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Distributional effects of immigration and imperfect labour markets☆

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ABSTRACT

In canonical models, the labour share is orthogonal to immigration shocks in the long run, regardless of the impact of immigration on productivity. In contrast, this paper provides evidence that immigration increases labour productivity while reducing the labour share. We produce this evidence using data from Great Britain with a shift-share instrument that exploits European Union expansions and changes in immigration to other high-income countries. Our results are consistent with the predictions from imperfect labour market models, where immigrant and native workers are heterogeneous in skills, and the former have lower labour supply elasticities than the latter. A significant implication of our analysis is that immigration redistributes income from workers to employers.

1. Introduction

In canonical models of immigration, firms operating in perfect labour markets produce a homogeneous good by combining heterogeneous labour with skill-neutral capital under constant returns to scale. Within this framework, immigration shocks enhance aggregate labour productivity when migrants induce, on average, a higher-skilled workforce but do not alter the income shares of workers and employers in the long run.[1]

However, we document that shocks of immigration to Great Britain correlate positively with labour productivity and negatively with the labour share, as Fig. 1 shows. To provide evidence on the causality of these correlations, we instrument current changes in migration shares with a shift-share instrument. Our identification strategy exploits heterogeneous pre-determined exposure to migration across locations in Great Britain Altonji and Card (1991), Card (2001), combined with aggregate migrant shocks driven by the European Union expansions and changes in other push factors measured by immigration changes in high-income countries other than the UK. As Jaeger et al. (2018) warn, our estimates from a static specification capture pre-existing local trends. We then address this source of bias by controlling for lagged immigration changes. Estimates from this dynamic specification show that a one percentage point increase in the immigrant share increases labour productivity by 1.968%. At the mean, a one percentage point increase in the immigrant share increases output per worker by £1,035. As shown in Appendix D, these figures are comparable to those from other studies on migration's productivity effects like Ottaviano et al. (2018) and Peri (2012).

Labour compensation increases with immigration, albeit the estimate is not statistically significant. At the mean, one percentage point increase in the migrant share increases labour costs by £194 per worker. The size of the increase is smaller than that of productivity, resulting in immigration shocks compressing the labour share, as our evidence shows. The most direct implication of a declining labour share in the context of higher productivity is that productivity growth benefits employers rather than workers. Consequently, the negative effect of immigration on the labour share may lead to increased overall income inequality and potentially influence attitudes towards immigrants.

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[1] The observation that immigration reduces the return to labour and increases the return to capital, albeit in the short run, has been addressed within the canonical model. See, for instance, Borjas (1995).

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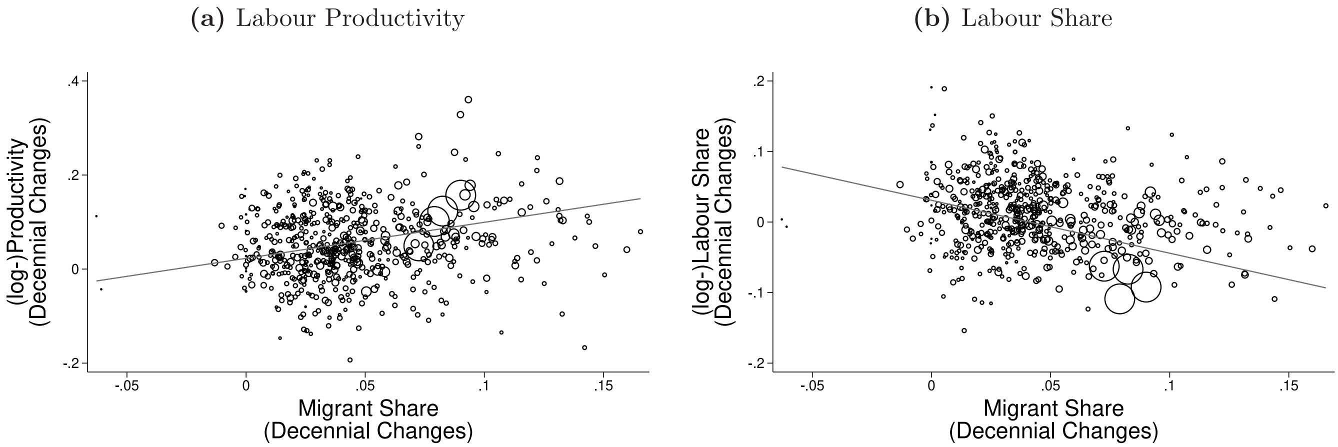

Fig. 1. Immigration, Productivity and Labour Share Effects
Note: Labour productivity as reported by ONS. Labour share computed by the authors from ONS data. Labour productivity: output (Gross Value Added, GVA) per job. The latter includes employees, self-employed and civil servants. Labour share: wages plus a proportion of the self-employed income as per equation 3 in Appleton (2011) divided by GVA. The grey line represents the best linear fit obtained from a specification where we weight every region by its contribution to the national GVA in 2002. The data covers 2002–2015. All observations are in decennial changes, i.e. variations w.r.t. 10 years before; that makes four periods in total: 2002–2012, 2003–2013, 2004–2014, and 2005–2015. The slope coefficient for Fig. 1(a) is 0.766 with a standard error of 0.217. For Fig. 1(b) the slope is −0.750 with standard error 0.305.

We show that immigration shocks, which simultaneously increase labour productivity and contract the labour share, can be naturally understood within the framework of imperfect markets (e.g. Amior and Manning, 2021; Manning, 2021; Naidu et al., 2016; Amior and Stuhler, 2023). We present additional evidence supporting imperfect labour markets: a decrease in labour costs (relative to productivity) is accompanied by a contraction in employment (see Amior and Stuhler, 2023).

2. Canonical model versus imperfect markets

Similar to most of the immigration literature (e.g. Card, 2001; Dustmann et al., 2013; Amior and Manning, 2021; Peri, 2012), we consider a production function with constant returns to scale (CRS) and skill-neutral capital, $F(H(\vec{L}), K)$. H is a CRS skill aggregator and the skill vector, $\vec{L}$, has sth element $L_s = \eta_s N + \mu_s M$. The densities $\eta_s = \frac{N_s}{N}, \mu_s = \frac{M_s}{M}$ ($s \in \{1, \ldots, S\}$) represent the distribution of skills for native labour, N, and migrant, M, respectively. Moreover, we focus on the long run when capital is fully elastic and can be purchased in the international market at an exogenous price, say p.

We start our analysis by deriving the implications of the canonical model for immigration on labour productivity, that is $F(H(\vec{l}), k)$,

$$\frac{dF(H(\vec{l}), k)}{dm} = F_H \sum_s H_s(\mu_s - \eta_s) - p\frac{F_{KH}}{F_{KK}} \sum_s H_s(\mu_s - \eta_s)$$
$$\frac{dF(H(\vec{l}), k)}{dm} > 0 \iff \sum_s H_s\mu_s > \sum_s H_s\eta_s, \tag{1}$$

where lower-case letters indicate per-worker quantities and $H_s = \frac{\partial H}{\partial l_s}$ is the derivative of the skill aggregator w.r.t. the sth skill group. $m = \frac{M}{M+N}$ is the migrant share and the derivative assumes constant densities μ_s and η_s.

Eq. (1) demonstrates that, within the canonical model, aggregate productivity increases with immigration if the average migrant is more productive than the average native. This concept can be easily extended to account for immigrants changing the workforce skill composition of natives, as detailed in Appendix F.

As for the income distribution between labour and capital, capital-skill neutrality imposes a tight restriction when capital is flexible (see Lewis, 2013). By constant returns to scale and labour aggregation, we can express the labour share as follows,

$$\frac{\sum_s F_s l_s}{F(H(\vec{l}), k)} = 1 - \frac{pk}{F(H(\vec{l}), k)} = 1 - \frac{pF_k^{-1}(1, p)}{F(1, F_k^{-1}(1, p))} \tag{2}$$

Eq. (2) shows that the labour share is not a function of the skill aggregator. Therefore, in perfect labour markets with capital-skill neutrality, migration shocks do not alter the income distribution between labour and capital. This result contradicts the correlations in Fig. 1 and our IV estimates in Section 3.

We now relax the assumption[2] of perfect labour markets by considering a simple wage-setting monopsony model where wages take the form (see, for instance, Card et al., 2018; Amior and Manning, 2021),

$$\omega_s = \gamma(e_s)F_s \tag{3}$$

where ω_s is the wage of workers with skill s; $e_s = \frac{e_N\eta_s(1-m)+e_M\mu_s m}{\mu_s m+\eta_s(1-m)}$ is the (weighted) average elasticity of labour supply, with e_N and e_M being the elasticities of native and migrant labour supply (to firms). $\gamma(e_s) \in (0, 1]$ is the wage wedge (see Amior, 2017).[3] The existence of rents in the labour market leads to a distributive expression of labour productivity, where the shares of workers and employers depend on the labour supply elasticities,

$$\sum_s \left[\left(1 - \gamma(e_s)\right) + \gamma(e_s)\right] \frac{F_s l_s}{F} = 1 - \frac{pF_k^{-1}(1, p)}{F(1, F_k^{-1}(1, p))} \tag{4}$$

On the left-hand side of (4), the (average) contribution of labour to productivity, $\frac{F_s l_s}{F}$, is distributed between workers and monopsony employers, with the labour share (wage wedge γ) increasing in the labour supply elasticity. Because the capital supply is infinitely elastic, the right-hand side of (4) does not change with immigration. That is, while the conditions in the labour market do not affect the overall contribution of labour to productivity, they do play a significant role in determining how this contribution is distributed between employers and workers.

For the labour share to decrease with the migrant share, the proportional change in (per unit) labour compensation should be smaller than the proportional change in (per labour) production,[4]

$$dln \sum_s \omega_s l_s = dln \sum_s \gamma(e_s)F_s l_s < dlnF(H(\vec{l}), k) = dln \sum_s F_s l_s \tag{5}$$

[2] The other assumption that prevents migration from altering the labour share is capital-skill neutrality.

[3] The wage wedge $\gamma_s(\cdot)$ is the fraction of the marginal productivity of workers of type s, F_s, that goes to the worker. The wage wedge function is increasing in the labour supply elasticity e_s.

[4] Eq. (5) uses that, under CRS, the proportional change in the production equals the proportional change in the factors.

The impact of productivity-enhancing immigrants with more inelastic labour supplies on the share of labour has two components with opposite signs. On the one hand, migrants may push average wages up because they are more productive and/or induce a more productive skill mix. On the other hand, immigrants with more inelastic labour supplies reduce labour compensation. We can then express inequality (5) as

$$\frac{(e_M - e_N)}{\sum_s \omega_s l_s} \sum_s \gamma'(e_s) F_s l_s \Gamma_s + \frac{\sum_s \gamma(e_s) \frac{\partial F_s l_s}{\partial m}}{\sum_s \gamma(e_s) F_s l_s} < \frac{\sum_s \frac{\partial F_s l_s}{\partial m}}{\sum_s F_s l_s} \tag{6}$$

where $\Gamma_s = \frac{\mu_s \eta_s}{l_s^2} > 0$.

In (6), when the labour supply of migrants is inelastic relative to natives', $e_M < e_N$,[5] and immigration increases labour productivity, $\sum_s \frac{\partial F_s l_s}{\partial m} > 0$, a sufficient condition for the labour share to be decreasing in the migrant share is as follows,

$$\frac{\sum_s \gamma(e_s) \frac{\partial F_s l_s}{\partial m}}{\sum_s \frac{\partial F_s l_s}{\partial m}} \leq \frac{\sum_s \gamma(e_s) F_s l_s}{\sum_s F_s l_s} \tag{7}$$

Note that when $e_M < e_N$ it is always the case that $\sum_s \gamma(e_s) \frac{\partial F_s l_s}{\partial m} < \sum_s \frac{\partial F_s l_s}{\partial m}$ because in the skill cells with higher densities of migrants μ_s (on average more productive) the wage wedges γ_s are relative smaller.

Condition (7) states that the ratio of the change in labour compensation to the total change in labour productivity resulting from migration must be less than or equal to the existing proportion of labour compensation in the overall labour productivity. Therefore, in imperfect labour markets, when migrants have more inelastic labour supplies than natives, we should expect the labour share to decrease with immigration. Under condition (7), this is compatible with a simultaneous increase in productivity. That is, the immigration of highly skilled workers, or immigrant workers that induce upskilling of existing workers, with labour supply elasticities sufficiently low might raise the average labour productivity and decrease the labour share. This result is in line with Amior and Manning (2021). In a similar setting, i.e. unlimited skill types and no technological restrictions beyond CRS, they find that the impact of immigration in a monopsony model 'may also account for the aggregate decline in labour's income share'.

3. Empirical evidence

We estimate the effects of immigration on labour productivity and the labour share using data from Great Britain. Most data comes from ONS publicly available sub-regional figures, disaggregated at level three of the Nomenclature of Territorial Units for Statistics (i.e. NUTS3).[6] With one exception: we have merged London subdivisions into a single regional unit.[7] Even though the data on productivity is available for all years since 2002, we restrict our analysis to 2002–2015. The idea is to avoid possible confounders from the 2016 EU membership referendum results.

Throughout the paper, labour productivity is measured as GVA per job.[8] We measure labour cost as compensation of employees plus the estimated proportion of sole traders' income that takes the form of self-paid wages.[9] We then measure the labour share as the ratio of labour cost over GVA. Sub-regional labour productivity figures, reported from ONS, come from balanced GVA figures and as such sometimes differ from income-side GVA figures used to compute labour costs. To avoid this, we scale income side figures so that total GVA from the income side adds up to their balanced counterpart.[10] Finally, we measure changes in local immigrant shares from ONS publicly available tables containing population figures for age 16 to 64 by country of birth.

As is common in immigration studies, we face an identification challenge posed by the endogeneity of immigrants' location choices. (e.g. Ottaviano et al., 2018; Card, 1990; Peri, 2012; Card, 2001; Altonji and Card, 1991). For identification, we exploit within-region variation by combining local heterogeneous exposure to immigration inflows with aggregated migration shocks driven by EU expansions in 1995, 2004 and the 2007 and other push factors measured using changes in immigration to high-income countries other than the UK (ΔPop_{bt}^{-UK}) that we interact with the inverse of the distance, $\frac{1}{D_{bt}}$, between London and the country-of-origin largest city (see Llull, 2017). Formally, our instrument is defined in Eq. (8) below, where we allocate predicted national changes in stock ($\widehat{\Delta Pop_{bt}}$) from country of birth b to a given location r using the exposure measure Pop_{br}^{91}/Pop_b^{91} and then normalised by the region's population in 1991. We measure 1991 magnitudes using data from the 1991 Census.

$$\Delta z_{rt} = \sum_{b=1}^{B} \frac{1}{Pop_r^{91}} \frac{Pop_{br}^{91}}{Pop_b^{91}} \widehat{\Delta Pop_{bt}} \tag{8}$$

where $\widehat{\Delta Pop_{bt}}$ are fitted values from a regression such as

$$\Delta Pop_{bt} = \alpha_1 \Delta Pop_{bt}^{-UK} + \alpha_2 \frac{1}{Dist_b} + \alpha_3 \frac{1}{Dist_b} \Delta Pop_{bt}^{-UK} + \alpha_4 \mathbb{1}[b = Other] \Delta Pop_{bt}^{-UK} \tag{9}$$

$$EU_{bt}^{95} + EU_{bt}^{04} + EU_{bt}^{07} + \xi_{bt} \tag{10}$$

EU_{bt}^{τ} are dummies taking value one if country-of-birth b belongs to expansion group τ and has become an EU member by year t. We construct the left-hand-side in Eq. (9) from LFS microdata that we aggregate at the year and country-of-birth levels differentiating 61 countries of birth including an "Other" category.[11] Changes in migration stocks in high-income countries other than the UK, ΔPop_{bt}^{-UK}, are measured from UN bilateral migration stock data.[12]

In Appendix C we provide balancing tests using predetermined local characteristics. These balancing tests show that the instrument is correlated with pre-existing characteristics; however, these correlations are driven by correlated lagged effects that we control for using the dynamic IV strategy proposed by Jaeger et al. (2018). Thus our main specification takes the form

$$\Delta y_{it} = \beta \Delta m_{rt} + \gamma \Delta m_{rt-10} + \theta_t + \Delta \epsilon_{rt} \tag{11}$$

where we instrument current, m_{rt}, and lagged, m_{rt-10}, migrant shares with the current, z_{rt}, and lagged, z_{rt-10} instrument while controlling for year fixed effects.[13]

Table 1 presents OLS and IV[14] estimates detailing the impact of immigration on productivity, labour costs, and the labour share. In

[5] Note that when the labour supply elasticities of immigrants and natives are equal, i.e. $e_M = e_N = e$, the proportional increase of the labour compensation equals that of production, so the labour share does not change with immigration.

[6] A detailed list of data sources is provided in Appendix A.

[7] In Figure Appendix E.5 we provide estimates produced with a sample where we aggregate all other NUTS3 regions to their best-fit Travel to Work Areas, estimates are qualitative and quantitative similar.

[8] Table Appendix B.1 provides descriptive statistics

[9] As Appleton (2011) we estimate the proportion of sole traders' income that takes the form of self-paid wages as $\frac{coe}{gos+coe} * mincome$, where coe is compensation of employees, gos is gross operating surplus and $mincome$ is the income generated by sole traders.

[10] In Table Appendix E.7 we provide estimates computed from un-scaled income-side GVA figures.

[11] For the "Other" category we impute value zero for the inverse of distance.

[12] These data have quinquennial frequency, we impute years in between by linear interpolation.

[13] We use the instrument defined in Eq. (8) instead of the more traditional one exploiting observed national level changes (see Altonji and Card, 1991; Card, 2001; Jaeger et al., 2018) because, in our context, the traditional version fails a pre-trend test, see Table Appendix E.2. Nonetheless, in Appendix E.1 we show that exploiting realised national changes in migrant stocks produces qualitatively similar evidence for our main outcomes.

[14] We provide first-stage estimates and a formal weak-instrument statistic in Table Appendix B.2.

Table 1
Main estimates.

	(1)	(2)	(3)	(4)
	Static		Dynamic	
	OLS	IV	OLS	IV
	Labour Productivity			
Δ Immigrant Share	0.753***	1.432***	0.564***	1.968***
	(0.200)	(0.220)	(0.182)	(0.707)
Lagged Δ Immigrant Share			0.429***	−0.335
			(0.140)	(0.339)
	Labour Cost			
Δ Immigrant Share	0.007	−0.776***	0.196	0.620
	(0.212)	(0.283)	(0.183)	(0.443)
Lagged Δ Immigrant Share			−0.428**	−0.873***
			(0.197)	(0.275)
	Labour Share			
Δ Immigrant Share	−0.746**	−2.209***	−0.368***	−1.349**
	(0.312)	(0.405)	(0.113)	(0.517)
Lagged Δ Immigrant Share			−0.857***	−0.538**
			(0.186)	(0.210)
Obs.	592			
Regions	148			

† We compute labour costs and labour shares following ONS methodology (see Appleton, 2011), where a fraction of mixed-income is added to the compensation of employees. We compute labour cost (share) per job by dividing the resulting measure of income by the number of jobs (GVA). Jobs include employees, self-employed, government-supported trainees and members of Her Majesty's Forces. All specifications include year fixed effects. We weight estimates by the region's contribution to national GVA in 2002. All specifications are in decennial changes as per equation (11). Standard errors (clustered by region) between parentheses. $^{*}p < 0.10$ $^{**}p < 0.05$, $^{***}p < 0.01$

the static specification, both OLS and IV estimates reveal similar qualitative effects: immigration increases labour productivity but does not translate into higher labour compensation. These effects lead to a significant contraction in the labour share. In the dynamic specification, we observe similar qualitative effects concerning labour productivity and the labour share. However, we also note that the negative labour cost effect in column (2) is driven by correlated lagged effects, as apparent in column (4). Upon conditioning for these effects, labour costs increase with immigration but below productivity, resulting in a contraction in the labour share, although of a smaller magnitude than that estimated by the static specification.

When assessing the dynamic IV estimates at the means (see Table Appendix B.1), we find that a one percentage point increase in the immigrant share increases productivity by £1,035 per worker. Moreover, labour compensation expands by £194. Thus producing a 1.349% contraction in the labour share per every one percentage point increase in the migrant share. In Appendix E we provide a comprehensive set of robustness tests for these results.

The effect of immigrants on the distribution of skills is the primary mechanism behind migration productivity effects. To estimate whether immigration shocks shift the skill distribution, we use occupational shares. Table Appendix B.3 reports the effects of immigration shocks on the weights of nine occupational groups among all workers. Estimates from our dynamic specification show that immigration shocks shift employment towards professional and associate professional occupations. Therefore, immigration-induced changes in the occupational composition support the skill-based mechanism for migration productivity effects.

Last, in Table Appendix B.4, we provide additional evidence in support of imperfect markets: We observe that a decrease in labour costs relative to productivity is associated with a contraction in employment, a situation that is hard to reconcile within the canonical model (Amior and Stuhler, 2023).

4. Final remarks

Using sub-regional data from Great Britain, we show that immigration shocks positively impact productivity while simultaneously reducing the labour share.

This evidence contradicts the canonical model, and can instead be better explained within the framework of imperfect labour markets, where immigrants who enhance productivity might be willing to work for lower wages.

Our results thus offer further supporting evidence to a recent subfield of Migration Economics studying immigration effects within imperfect labour markets (e.g. Amior and Manning, 2021; Manning, 2021; Naidu et al., 2016; Amior and Stuhler, 2023).

Data availability

Code and most data will be shared. We cannot share LFS micro-data files, but these can be obtained by registered researchers from the UK Data Service.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.econlet.2024.111832.

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Further reading

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