( w \geq b_N \): firms only recruit natives if their offer exceeds \( b_N \). The \( \frac{\lambda}{k} u_N \) and \( \frac{\lambda}{k} u_M \) terms are the flows of workers from unemployment, and the \( \frac{\lambda}{k} (1 - u_N) G_N(w) \) and \( \frac{\lambda}{k} (1 - u_M) G_M(w) \) terms are the flows from firms paying less than \( w \). Using (A10), (A11), (A12) and (A13), this expression can be simplified to:

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

(A16)

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

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

(A17)

### B.3 Equilibrium size of low-wage sector

As Burdett and Mortensen (1998) famously show, the combination of wage posting and on-the-job search yields a non-degenerate continuous distribution of wage offers. Intuitively, if there is a mass point in the wage offer distribution, a firm can profit by offering epsilon more than that mass point: the cost in wages is negligible, but the firm recruits a discretely larger workforce.

In equilibrium, firms can either locate in the “high-wage sector” (offering \( w \geq b_N \)) or “low-wage sector” (offering \( w < b_N \)). If the high-wage sector exists (i.e. \( \phi > 0 \)), the lowest offer in that sector must be \( b_N \): otherwise, the lowest-paying firm (in that sector) would increase their profit by cutting their offer to \( b_N \) (with no employment loss). Similarly, if the low-wage sector exists (i.e. \( \phi < 1 \)), the lowest offer in that sector must be \( b_M \). Just as in the baseline model in the main text, the equilibrium offer distribution can take one of three forms:
1. \( \pi (b_N) = \pi (b_M) \), and firms locate in both sectors (i.e. \( 0 < \phi < 1 \))

2. \( \pi (b_N) > \pi (b_M) \) and all firms locate in the high-wage sector (i.e. \( \phi = 1 \))

3. \( \pi (b_N) < \pi (b_M) \) and all firms locate in the low-wage sector (i.e. \( \phi = 0 \))

Using (A17), the equilibrium profit from offering \( b_N \) and \( b_M \) can be written as:

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

(A18)

and

\[
\pi (b_M) = (p - b_M) l (b_M) = \frac{n}{k} \cdot \frac{\mu \delta \lambda (p - b_M)}{(\delta + \lambda)^2}
\]

(A19)

The equilibrium \( \phi \) can be derived by inserting (A18) and (A19) into the three cases listed above. Just as in the baseline model, the equilibrium \( \phi \) can be expressed as:

\[
\phi = \min \left\{ \max \left\{ 0, \tilde{\phi} \right\}, 1 \right\}
\]

(A20)

where \( \tilde{\phi} \) is a “latent \( \phi \):

\[
\tilde{\phi} = \frac{\delta}{\lambda} \cdot \frac{\delta + \lambda}{\delta} - \left[ \mu \left( 1 + \frac{b_N - b_M}{p - b_N} \right) \right]^{1/2}
\]

(A21)

So, \( \phi = 0 \) if \( \tilde{\phi} < 0 \), and \( \phi = 1 \) if \( \tilde{\phi} > 1 \). The latent \( \tilde{\phi} \) is decreasing in \( \mu \left( 1 + \frac{b_N - b_M}{p - b_N} \right) \). Just as in the baseline model, firms are more likely to make a low-wage offer (i.e. below \( b_N \)) if (i) there are many migrants (\( \mu \) large) and (ii) if the migrant reservation \( b_M \) is small relative to \( b_N \).

**B.4 Equilibrium offers within high and low-wage sectors**

Equations (A20) and (A21) describe the equilibrium share of firms \( \phi \) which locate in the high-wage sector (i.e. offer wages \( w \geq b_N \)). Conditional on this equilibrium \( \phi \), we now solve for the offer distribution within the high and/or low-wage sectors. Since firms are identical, we can solve for the equilibrium offer distribution by imposing that all firms earn the same profits. In the high wage sector (assuming it exists: i.e. if \( \phi > 0 \)), the lowest-paying firm offers \( b_N \), so this requires:

\[
\pi (w) = \pi (b_N)
\]

(A22)

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for \( w \geq b_N \). Replacing the profit functions with (A17) and rearranging, the share of offers between \( b_N \) and any given \( w \geq b_N \) can be expressed as:

\[
F(w) = \left(\frac{\delta}{\lambda} + \phi\right) \left[1 - \left(\frac{p - w}{p - b_N}\right)^{\frac{1}{2}}\right]
\] (A23)

We now apply the same logic to the low-wage sector. Conditional on this sector existing (i.e. if \( \phi < 1 \)), the lowest-paying firm offers \( b_M \). Given all firms earn identical profits, it must be that:

\[
\pi(w) = \pi(b_M)
\] (A24)

for \( w \geq b_M \). Applying (A17) and rearranging, conditional on \( \phi < 1 \), the share of offers below any given \( w < b_N \) can be expressed as:

\[
F(w) = \frac{\delta + \lambda}{\lambda} \left[1 - \left(\frac{p - w}{p - b_M}\right)^{\frac{1}{2}}\right]
\] (A25)

Putting together (A23) and (A25), we therefore have:

\[
F(w) = \begin{cases} 
I[\phi < 1] \cdot \frac{\delta + \lambda}{\lambda} \left[1 - \left(\frac{p - w}{p - b_M}\right)^{\frac{1}{2}}\right] & \text{if } w \in [b_M, b_N) \\
I[\phi > 0] \cdot \left\{1 - (\frac{\delta}{\lambda} + \phi) \left[1 - \left(\frac{p - w}{p - b_N}\right)^{\frac{1}{2}}\right]\right\} & \text{if } w \in [b_N, p) 
\end{cases}
\] (A26)

### B.5 Implications for Propositions 1-4

We now revisit Propositions 1-4 from Section 2.2 in the main text:

1. Proposition 1 states that migrants concentrate in low-paying firms. This continues to be true: only migrants will accept wage offers below \( b_N \).

2. Proposition 2 states that a larger migrant \( \mu \) induces firms to reduce offers at the bottom of the distribution. The continues to be true: the latent high-sector firm share \( \tilde{\phi} \) is decreasing in \( \mu \), and this effect is increasing in the \( \frac{b_N - b_M}{p - b_N} \): see equation (A21).

3. Proposition 3 states that a larger migrant \( \mu \) induces firms to shed native employment at the bottom of the distribution. This continues to be true: as \( \mu \) increases, firms drop into the low-wage sector (\( \phi \) decreases), and native unemployment \( u_N \) expands: see equation (A10).
4. Proposition 4 states that a larger migrant $\mu$ may induce firms to reduce their employment overall. Equation (A17) reveals that $\mu$ has a positive “composition effect” on firms’ employment in the low-wage sector: holding wage offers fixed, only migrants accept low-wage offers. But (A17) also shows that $\mu$ has a negative “wage-setting effect”: as more firms drop into the low-wage sector, they lose access to native employment. And just as in the baseline model, without knowledge of the parameter values, we cannot know ex ante which effect will dominate on average.

Though the four propositions are robust to the introduction of on-the-job search, there is one difference worthy of comment. Unlike in the baseline model, a larger $\mu$ does now generate a negative effect on natives’ realized wages. As firms drop into the low-wage sector (i.e. as $\phi$ decreases) in response, this increases monopsony power in the high-wage sector, so firms are able to extract greater rents from natives. This is visible in equation (A12): at any given wage $w \geq b_N$, the share of native workers on wages below $w$, i.e. $G_N(w)$, expands as $\phi$ contracts.

\section{Model with endogenous contact rate}

\subsection{Free entry condition and equilibrium}

In the baseline model, we have assumed a fixed number of firms ($k$) and hence a fixed contact rate $\lambda$. In this appendix, we consider an environment (with homogeneous firms) where these are endogenous. If firms are free to enter and produce, monopsonistic power must be maintained by some barrier to entry or hiring. We impose a fixed cost $c$ which each firm must pay to produce any quantity of output. Of course, there are alternative means of sustaining market power in equilibrium, but the specific modeling decision is immaterial for the theoretical results.

Suppose the total flow of worker-firm meetings is determined by a Cobb-Douglas matching function $m(\bar{u}n, k) = \lambda_0 (\bar{u}n)^\alpha k^{1-\alpha}$, where:

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

(A27)

is the mean unemployment rate (so $\bar{u}n$ is the stock of unemployed workers), and $k$ the (now endogenous) stock of firms. An important parameter is the labor market tightness, defined
by \( \theta \equiv \frac{k}{\bar{un}} \). The contact rate for workers \( \lambda \) is now equal to:

\[
\lambda = \lambda_0 \theta^{1-\alpha}
\]  

(A28)

and the contact rate for firms is \( \lambda_0 \theta^{1-\alpha} \cdot \frac{\bar{un}}{k} = \lambda_0 \theta^{-\alpha} \).

The free entry condition requires that:

\[
\pi(w) = c
\]

(A29)

in equilibrium, for any wage offer \( w \) (since firms are identical). Suppose at least some firms offer the high wage \( w_1 \) (i.e. \( \phi > 0 \)): this must be true if at least some natives are employed. Replacing profit with \( \pi(w_1) \) from equation (9), the free entry condition can then be expressed as:

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

Using (A27), (A28), and the definition of \( \theta \), this can be rewritten as:

\[
\frac{\lambda_0}{\delta} (p - b_N) = c \theta^\alpha
\]

(A30)

Equation (A30) shows that market tightness \( \theta \) is fully determined by \( \frac{\lambda_0}{\delta} \), \( p - b_N \) and the operating cost \( c \). Intuitively, profits are increasing in \( \frac{\lambda_0}{\delta} \) (which ensures hires are larger relative to separations) and \( p - b_N \) (i.e. greater profits per hire), and decreasing in \( c \). To ensure that profits are equal to the operating cost \( c \) in equilibrium, each of these must be offset by larger market tightness \( \theta \), which increases competition over workers (and hence diminishes profits).

Crucially though, market tightness \( \theta \) is independent of the migrant share \( \mu \). This is because native wages are fixed at their reservation \( b_N \). Consequently, the migrant share does not affect the profits of individual firms offering \( w_1 \); and since all firms must earn the same profit in equilibrium (firms are identical), \( \mu \) does not enter equation (A30). Since \( \mu \) does not affect market tightness \( \theta \), it does not affect the contact rate \( \lambda \); so the implications for wage offers (Proposition 2) and native employment (Proposition 3) are identical to the baseline case (with fixed stock of firms \( k \)) in the main text.\(^{26}\)

The implications for firm size (Proposition 4) are also unaffected. Recall mean firm size

\(^{26}\)Though \( \theta \) is immune to migrant share \( \mu \), the stock of firms \( k \) may of course change (if the total unemployment stock \( \bar{un} \) does), since \( k = \theta \bar{un} \). But in this model, it is the market tightness \( \theta \) which is crucial to wages offers and employment rates.
can be expressed as $\frac{(1-\bar{u})n}{k}$. In the baseline model, we take $\frac{n}{k}$ is taken as given; so mean firm size is fully determined by the mean unemployment rate $\bar{u}$. But the same is true in this extension. Notice that mean firm size can also be written as $\theta \left( \frac{1}{\bar{u}} - 1 \right)$. Since market tightness $\theta$ is immune to migrant share $\mu$, any effect on mean firm size can only come through $\bar{u}$ - just as in the baseline model.

C.2 Alternative version with on-the-job search

Above, we have shown that market tightness $\theta$ is unaffected by migrant share $\mu$. But alternative assumptions do yield different results. In particular, $\theta$ does respond positively to $\mu$ if workers can search on-the-job. The reason is that, in this framework, native wages contract in response to $\mu$ (see Appendix B); all else equal, this would expand profit per worker; so $\theta$ must increase in equilibrium (to ensure profits remain fixed at the operating cost $c$).

To show this formally, we need to redefine the matching function (since both employed and unemployed workers now search): $m(n, k) = \lambda_0 n^{\alpha} k^{1-\alpha}$. Market tightness $\theta$ is now equal to $\frac{k}{n}$. The free entry condition for this model can be derived by imposing $\pi(b_N) = c$ in equation (A18). Combining this with (A10), this yields:

$$\frac{\lambda_0}{\delta} (p - b_N) u_N^2 = c\theta^\alpha \quad (A31)$$

This is identical to equation (A30), except we now have the native unemployment rate $u_N$ on the left-hand side. Equation (A31) describes a positive relationship between $\theta$ and $u_N$: larger native unemployment increases the recruitment pool for firms, so equilibrium requires a larger $\theta$ (which increases competition over workers) to keep profit fixed.

Using (A21), we can also derive a downward sloping “wage-setting curve”. Assuming for simplicity that $0 < \phi < 1$ (i.e. firms operate in both the high and low-wage sectors), equations (A21) and (A10) imply:

$$u_N = \frac{\delta}{\delta + \lambda_0 \theta^{1-\alpha}} \left[ \mu \left( 1 + \frac{b_N - b_M}{p - b_N} \right) \right]^{\frac{1}{\theta}} \quad (A32)$$

which is a negative relationship between $\theta$ and $u_N$. Intuitively, a larger $\theta$ implies a larger contact rate $\lambda$, which dries up the migrant unemployment pool. Holding native unemployment $u_N$ fixed, this makes the low-wage sector relatively less attractive to firms. To ensure firms are optimizing in wage offers, this larger $\lambda$ must be offset in equilibrium by a smaller
Together, the free entry condition (A31) and wage-setting curve (A32) imply a unique equilibrium in market tightness $\theta$ and native unemployment $u_N$. What is the impact of immigration? A larger migrant share $\mu$ shifts the wage-setting curve (A32): native unemployment $u_N$ increases for every $\theta$. But migrant share does not enter the free entry condition (A31). Consequently, a larger $\mu$ will increase both $\theta$ and $u_N$ in equilibrium. The firm entry response does limit the impact on $u_N$: larger $\theta$ and hence $\lambda$ dries up the migrant unemployment pool, and discourages firms from dropping into the low-wage sector. However, it cannot reverse the impact on $u_N$: the firm entry response only materializes in the first place because of a contraction of native employment and wages.

Finally, what are the implications for the firm size effect? Recall that average firm size is equal to: $\frac{(1-\bar{u})n}{k} = \frac{1-\bar{u}}{\theta}$, where $\bar{u}$ is the mean unemployment rate. For fixed $\theta \equiv \frac{k}{n}$ (as in baseline model), firm size is fully identified by (and decreasing in) $\bar{u}$. But in this extension (with both free entry and on-the-job search), we also expect an increase in $\theta$, so firm size will respond more negatively (or less positively).

### D Model with heterogeneous firms

In the baseline model, we assume all firms have identical productivity $p$. We now consider an alternative scenario where firms vary in their productivity, akin to Albrecht and Axell (1984). Let $H$ denote this productivity distribution, so $H(p)$ is the share of firms with productivity below $p$. Firms may either be active (if they can operate at a profit) or inactive (if not). All (and only those) firms with productivity $p$ above the migrant reservation wage $w_0$ will be active: so the active stock of firms ($k$ in the baseline model) is equal to $1 - H(w_0)$. This set-up implies a limited stock of high-quality firms (which may be justified by a constrained supply of entrepreneurial talent), similar in spirit to Melitz (2003). We assume for simplicity that the contact rate $\lambda$ is exogenous of the active stock of firms: this is equivalent to assuming $\alpha = 1$ in equation (A28) in Appendix C but see Appendix C for the implications of relaxing this assumption. For the purposes of this analysis, we restrict attention to equilibria with equilibrium wage dispersion: i.e. at least some firms offer $w_1$ and others offer $w_0$ ($0 < \phi < 1$).

#### D.1 Equilibrium

We now solve for equilibrium in this framework. Let $p^*$ denote the productivity of the marginal firm (endogenous in the model) which is indifferent between offering $w_1$ and $w_0$. 

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That is, \( p^* \) must satisfy:

\[
\pi(w_0|p^*) = \pi(w_1|p^*) \tag{A33}
\]

where \( \pi(w|p) \) is the profit earned by a productivity \( p \) firm offering wage \( w \). Just as in the baseline model, employment in low-wage firms is

\[
l(w_0) = \frac{n}{k} \left[ \frac{\lambda \mu}{\delta + \lambda} + \frac{\lambda(1-\mu)}{\delta + \lambda \phi} \right],
\]

and employment in high-wage firms is

\[
l(w_1) = \frac{n}{k} \left[ \frac{\lambda \mu}{\delta + \lambda} + \frac{\lambda \mu}{\delta + \lambda} + \frac{\lambda}{\delta + \lambda} \right] + \frac{\lambda \mu}{\delta + \lambda} + \frac{\lambda}{\delta + \lambda} \cdot \left[ \frac{b_N - b_M}{p^*-b_N} \right] - \frac{\phi \lambda}{\delta + \lambda} \tag{A34}
\]

We call this the “wage-setting equation”. Note it is identical to (11) in the main text, except productivity \( p \) has now been replaced by \( p^* \): since firms are no longer identical, this wage-setting equation must only be satisfied by the marginal firm. Equation (A34) is a positive equilibrium relationship between \( \phi \) and \( p^* \). Intuitively, if the marginal firm is more productive (i.e. \( p^* \) larger), that firm will care relatively more about employment (compared to profit per worker). All else equal, this will incline such a firm to offering \( w_1 \) instead of \( w_0 \). To ensure indifference, \( \phi \) must therefore be larger in equilibrium: this ensures a smaller 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 \( \phi \) (the share of active firms which offer \( w_1 \)):

\[
\phi = \frac{1 - H(p^*)}{1 - H(w_0)} \tag{A35}
\]

We call this the “active firm condition”. Holding the migrant reservation \( w_0 \) fixed, (A35) describes a negative relationship between \( \phi \) and \( p^* \): if the marginal firm which offers \( w_1 \) is more productive (i.e. \( p^* \) larger), the share of active firms offering \( w_1 \) (i.e. \( \phi \)) must mechanically be smaller. However, this relationship is amplified through changes in the active stock of firms. Based on (5), the migrant reservation \( w_0 \) is increasing in \( \phi \), since a larger \( \phi \) improves access to high-wage firms. If so, a larger \( p^* \) implies a smaller \( w_0 \): the denominator of (A35) therefore expands, and \( \phi \) contracts even more.

Putting equations (A34) and (A35) together, we therefore have a unique equilibrium in \( \phi \) and \( p^* \).
D.2 Impact of immigration

A larger migrant share $\mu$ shifts the wage-setting equation (A34): the high-wage share $\phi$ of active firms contracts for any $p^*$. But migrant share does not enter the active firm condition (A31). Consequently, a larger $\mu$ will reduce $\theta$ and increase $p^*$ in equilibrium. Since $\phi$ contracts, the migrant reservation $w_0$ and native employment will also contract; so the effects of immigration are qualitatively unchanged from the baseline model in the main text.

Crucially though, the effects of immigration are amplified in this model. First, the impact of migrant share $\mu$ on $\phi$ will be larger if the productivity $p^*$ of the marginal firm is smaller (see equation (A34)): this is because lower-quality firms care relatively more about profit per worker (compared to employment), so they drop more readily from $w_1$ to $w_0$.

Second, the impact on $\phi$ is amplified 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 offers to the labor force, amplifying any adverse effects on the migrant reservation $w_0$ and native employment. To see how this manifests formally, consider the active firm condition (A35). If all firms have productivity above $w_0$ (as in the baseline model), the denominator of (A35) will collapse to 1. This turns off the amplification mechanism via $w_0$ in that denominator (described above). The negative relationship between $\phi$ and $p^*$ in (A35) then becomes shallower, and the overall (negative) impact of migrant share $\mu$ on $\phi$ is therefore smaller.

Finally, consider the implications for the firm size effect. Proposition 4 states that average firm size will contract in response to a larger migrant share $\mu$ if the negative “wage-setting effect” dominates the positive “composition effect”. The endogenous activation of low-quality firms amplifies the former (since wage offers and native employment contract further), so the negative “wage-setting effect” becomes larger and is more likely to dominate.

E Additional details on US data

[TO BE COMPLETED]

F Additional empirical evidence
Table A1: Wage levels by industry

<table>
<thead>
<tr>
<th>Industry</th>
<th>Natives previous</th>
<th>Natives recent</th>
<th>Migrants previous</th>
<th>Migrants recent</th>
<th>Wage gap raw</th>
<th>Wage gap adjusted</th>
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<tbody>
<tr>
<td>Agriculture and forestry</td>
<td>3.79</td>
<td>4.01</td>
<td>3.73</td>
<td>-0.06</td>
<td>0.04</td>
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<td>Energy</td>
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<td>3.59</td>
<td>-0.97</td>
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<td>3.74</td>
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<td>-0.24</td>
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Figure A1: Firm wage effects: natives
Figure A2: Firm wage effects: natives (worker-weighted)