Comparing the Immigrant-Native Pay Gap
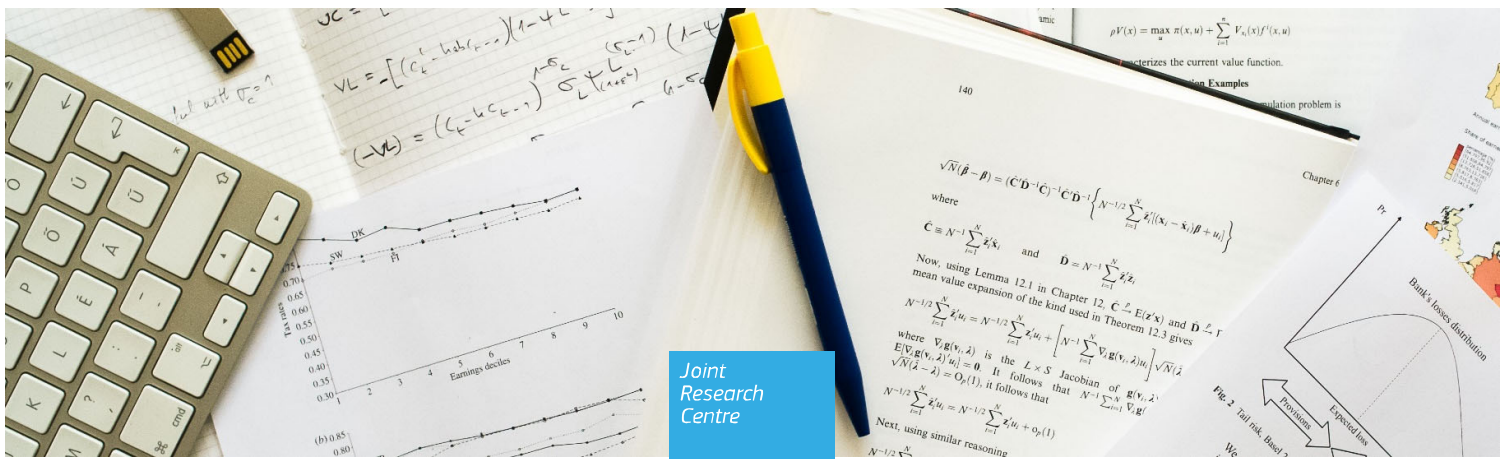
A novel evidence from home and host countries

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Executive summary

The literature has robustly documented a negative migrant-native wage gap in developed economies. Yet empirical evidence of pay differences has been elusive for developing countries. We approach this question by leveraging internationally harmonised microdata with 1.5 million individuals from 6 transition and developing countries and 15 OECD economies spanning from 1995 to 2016 and employ counterfactual decomposition techniques which allow us to control for individual-productivity and job-specific characteristics, and explain up to 72% of the observed immigrant-native wage gap. The Blinder-Oaxaca baseline results indicate that, vis-à-vis workers born in developed economies the pay for workers born in transition and developing economies is discounted both in their home country labour markets and – if migrating – also in developed host country labour markets. The estimated Blinder-Oaxaca wage differentials suggest the opposite holds for workers born in developed countries – their wages are higher not only in developed countries but for migrants also in developing host countries. These results are novel and have not been reported for developing countries in a cross-country setup. Our estimates also show that in the developed country sub-sample, the mean immigrant wage disadvantage has remained nearly unchanged over the last two decades both in terms of the trend and variance. The magnitude and growth rate of the mean wage gap for the transition/developing economies sub-sample is similar to developed economies though with the opposite sign – native-born workers in developing countries systematically receive lower wages than foreign-born workers. During the two decades, the unexplained wage gap – attributable to the labour market discrimination, differences in unobserved job characteristics, variation in unobserved skills and the institutional framework of labour market – has remained at a non-trivial magnitude.

Complementing the quantitative microanalysis, we have also provided a narrative evidence of the unexplained gap of native-born wages vis-à-vis immigrants and attempted to relate potential explanations to the key sets of factors identified in the literature: group differences in the labour force attachment due to labour market discrimination, differences in unobserved job characteristics, and differences in unobserved skills. Correlation analyses suggest that labour market discrimination is not of a first-order importance in the link between cross-country variation in the unexplained wage gap – in contrary to an often speculated determinant. A more important factor driving the cross-country variation of unexplained native-to-migrant wage gaps appear to be the cross-country variation in unobserved job characteristics (e.g., distribution between native-born and foreign-born workers by skill levels, temporary contract, complementarities between immigrant and native workers and/or wage competition) and unobserved skills among foreign-born and native-born workers (e.g., imperfect transferability of migrants' skills, language proficiency, literacy skills, numeracy skills or problem solving skills, time spent in the host country by migrants). These results provide a robust cross-country evidence strengthening previous literature findings based on single country data.

From a policy perspective, our findings hint to an untapped potential of economic gains at the aggregated level. In addition to ethical and social considerations, lower demand and lower wages for equally productive foreign workers results in a waste of valuable human capital resources. Our findings contribute to the growing body of literature that shows that eliminating distortions in the allocation of talent can result in sizeable productivity and welfare gains. For example, Hsieh et al. (2019) estimate large gains for the U.S. between 1960 and 2010 – their study focuses on race- and gender-based distortions. Kancs and Lecca (2018) find that although the immigrant integration (e.g., by the providing language and professional training) is costly for the host country budget, in the medium- to long-run, the social, economic and fiscal benefits can significantly outweigh the short-run immigrant integration costs in the EU.

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Comparing the immigrant-native pay gap:

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Abstract

The literature has robustly documented a negative migrant-native wage gap in developed economies. Yet empirical evidence of pay differences has been elusive for developing countries. We approach this question by leveraging internationally harmonised microdata with 1.5 million individuals from 6 transition and developing countries and 15 OECD economies spanning from 1995 to 2016 and employ counterfactual decomposition techniques which allow us to control for individual-productivity and job-specific characteristics, and explain up to 72% of the observed immigrant-native wage gap. The Blinder-Oaxaca baseline results indicate that, vis-à-vis comparable workers born in developed economies, the pay for workers born in transition and developing economies is discounted both in their home country labour markets and – if migrating – also in developed host country labour markets. However, the unexplained native-to-migrant wage gap remains sizeable in most countries even after controlling for productivity differentials (28% and more). Cross-country correlation analyses contribute a direct empirical support to the link between variation in unobserved job characteristics and skills among foreign-born and native-born workers and wage gap, while the labour market discrimination environment is of a second-order importance.

Keywords: Labour market, wage gaps, immigrants, decomposition.

JEL codes: D31, J15, J7.

1.   Introduction

In 2020, there were around 276 million international migrants comprising a continuously growing share of the world's population (United Nations 2022). The majority – estimated 169 million – have relocated to another country for a work purpose, more than half of them from developing countries (IOM 2022). Whereas 37.6% of migrants residing in a developed country were from another developed country, only 11.7% of migrants to a developing country were from a developed country; the remaining originating from developing countries. Typically, in developing economies the immigrants' contribution to value added exceeds their population share in employment (OECD 2018). For developed economies, the labour income ratio of foreign- to native-born workers is more nuanced and differentiated by the migrant home country, skill level and the sector of activity, indicating possibly differing levels of productivity (Lemieux 2006).

The empirical literature has robustly documented substantial employment and earnings differentials between immigrants and native-born, suggesting that the foreign labour is often treated as an imperfect substitute for native-born in host labour markets. Studies on developed countries report a significant wage advantage for native-born compared to immigrant workers (e.g., Lehmer and Ludsteck (2011) for Germany; Van Kerm et al. (2016) for Luxembourg; Long hi et al. (2013) for the UK; Abbott and Beach (1992), Huffman (2004), Ruist (2013), Bertrand and Mullainathan (2004), and Smith and Fernandez (2017) for the US and Canada). The relative employment disadvantage for foreign-born workers is similarly persistent. For instance, in a review of 36 studies Zschirnt and Ruedin (2016) find that a median call-back rate for minorities relative to native-born whites is only 67% in OECD countries, implying that employers tend to set a significantly higher bar for foreign workers, or avoid hiring it altogether.

In contrast, the scarce evidence available for developing economies suggest that the relative labour income ratio of foreign- to native-born workers exceeds unity. The price for a comparable foreign work is found substantially higher, for example, in Kyrgyzstan (22%-25%), Rwanda (12%-15%) and Ghana (12%) (OECD/ILO 2018). In South Africa, newly arrived immigrant workers are found to increase the negative wage gap between native-born and immigrant workers. Gerard et al. (2021) estimate an ethnic wage gap between whites and non-whites natives in Brazil in a range of 27% to 33%, disproportionately disadvantaging the non-white native population. An important limitation of these studies is that country-specific data and differences in methods employed do not allow to assess how robust and comparable are these estimates with those for developed countries.

The present report approaches these cross-country and over-time comparability issues by leveraging internationally harmonised microdata – the Luxembourg Income Study (LIS) – with 1.5 million individuals for 6 transition/developing economies and 15 OECD countries spanning from 1995 to 2016. The LIS microdata have been used for cross-country studies before, though in different contexts of migration (e.g. Anastossova and Paligorova 2006; Birinci et al. 2021). We employ counterfactual decomposition techniques to compute the levels of wage differentials and inequality trends of foreign-born and native-born workers. The Blinder-Oaxaca decomposition technique has been extensively used in the empirical labour literature to study gaps in wages and employment across different groups (e.g., Oaxaca and Ransom 1994).

Controlling for individual-productivity and job-specific characteristics allows us to explain up to 72% of the observed immigrant-native pay gap. The Blinder-Oaxaca estimates show that, vis-à-vis comparable workers born in developed economies, the pay for workers born in transition and developing economies is discounted both in their home country labour markets and – if migrating – also in developed host country labour markets. Benchmarking these estimates to those for workers born in developed countries – in line with literature – the estimated wage differentials are negative. Further, in the developing economy sub-sample, the mean immigrant wage differential has remained nearly unchanged during the last two decades in terms of both the trend and variance. For comparison, the magnitude and growth rate of the mean wage gap for the developed countries sub-sample is similar to developed economies though with the opposite sign – comparable native-born workers in developing countries systematically receive lower wages than foreign-born workers at the mean. These cross-country and over-time comparable estimates are novel for developing countries. Interestingly, the wage gap shrinks as the immigrants live longer (e.g., more than 15 years) in the host developed countries. The opposite holds true for transition and developing host countries: the longer the immigrants live in these countries, the more they earn compared to the similar native population.

Our report is related to the large body of the inequality literature, showing that a significant part of the observed raw differences in labour market outcomes between heterogeneous groups of workers can be explained by productivity differences (Dustmann and van Soest 2002; Ferrer et al. 2006; Hellerstein and Neumark 2003; Bratsberg and Ragan 2002). Two sources for productivity differentials have been studied in the literature: intrinsic productivity differences between immigrants and native-born, and segregation into labour market categories with a differentiated productivity (García-Pérez et al. 2014).[1] A step-by-step decomposition shows that observed productivity differences alone cannot explain fully why heterogeneous groups of workers receive different wages for an otherwise comparable work when being employed. Even when controlling for individual and work characteristics, including industry and employment type, education and skills intensity, etc., 28% and more of the total native-to-migrant wage gap still remains unexplained across the 21 countries covered in this report. The result on shrinking wage gaps based on the years of residence in the host country ties in with the previous literature on immigrants' assimilation (e.g., Izquierdo et al. 2009).

The literature attributes a large fraction of the unexplained wage gap to differences in the labour market discrimination between migrants and natives (e.g., Lehmer and Ludsteck 2011). Other frequent causes of the unexplained wage gap studied in the literature are unmeasured/unobserved (omitted in the data) productivity differentials between immigrants and natives and factors affecting it, particularly, when conducting estimations at the individual level. Tang et al. (2020) decomposition shows that in the US the within-job inequality accounts for more than 80% of the wage inequality between 1983 and 2013. Similar results were found for the immigrant wage inequality by García-Pérez et al. (2014) and Izquierdo et al. (2009), Himmler

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[1] Whereas intrinsic productivity effects capture differences between natives and immigrants within the same category (e.g., unequal productivity between immigrants and natives within the same occupation), sorting refers to differences in the distribution of natives and immigrants between categories that each encompasses a distinct level of productivity (e.g., over-representation of immigrants in occupations with lower productivity/wage) (Autor and Katz 1999; Lemieux 2006).

and Jäckle (2018) and Valentine et al. (2021) for Spain, Germany, Austria and Belgium, respectively. These findings suggest that heterogeneous labour market groups must differ according to some further characteristics valued on the market, e.g., group differences in the labour force attachment due to job characteristics, or differences in unobserved skills.

More recently, the institutional framework governing labour markets has been found to impact the way wages of different groups of workers are formed in a given economy (Plasman et al. 2007; Lemieux et al. 2009). For example, the collective wage bargaining is found to diminish the observed wage discrimination against minority groups, as usually trade unions tend to present themselves as advocates of "fair pay" for vulnerable groups on the labour market (Plasman et al. 2007; Dostie et al. 2020). Card et al. (2020) find that in the US and Canada unions reduce economy-wide wage inequality by around 10%. The inequality-reducing effect of minimum wages is confirmed both for developed and developing economies (Lee 1999; Gerard et al. 2021). Moreover, trade unions and the minimum wage reduce wage inequality also through indirect spillover effects on wages of non-union members and higher wage cohorts, respectively (Lee 1999; Dittrich et al. 2013; Fortin et al. 2021), which is particularly relevant for migrants which often have lower union participation or are employed in the informal sector. In addition, market imperfections are found to affect the wage discrimination against migrants, such as the fierceness of competition in labour and product markets. While a concentration of market power in labour and products markets may reinforce wage discrimination against migrants, fierce competition may augment the role of collective wage bargaining for reducing the labour market discrimination (Valentine et al. 2021).

Given that a significant native-to-migrant wage gap remains unexplained after the Blinder–Oaxaca decomposition, we complement individual-level estimates with a country-level narrative evidence – correlation analyses as in Guzi et al. (2021). The purpose of this exercise is to show potential relationships between unexplained Blinder–Oaxaca wage gaps and aggregated macro-level contextual variables related to labour market discrimination, differences in unobserved job characteristics, and differences in unobserved skills. We construct macro-level variables from public UN, ILO, OECD, the Social Progress Imperative and the World Bank databases. The correlation analyses indicate that the labour market discrimination is not an important explanatory factor of the cross-country variation in the unexplained wage gap between natives and migrants across countries. Rather, the cross-country variation in unobserved job characteristics and unobserved skills among foreign-born and native-born workers seem to be the main driver in the cross-country variation of unexplained native-to-migrant wage gaps.

The main contribution of this study is to provide an internationally comparable cross-country and between-group evidence on wage inequality by migration status in developing countries (migrant workers from other developed and from developing countries). We benchmark these estimates to the earnings of natives in developed countries compared to immigrants (from other developing and from developed countries) – the magnitude of which is in line with literature. The closest study to ours is that of Clemens et al. (2019) who estimate the real wage gaps between immigrants in the United States and their observably equivalent national counterparts in 42 home labour markets in developing countries. The estimated average lower bound on this wage ratio (weighted by the working-age (15–49) population of the home countries) is 5.7 - the ratio

exceeding 16 for some developing countries in the sample. While Clemens et al. (2019) focus on the between-country dimension of the global inequality, we estimate the within-country wage inequality of native-born versus immigrant workers and compare the estimated inequalities measures between developed versus developing countries.

The report is organised as follows. Section 2 concisely explains the Blinder-Oaxaca methodology for the measurement and decomposition of the wage gap between natives and immigrants and the estimation approach of determinants of discrimination. The third section details the data that we use in the empirical analysis and the construction of variables derived from previous studies. The fourth section presents the estimated wage gaps between natives and immigrants. The last section concludes.

2.   Empirical strategy

2.1. Decomposition analysis

To decompose the observed average earnings gap between natives (N) and immigrants (I), we employ the standard Blinder-Oaxaca (B-O) decomposition technique (Blinder 1973; Oaxaca 1973; Oaxaca and Ransom 1994).[2] In our context, the B-O methodology allows to decompose the mean wage difference in two parts: one that can be explained by group differences in observable human capital factors – intrinsic productivity differences and segregation into labour market categories – and a remainder unexplained part that cannot be accounted for by differences in observable characteristics of migrants and native-born – that is differences in the estimated coefficients.

Our baseline decomposition approach is based on the classical Mincerian wage equation, which is estimated separately for each of the two groups by the Ordinary Least Squares (OLS) estimator:

$$\ln \overline{Wage}_j = \hat{\beta}_j \bar{X}_j, \qquad j \in \{N, I\}. \tag{1}$$

Following the conventional approach (e.g., Jann 2008; Budig et al. 2021), we write the two-fold decomposition of the native-immigrant wage gap as follows:[3]

$$\ln \overline{Wage}_N - \ln \overline{Wage}_I = \underbrace{(\bar{X}_N - \bar{X}_I)\hat{\beta}_N}_{Explained} + \underbrace{\bar{X}_I(\hat{\beta}_N - \hat{\beta}_I)}_{Unexplained}, \tag{2}$$

where $\ln \overline{Wage}_N$ and $\ln \overline{Wage}_I$ are the native- and immigrant-specific means of the natural logarithm of hourly wages (conditional on being employed), $\bar{X}_N$ and $\bar{X}_I$ represent the respective vectors of mean values of explanatory (Mincerian) variables for natives and immigrants (as detailed in the Data section). $\hat{\beta}_N$ and $\hat{\beta}_I$ are the corresponding vectors of coefficients estimated from separate regressions for both groups.[4]

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[2] Given that Blinder-Oaxaca may be sensitive to the choice of omitted characteristics making the results difficult to interpret, for robustness we also estimate the Oaxaca-Ransom wage differentials, where we weigh the first term of the decomposition expression using coefficient estimates from a pooled sample of all groups.

[3] In order to ensure representativeness, we consider survey weights in all our microeconomic analyses.

[4] See Elder et al. (2010) on discussing the pros and cons of different approaches of estimating the unexplained part in the B-O decomposition.

To explore results beyond the mean, we further decompose the estimated wage differential between natives (*N*) and immigrants (*I*) in each country at different quantiles of the wage distribution. To do so, we apply unconditional quantile decomposition techniques using Recentred Influence Function (RIF) regressions along with the standard B-O method (Firpo et al. 2009). By replacing the variable of interest (in our case hourly wage) with the RIF of a specific percentile, it is possible to link a distributional analysis to a standard regression framework. Given the intrinsic properties of the RIF and the necessary minimum assumptions to the error term, it is possible to model the expected value of the RIF of the percentile of interest as a linear function of a set of covariates:

$$\text{RIF}(lnWage_j, q_\tau) = X_j\beta_j(q_\tau) + u_j, \tag{3}$$

where j is the indicator of the group, q_τ is the τ-quantile of interest, X is a vector of covariates and $\beta_j(q_\tau)$ is a vector of coefficients estimated for the τ-quantile.

Equation (2) can be estimated by the OLS for the respective subpopulation and therefore it is possible to apply the B-O decomposition similarly to the decomposition presented in the baseline estimations of decomposing the difference in the quantile into two additive components, the explained component and the residual component:[5]

$$q_{N\tau} - q_{I\tau} = \underbrace{(\bar{X}_N - \bar{X}_I)\beta_N(q_\tau)}_{Explained} + \underbrace{\bar{X}_I(\beta_N(q_\tau) - \beta_I(q_\tau))}_{Unexplained}. \tag{4}$$

2.2. Unexplained wage gaps and institutions

Empirically, we complement individual-level estimates with a country-level indicative evidence (see, e.g., Guzi et al. 2021). Here we correlate the estimated wage differentials (unexplained part of the wage gap) to a set of macro-level contextual variables that are typically considered in the literature to influence earnings at the aggregate level. We do so by estimating a set of bivariate regressions:

$$\chi = \alpha + \phi z + \varepsilon, \; \forall z \in Z, \tag{5}$$

where α is a constant, z represents the considered country-level indicator of all the relevant indicators Z (see Appendix A, Table A.3, for a detailed description). Coefficient ϕ is of a particular interest, capturing the relationship between the unexplained part χ and macroeconomic contextual variable $z \in Z$. The selected country-level observables in Z are not accounted for in the B-O decomposition (i.e., not available in the LIS database) but were identified in the literature to potentially affect earnings differentials between native-born and immigrant workers.

3. Data and variable construction

Our goal is to study the labour earning of native workers in transition and developing economies vis-à-vis comparable immigrants, and to benchmark them to the relative earnings of natives in developed countries

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[5] For the empirical implementation of the RIF quantile decomposition, see e.g., Longhi et al. (2013).

vis-à-vis comparable immigrant workers. Given that the decomposition of global inequality into between-country and within-country inequality is highly sensitive to country-specific data measurement issues, in the empirical analysis we rely on large internationally harmonised microdata with 1.5 million individuals (containing both native-born and migrants from developed, transition and developing economies). The cross-country and over-time comparable data allow us to estimate the native-migrant wage gap in 21 countries over a 20-year period.

3.1. Definitions

We define as immigrants all individuals born in a foreign country with respect to the current host country as well as individuals who are (self-) defined as immigrants (the information on the country of origin is in the Luxembourg Income Study database). A closer definition is provided in Appendix A (Table A.2).

To identify structural differences (and similarities) in the wage inequality by immigration status across countries, we regroup the 21 sample countries into one of three broad categories following the United Nations World Economic Situation and Prospect (WESP) classification: developed economies, economies in transition and developing economies. For convenience, the latter two are presented together in the empirical analysis.

3.2. Luxembourg Income Study data

The empirical analysis of wage differences between native and foreign-born workers is based on a large representative survey data obtained from the Luxembourg Income Study (LIS) database.[6] A comparative advantage of the LIS microdata is the broad coverage of a large set of countries across the world and over time and a large set of representative and harmonised variables, making the results directly comparable across countries and over time. The LIS database is the largest available income database of harmonised microdata collected from more than 50 countries in Europe, North America, Latin America, Africa, Asia, and Australasia spanning over five decades. LIS datasets contain household- and individual-level records, e.g., on the labour income and wages, capital income, social security and private transfers, taxes and contributions, employment, expenditures, and demography. Most importantly, the LIS microdata also contain information on the immigration status of individuals. Unfortunately, not for every country in the LIS database we can observe the immigration status variable and some other crucial covariates necessary for the empirical analysis (e.g., hourly wages earned, employment status, education and experience, industrial sector, occupation, etc.). After a detailed screening and weighing data paucity trade-offs, we have selected a subset of 21 countries with a complete coverage of the necessary variables,[7] resulting in complete records for more than 1.5 million individuals of which around 150,000 belong to the immigrant population.

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[6] For more details about the data, see: https://www.lisdatacenter.org/our-data/lis-database/ and Appendix A and B, which provide more details about the LIS database and variables used in the empirical analysis.

[7] Austria, Brazil, Canada, Chile, Czechia, Estonia, Germany, Greece, Guatemala, Iceland, India, Ireland, Israel, Italy, Luxembourg, the Netherlands, Paraguay, South Africa, Spain, Switzerland, and the United States.

3.3. Variable construction

In the decomposition analysis, our outcome variables of interest are employment (a dummy variable taking the value of 1 if an individual is employed for wage) and the logarithm of hourly wage for the working population.[8] Both variables are constructed based on the LIS microdata. In addition to our main grouping variable of interest (migration status) and augmenting the standard Mincerian equation of earnings, we use three sets of explanatory variables, X, in the estimation of equations (1) and (3). The first set relates to intrinsic productivity differences in the value of the human capital or the ability of individuals and includes variables mostly linked to experience. In the context of immigrants, they have been documented to affect employment and wages in studies on the language abilities of immigrants (Dustmann and van Soest 2002; Hellerstein and Neumark 2003), literacy skills (Ferrer et al. 2006) or the quality and transferability of foreign education and training (Bratsberg and Ragan 2002). Following the standard decomposition literature (Blinder 1973; Oaxaca 1973), age and age squared,[9] gender, education (three categories for low, middle, and high), family composition (number of children) are our main explanatory variables related to intrinsic productivity of workers. For a robustness check, we also consider the number of years since the arrival in the receiving country as an explanatory variable.[10]

A second source of productivity and hence wage differences between natives and immigrants is the labour market segregation, i.e., a non-random sorting of employees into categories with different productivity and hence wages (e.g., Lemieux 2006 for the US, and Elliott and Lindley 2008 for the UK). This literature proposes a number of variables associated with the labour market segregation, including job types, tasks, occupational nomenclatures, firms with different technologies or capital endowments and sectors of activity. In line with this literature, we include the sector of employment and occupation[11] as explanatory variables.

3.4. Institutional characteristics

We complement the formal decomposition analysis with a narrative evidence – correlation analyses – in an attempt to associate the unexplained wage differences between native-born and immigrants by aggregated macro-level contextual variables. The aim of this exercise is to complement individual-level estimates with variables not available in the LIS database (i.e. those drives not account for in explanatory variables, X, in B-O equations (1) and (4)) with sources that have been identified in the literature to drive wage inequalities between natives and immigrants, i.e., labour market discrimination, differences in unobserved job characteristics, and differences in unobserved skills. The incidence of these factors varies strongly across countries and thus are expected to generate cross-country variation of the unexplained wage gap.

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[8] For the vast majority of countries, we observe a gross hourly wage, while for Chile, Italy, and Paraguay we can work only with a net hourly wage.

[9] In a standard Mincerian equation, the working experience is preferred. However, this information is available only for a small set of countries in the LIS database. Note that for those countries the correlation between experience and age is very strong ($\rho \approx 0.76$), therefore it seems to be justifiable to proxy experience by age.

[10] For details on definitions of all microeconomic variables entering decomposition analysis, see Appendix A (Table A.1).

[11] Details on occupational status are available only for a small set of countries. Decomposition results also controlling for occupation are available from authors upon request.

Often, the literature attributes the unexplained wage gap to a *labour market discrimination* between migrants and natives (e.g., Lehmer and Ludsteck 2011). In our context, we understand systemic discrimination as emerging from group-based differences in non-group characteristics, conditional on a measure of individual qualification and job characteristics. Depending on the fierceness of competition on output markets, the native-to-migrant wage discrimination is possible both in imperfectly competitive markets (taste-based discrimination) and competitive product markets (the statistical discrimination and social interactions and networks theories). Discrimination can be either positive (favours natives) or negative (punishes migrants).[12] To explore whether the mainstream society's attitudes towards migrants and the wage gap are related, we correlate the unexplained wage gaps and the discrimination and violence against minorities and the tolerance for immigrants indices available from the Social Progress Imperative database (for more details, see Appendix A.3).

A second source of the unexplained wage gap variation across countries has been attributed to *differences in unobserved job characteristics*. For example, there may be a penalty associated with non-standard forms of employment (e.g., temporary employment, part-time work, temporary agency work, seasonal work and dependent self-employment); workers are usually paid lower wages for non-standard forms of employment than standard jobs (e.g., Hotchkiss and Pitts 2007). This penalty is often argued to be an important source of lower wages observed for immigrants relative to native-born, as immigrants generally have a higher incidence of this form of employment (OECD/ILO 2018). Further, various other missing or unobserved between-job (e.g. occupation types in terms of tasks and duties carried out) and within-job differential factors in LIS database (e.g. performance-pay versus fixed hourly wage and skill (mis)match, the relatedness between the field of study and the occupation at the current job, complementarities/substation of tasks and skills between immigrant and native-born workers) have been shown to matter for the wage inequality (Lemieux et al. 2009; D'Amuri et al. 2010; Leuven and Oosterbeek 2011; Tang et al. 2020;). To control for unobserved job characteristics in the correlation analyses, we consider a number of proxies: (i) the ratio of foreign-born to native-born in low skill employment and high skill employment from ILOSTAT, (ii) the ratio of foreign-born to native-born workers with a temporary contract for low-skill workers and for high-skill workers from OECD and (iii) the share of migration in the total population from the United Nations Population Division (for more details, see Appendix A.3).

A wage gap variation across countries may also arise due to possible *differences in unobserved skills*, which would imply that immigrant workers have different unobserved (or omitted in the data) skills than native-born workers with the same observed characteristics, which would bias estimates based on the structure of wages for foreign-born and native-born workers (Carnevale et al. 2001; Lemieux 2006). Further, movements in the within-group inequality may also reflect market forces changing the returns to (unmeasured) skills. Changes in characteristics of labour markets affect both the demand and supply of observed and unobserved skills and

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[12] For example, natives may receive inferior wage to migrants despite having equal productivities if employers assign positive utility to migrants (in the case taste-based discrimination theory), if migrants have mean statistical productivity higher than natives (for the statistical discrimination theory) or if natives have better developed social and professional networks (for the social interactions and networks theory).

can alter wage and employment outcomes which ultimately dependents on particular country market conditions (Katz and Autor 1999). The variation of unobserved skills (or those not available in LIS database) among foreign-born and native-born workers across countries may be, among others, due to the cross-country variation in the distribution of the transferability, comparability and recognition of migrants' experience and education to the host country (e.g. over-qualification or under-qualification effects), language proficiency, literacy skills, numeracy skills or problem solving skills (Dustmann and van Soest 2002). To account for unobserved skills we use the following variables in the correlation analyses: (i) the ratio of foreign-born to native-born over-qualification rates form OECD, and (ii) the share of immigrants born in a high-income country from OECD (iii) the ratio of foreign-born to native-born in literacy, numeracy and problem solving indicators from the Programme for the International Assessment of Adult Competencies (PIAAC) database of the OECD, (iv) the ratio of immigrants not speaking the host-country language to those that do, (v) the share of immigrants that are multilingual native speakers from OECD (for more details, see Appendix A.3).

4.   Results and Discussion

4.1. Raw wage gaps between native-born and foreign-born workers

The Blinder-Oaxaca wage differentials (i.e., total wage gaps including both explained and unexplained parts) are reported in Table 1, where the earnings differentials between native-born and immigrant workers are presented in percentage points. First, notice a significant heterogeneity in the native-born/immigrant earnings differentials *between* countries in the harmonised and hence directly comparable sample. For example, whereas in Luxembourg on average native-born workers receive one third higher salary than migrant workers (+34.34%) (migrants are disadvantaged), in Brazil on average native-born workers are paid only half of what migrant workers are paid (-48.72%) (migrants are advantaged) (column '1995-2016' in Table 1).

Second, the Blinder-Oaxaca wage differentials are strikingly consistent *within* the two country groups ('developed' and 'transition/developing'). The total observed pay gap between native born and migrant workers is positive and statistically significant for all OECD economies in our sample implying that, on average, immigrant workers face a wage disadvantage in advanced economies (column '1995-2016' and top panel in Table 1). These results are in line with previous estimates for developed countries which tend to find positive native-to-migrant wage gap (e.g., Baker and Benjamin 1994; Chiswick and Miller 2008; Lehmer and Ludsteck 2011; Van Kerm et al. 2016; Longhi et al. 2013; Ruist 2013, Bertrand and Mullainathan 2004; Smith and Fernandez 2017).

Table 1: Raw native-to-migrant percent wage gap

|	Mean wage difference, %			
	1995-2016	1995-2000	2001-2010	2011-2016
Developed economies				
Austria	22.13	23.55	25.24	17.61
Canada	11.55	12.38	12.88	9.41
Czechia	2.40	7.05	3.22	-3.06
Estonia	17.16		28.15	23.33
Germany	7.53	0.74	10.21	11.63
Greece	30.76	34.63	28.16	29.50
Iceland	10.61		11.88	19.94
Ireland	8.82	5.38	5.29	15.79
Israel	12.53		21.94	15.66
Italy	18.83	5.98	22.33	28.17
Luxembourg	34.34	35.91	31.06	36.06
The Netherlands	6.27		9.39	9.43
Spain	18.82		23.47	32.98
Switzerland	4.42		7.11	6.14
The United States	10.21	10.21	11.38	9.05
Transition and developing economies				
Brazil	-48.72		-51.00	-46.45
Chile	-23.53		-29.43	-17.63
Guatemala	-36.90		-42.53	-31.28
India	-7.69		-9.66	-5.72
Paraguay	-23.85	-18.28	-30.35	-22.91
South Africa	-19.21		-20.37	-18.06

Notes: Missing values imply no LIS data are available for the specific country-period.

Source: Estimated results based on Luxembourg Income Study data.

In contrast, Blinder-Oaxaca wage differentials are negative and statistically significant for all transition and developing economies in the LIS sample, implying that, on average, the relative mean wages of immigrant workers are higher than those of native-born workers (bottom panel in Table 1). The wage disadvantage for native-born vis-à-vis immigrant workers ranges from -7.7% in India to -48.7% in Brazil. In all six analysed transition and developing economies the wage differentials have been narrowing slightly during the last two decades (see last two columns in Table 1). These results are novel, they are striking though not necessarily surprising when compared to single-country studies. For example, OECD/ILO (2018) have estimated that in South Africa, newly arrived immigrant workers increase the wage gap between native-born and immigrant workers. Gerard et al. (2021) have estimated negative wage gaps between non-whites natives and whites in Brazil in a range of 27% to 33%.

The methodological consistency of the LIS harmonised data across countries and over time allows us to comparably assess both the inter-national and inter-temporal dimension of labour earnings inequality by immigration status. Columns 3-5 in Table 1 and bold lines in Figure 1 report the development of the relative mean wages of immigrant workers vis-à-vis native-born workers during the last two decades. The difference-in-differences perspective suggests that the mean wage gap of immigrant workers vis-à-vis native-born workers has remained of the same order of magnitude in most developed economies (top panel in Table 1). A similar pattern can be observed for most transition and developing economies in our sample – the mean wage differential of immigrant workers vis-à-vis native-born workers has changed (narrowed) little (bottom panel in Table 1).

Figure 1: Raw native-to-migrant percent wage advantage in developed economies and transition/developing economies
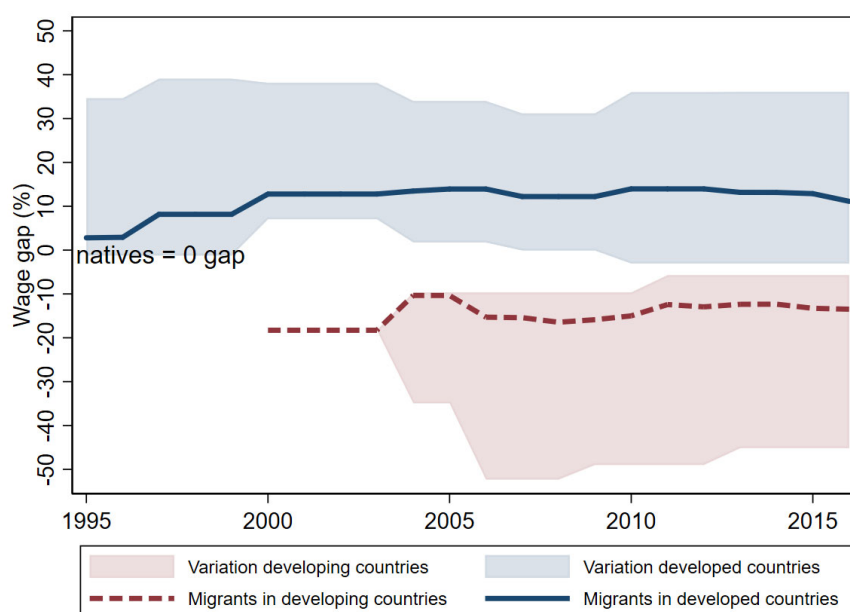
Notes: Positive wage gap indicates the percentage by which the wages of native-born workers exceed those of the foreign-born.

Source: Estimated results based on Luxembourg Income Study data for wage gaps and the UN Population Division, Trends in Total Migrant Stock data for migrant population weights used to calculate the mean wage gap for the two country groups.

Capturing both dimensions, Figure 1 plots a weighted average of these inequality trends between foreign-born and native-born workers across developed economies (solid line) and economies in transition and developing economies (dashed line). Indeed, the average wage inequality trends (solid and dashed lines in Figure 1) and the cross-country wage dispersion (shaded area in Figure 1) have changed insignificantly during the last 15 years.

It is a well-established in the literature that the average earnings of immigrants differ from those of natives, among others, depending on the migrant country of origin and time spent in the host country (e.g., Adsera and Chiswick 2007). In order to investigate the impact of the length of immigrant experience in the host country,

we split our sample into three cohorts: migrants having lived in the host country less than 10 years, 10-15 years and more than 15 years.[13] The estimated native-born/immigrant wage differentials for each cohort are reported in Table 2.

Table 2: Time in the host country and the percent native-to-migrant wage gap

	Mean wage difference, %		
	<10 years	10-15 years	>15 years
Developed economies			
Austria	20.96	18.16	12.93
Canada	26.87	18.74	1.00
Estonia	4.61	8.64	26.53
Germany	28.98	20.75	2.35
Greece	50.29	33.59	19.07
Ireland	12.22	14.16	4.56
Israel	53.89	32.42	0.71
Italy	35.57	28.27	15.01
Luxembourg	37.05	35.10	25.54
Switzerland	5.36	6.80	7.27
The United States	26.12	15.27	-4.24
Transition and developing economies			
Chile	-12.11	-20.19	-34.45
Guatemala	-4.06	-44.36	-14.35
South Africa	-35.05	-0.62	-16.84

Notes: Missing data on the immigrant time in the host country for Brazil, Czechia, Iceland, India, the Netherlands, Paraguay, Spain.

Source: Luxembourg Income Study data.

The wage differentials by the length of experience in the host country suggest a sizeable heterogeneity in the LIS sample (Table 2). Both the sign and magnitude of the impact of the time spent in the host country on wage differentials between native-born and migrant workers differ substantially *between* sample countries. At the same time, we can observe a remarkably consistent pattern *within* the *developed country* sub-sample (Austria, Canada, Germany, Greece, Ireland, Israel, Italy, Luxembourg, the United States), where the relative mean wages of immigrants vis-à-vis the native-born decrease in the time spent in the host countries. Estonia and Switzerland are the only developed economies in our sample where the native/immigrant wage differentials are widening – even after longer time periods spent in the host country the immigrant wage disadvantage remains substantial, suggesting that integration may be more challenging for foreigners in Estonia (mainly Russian-speaking immigrants opting not to integrate for ideological reasons, see, e.g. Kielyte

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[13] Note that information on years of residence is available only for a subset of countries.

and Kancs 2002) and Switzerland (which is known for its tough stance on immigrants) compared to other developed economies (see, e.g. Hainmueller and Hangartner 2013).[14] In contrast, the wage gap does not seem to be considerably decreasing in the time immigrants have spent in the host transition and developing economies (Chile, Guatemala, South Africa).

4.2. Unexplained wage gap: controlling for productivity differences

A significant part of differences in labour market outcomes between heterogeneous groups of workers can be explained by productivity differences. In the Blinder-Oaxaca decomposition, we control for two sources of productivity differentials between immigrants and native-born: intrinsic productivity differences between immigrants and native-born within the same category (age, gender, education, experience, family composition) and sorting into labour market categories with a differentiated productivity (sector of employment, occupation). Controlling for these sources of productivity differences yields a robust estimate of the explained part of the Blinder-Oaxaca wage differentials. The residual (unexplained) wage gaps between native-born and immigrants and its development over time, after controlling for the observable intrinsic and segregation related characteristics are reported in Table 3. Figure 2 displays the size (share) of the unexplained wage gap relative to the total wage gap and in comparison with the explained gap.

The Blinder-Oaxaca decomposition results suggest that, after controlling for productivity differentials, the native-to-migrant percent wage advantage becomes smaller in most countries. The exceptions are Iceland, the Netherlands, Estonia and Israel where the productivity differentials (the explained wage gaps) tend to magnify the immigrant worker wage advantage relative to the native-born workers, while the unexplained wage gap remains the major source of the total wage gap (compare Table 1 and Table 3; Figure 2). Overall, the unexplained wage gap remains sizeable in most countries even after controlling for productivity differentials. Its share in the total wage gap varies between 34% and 127% in developed countries and between 28% and 78% in transition and developing economies. With few exceptions (i.e., Germany, the United States, Paraguay), the share of the unexplained wage gap in the total wage gap is greater in developed economies than in transition/developing economies (Figure 2).

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[14] Hainmueller and Hangartner (2013) document the immigrant discrimination and foreigner integration difficulties in Switzerland using a natural experiment.

**Table 3: Native-to-migrant percent unexplained wage gap after controlling for productivity differentials**

	Mean wage difference, %			
	1995-2016	1995-2000	2001-2010	2011-2016
Developed economies				
Austria	16.81	19.34	17.92	13.18
Canada	9.37	10.49	10.64	6.97
Czechia	1.90	4.95	2.01	-1.25
Estonia	21.42		23.40	19.44
Germany	2.58	-0.49	3.03	5.20
Greece	23.05	31.31	20.71	17.14
Iceland	13.52		9.83	17.20
Ireland	6.50	2.46	4.48	12.56
Israel	14.70		17.41	11.99
Italy	11.39	4.88	11.74	17.56
Luxembourg	23.67	19.36	21.96	29.68
The Netherlands	7.83		7.88	7.78
Spain	16.33		15.52	17.14
Switzerland	3.16		3.10	3.22
The United States	3.43	2.95	3.54	3.79
Transition and developing economies				
Brazil	-21.13		-20.35	-21.91
Chile	-11.64		-14.81	-8.47
Guatemala	-21.83		-28.53	-15.13
India	-2.13		-2.08	-2.17
Paraguay	-18.69	-13.29	-23.27	-19.51
South Africa	-6.07		-1.04	-11.09

Notes: Missing values imply no LIS data are available for the specific country-period.

Source: Luxembourg Income Study data.

We observe a sizeable heterogeneity in the magnitude of the unexplained wage gap across the LIS sample countries (column '1995-2016' in Table 3), the cross-country heterogeneity being persistent both *between* and *within* country groups. The unexplained wage gap remains positive for most developed economies and negative for all studied transition and developing economies. In other words, the unexplained factors cause mean wages of immigrant workers to be lower (higher) than those of the comparable native-born workers in developed countries (transition and developing economies). Figure 3 plots the weighted average unexplained inequality trends between foreign-born and native-born workers for developed economies (solid line) and transition and developing economies (dashed line). The unexplained wage inequality trends (lines in Figure 3) and the cross-country wage dispersion (shaded areas in Figure 3) have increased slightly during the last decade.

Figure 2: Distribution of explained and unexplained wage differentials (at the mean) between natives and immigrants across countries (1995-2016, total gap = 100%)
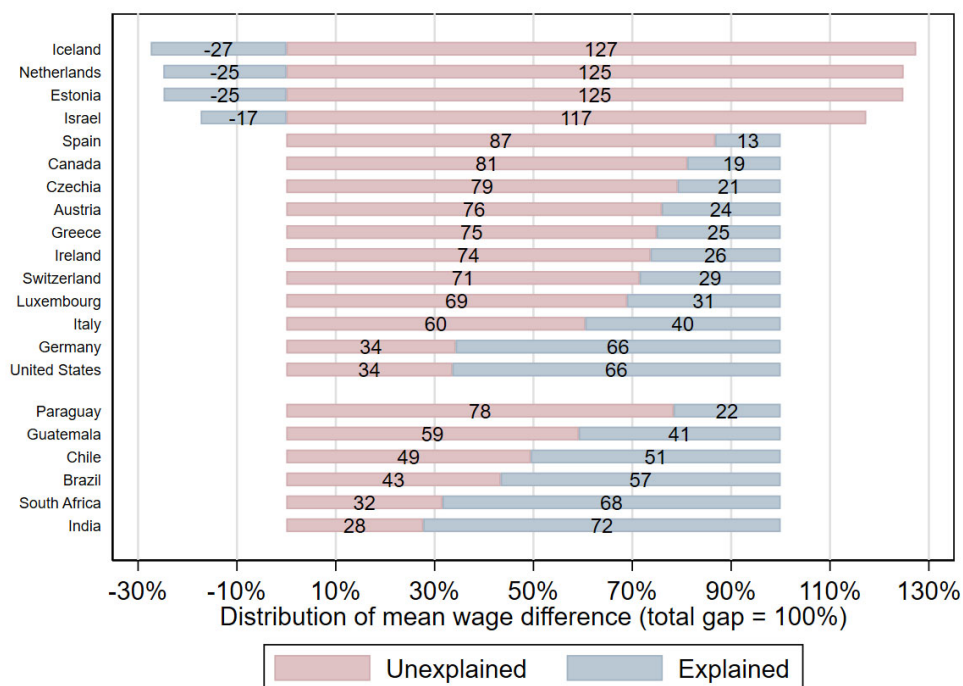

Note: Distribution of wage gaps are sorted according to the size (share) of unexplained wage gap within the two country groups.

Source: Luxembourg Income Study data.

Further, we observe a decrease in the unexplained wage gap in the time spent by migrants in the host countries in most developed countries with the exception of Canada and Switzerland. In contrast, the unexplained wage gap does not seem to be considerably decreasing with the immigrants' time spent for the host transition/developing economies (Chile, Guatemala, South Africa) (Table 4).

Overall, results reported in Table 3, Table 4 and Figure 3 suggest that vis-à-vis workers born in developed economies, the pay for workers born in transition and developing economies is discounted both in their home country labour markets and – if migrating – also in developed host countries. The opposite is true for workers born in developed countries – the estimated Blinder-Oaxaca unexplained wage differentials are positive (negative) vis-à-vis workers born in developing economies in home country (in transition and developing economies).

Figure 3: Native-to-migrant percent unexplained wage gap after controlling for productivity differentials in developed economies and transition/developing economies
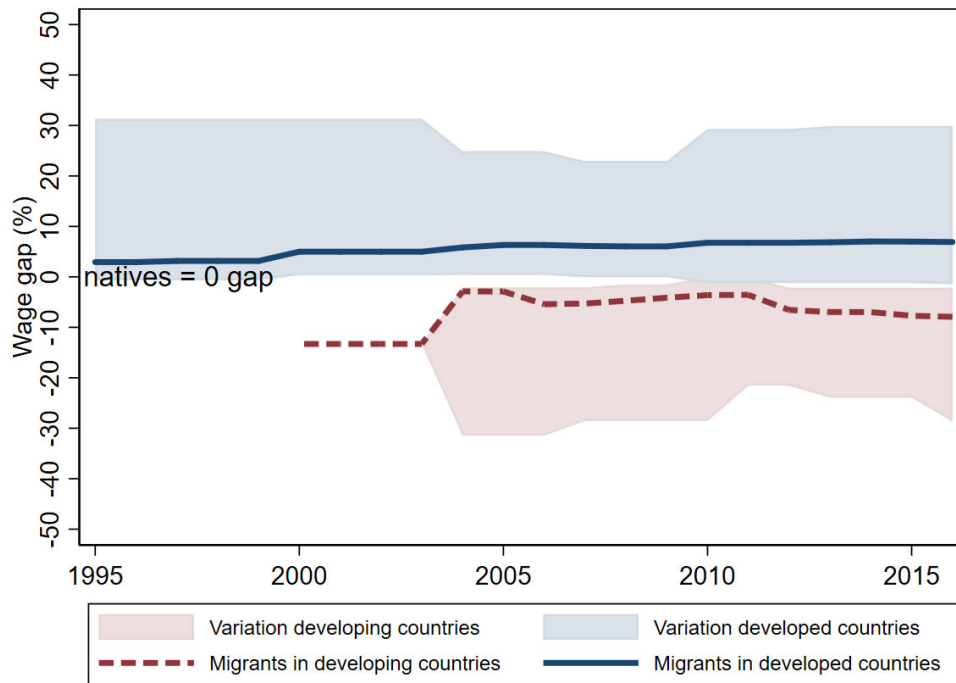
Notes: Positive wage gap indicates the percentage by which the wages of native-born workers exceed those of the foreign-born.

Source: Luxembourg Income Study data for wage gaps and the UN Population Division, Trends in Total Migrant Stock data for migrant population weights used to calculate the mean wage gap for the two country groups.

Table 4: Time in the host country and percent unexplained wage gap

	Mean wage difference, %		
	<10 years	10–15 years	>15 years
Developed economies			
Austria	12.93	9.30	6.59
Canada	16.34	11.88	0.56
Estonia	2.89	4.36	16.61
Germany	15.97	12.72	1.59
Greece	27.76	17.77	12.89
Ireland	6.17	7.12	2.84
Israel	28.62	18.71	0.50
Italy	18.75	17.98	8.09
Luxembourg	21.27	19.97	17.70
Switzerland	3.47	4.06	4.26
The United States	15.83	10.26	2.90
Transition and developing economies			
Chile	-8.40	-13.55	-20.67
Guatemala	-2.38	-23.47	-9.70
South Africa	-19.84	-0.41	-9.41

Notes: Missing data on the immigrant time in the host country for Brazil, Czechia, Iceland, India, the Netherlands, Paraguay, Spain.
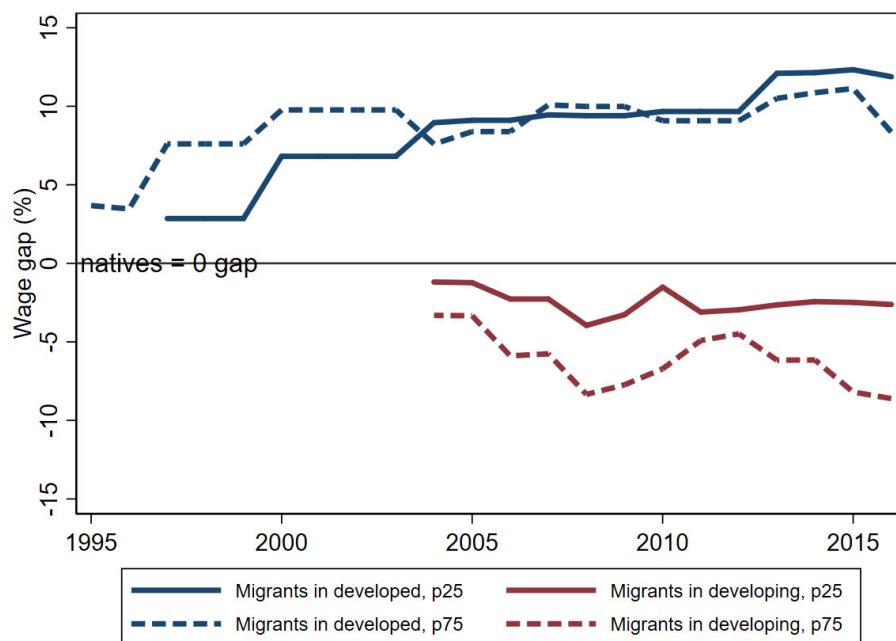
Source: Luxembourg Income Study data.

4.3. Robustness and further analysis

The analyses in sections 4.1 and 4.2 have focused on computing results obtained from the decomposition of wage differences at the mean. As already introduced in Section 2, we further explore the robustness of our results beyond the mean and decompose the wage gaps at different parts of the wage distribution, namely: p25, p50, and p75. A summary of findings from the quantile decomposition is presented in Figure 4.[15]

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[15] Full results obtained from the quantile decomposition are available from authors upon request.

Figure 4: Native-to-migrant percent unexplained wage gap at different parts of distribution after controlling for productivity differentials

Notes: A positive wage gap indicates the percentage by which the wages of native-born workers exceed those of the foreign-born.

Source: Luxembourg Income Study data for wage gaps and the UN Population Division, Trends in Total Migrant Stock data for migrant population weights used to calculate the mean wage gap for the two country groups.

Results from the quantile decomposition confirm the baseline results from the mean decomposition: vis-à-vis workers born in developed countries, the pay for workers born in transition and developing economies is discounted both in their home country labour markets and – if migrating – also in developed host countries. However, we can observe two opposite trends between developed and developing/transition economies. While in developed countries we observe larger (unexplained) gap at the bottom of the wage distribution (p25), developing/transition economies exhibit a large (negative) gap in the upper part of the wage distribution (p75). Furthermore, we can observe some divergence over the time, especially among developing/transition countries.

## 4.4. Unexplained wage gaps and institutions

As established in the previous section, the unexplained wage gap varies significantly between countries even within a sample of economies with a comparable wage structure, implying that other sources of wage differentiation must be present given the persistence of the unexplained wage inequalities. Here we provide a suggestive evidence of cross-country differences in the labour market discrimination, unobserved job characteristics, and unobserved skills.

Our correlation analyses of *discrimination* contribute a nuanced empirical support to the link between labour market discrimination against migrants and wage gap. The discrimination and violence against minorities exhibit a negative correlation with the unexplained wage gap in the developing country sub-sample, while the

tolerance for immigrants does not seem to be correlated among countries (Figure 5, Panels A and B). When considering developed countries, the respective correlations become slightly positive for the first but negative for the second index. These results are in line with the extant literature (Lehmer and Ludsteck 2011), suggesting the presence of systemic discrimination in developed countries where the native-migrant unexplained wage is positive.

The correlation analyses of cross-country variation in the migrant worker occupational concentration contribute a direct empirical support to the link between *unobserved job characteristics* and wage gap. Figure 5 (panel C) shows that the unexplained wage gap is positively correlated with the ratio of the share of foreign-born to native-born in low-skill employment but negatively related to high-skill employment. The unexplained wage gap increases in the share of migrants in low skill jobs compared to native workers. These results are consistent with previous findings (D'Amuri et al. 2010; Card et al. 2018) and provide a suggestive evidence that the occupational concentration by immigrant status and skill level may explain a significant fraction of the wage gap.

Figure 5: Correlations between the unexplained wage gap and discrimination (A, B) and job characteristics (C, D)
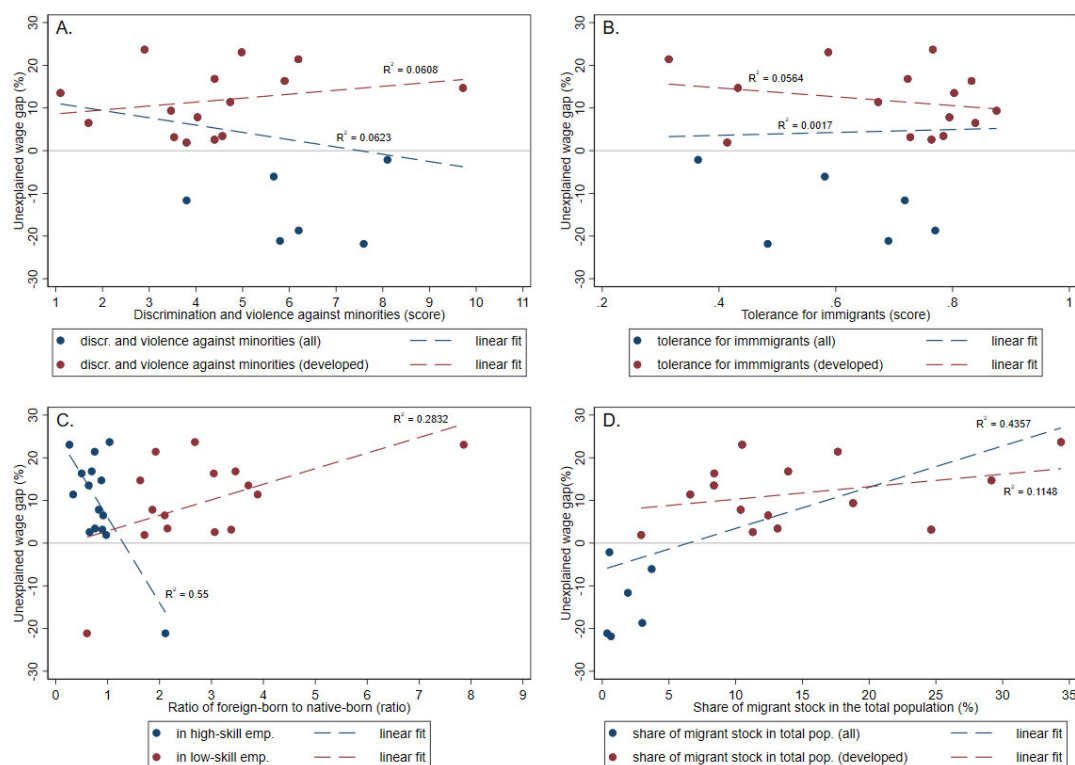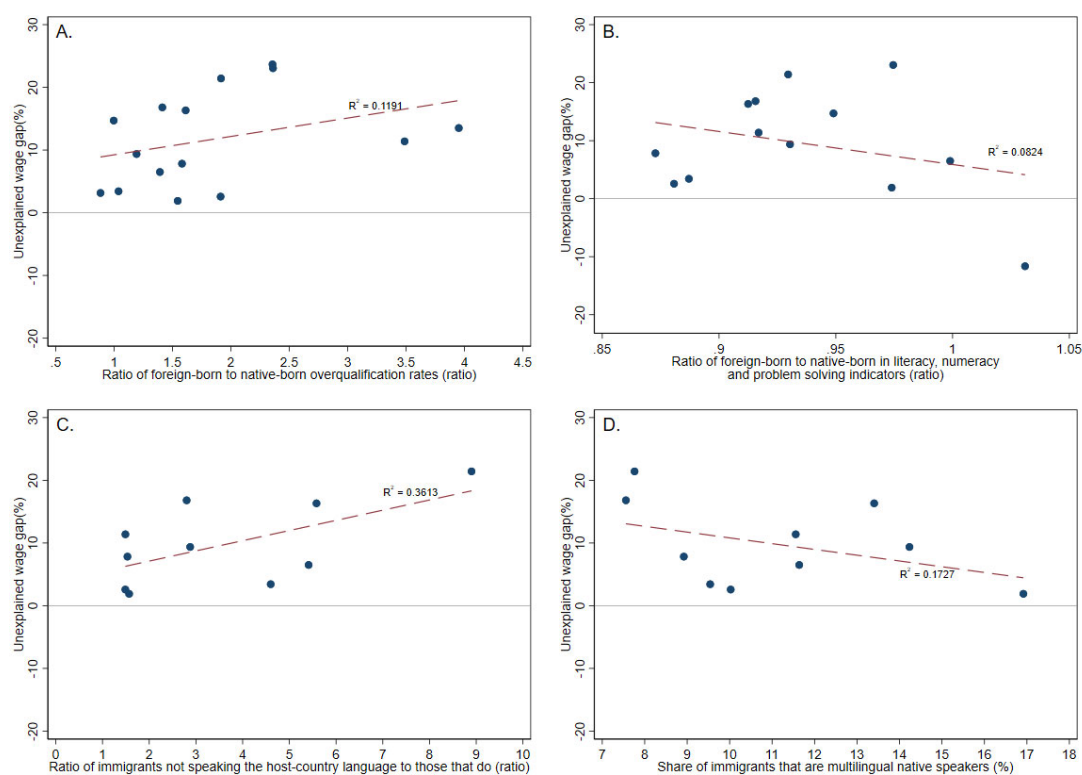

Source: Unexplained wage gaps estimated based on Luxembourg Income Study data as reported in Table 3; the Discrimination and violence against minorities score (panel A) and the tolerance for immigrants score (panel B) from the Social Progress Imperative, and the Social Progress Index, (www.socialprogressindex.com/resources) calculated as average values over the available years between 2004-2016; the ratios of foreign-born to native-born in low skill employment and high skill employment are from ILOSTAT, International labour migration statistics (ILMS) (ilostat.ilo.org/topics/labour-migration/) and are calculated as average values over the available years between 2010-2016 (panel C); the share of migrant

stock in the total population is average for 1995-2015 extracted from the International migrant stock 2019 – United Nations Population Division (panel D).

Our correlation analyses of cross-country variation in over-qualification rates between foreign-born and native-born workers contribute a direct empirical support to the link between *unobserved skills* and wage gap. The unexplained wage gap is increasing in the ratio of foreign-born to native-born over-qualification rates in developed countries (Figure 6, panel A). This indicates an imperfect transferability of migrant skills (education and experience) from their home to the host country. Skills acquired in the home country may fail to signal the true qualifications and serve an effective screening device of migrants' skills to employers in the host country. These results are in line with previous findings (e.g., Dustmann and van Soest 2002; Bratsberg et al. 2006; Izquierdo et al. 2009; Lehmer and Ludsteck 2011; Valentine et al. 2021).

Figure 6: Correlations between the unexplained wage gap and unobserved skills

Source: Unexplained wage gaps estimated based on Luxembourg Income Study data as reported in Table 3; the ratio of foreign-born to native-born over-qualification rates are from OECD (2015a) and are calculated as average values over the available years between 2012-2013 (panel A); the ratio of foreign-born to native-born in literacy, numeracy and problem-solving indicators is calculated based on OECD PIAAC data for 2012 (panel B); the ratio of immigrants not speaking the host-country language to those that do is calculated based on 2012 data from OECD (2015a) (panel C); the share of immigrants that are multilingual native speakers for 2012 is extracted from OECD (2015a) (panel D).

Figure 6 (panel B) further indicates a positive correlation between the gap in the literacy, numeracy and problem-solving skills, and the unexplained wage gap, suggesting that differences in these unobserved skills in LIS database that are relevant for social and professional performance in the host country may contribute to the observed pay gap between native born and migrant workers. Similarly, migrant-native discrepancies in language proficiency are an important cause of wage inequalities (Carnevale et al. 2001; Dustmann and van

Soest 2002). Figure 6 (panels C and D) confirm the positive correlation between the unexplained wage gap and language skills of migrants in OECD countries. This evidence suggests that migrants' knowledge of the host-country's language (panel C) and migrants' multilingual skills (panel D) reduce the wage differential with respect to natives.

5.   Conclusions

We have estimated the relative labour earnings and compared wages of natives in developing countries vis-à-vis migrants (from other developing and from developed countries), and wages of natives in developed countries vis-à-vis migrants (from other developed and from developing countries). To ensure an inter-country and inter-temporal consistency and comparability of estimates, our empirical analysis has leveraged a large internationally harmonised microdata – the Luxembourg Income Study – covering 21 countries, 20 years and 1.5 million individuals. Employing counterfactual decomposition techniques of Blinder and Oaxaca, we have decomposed the native-to-migrant wage inequality in an explained part (originating mainly from differences in productivity-related characteristics) and a residual (usually referred to as the unexplained) part. After accounting for a rich set of productivity-related characteristics of workers and jobs, 28% and more (depending on the country) of the unexplained wage inequality still remained.

Summarising our findings, vis-à-vis workers born in developed economies the pay for workers born in transition and developing economies is discounted both in their home country labour markets and – if migrating – also in developed host country labour markets. The estimated Blinder-Oaxaca wage differentials suggest the opposite holds for workers born in developed countries – their wages are higher not only in developed countries but for migrants also in developing host countries. These results are novel and have not been reported for developing countries in a cross-country setup. Our estimates also show that in the developed country sub-sample, the mean immigrant wage disadvantage has remained nearly unchanged over the last two decades both in terms of the trend and variance. The magnitude and growth rate of the mean wage gap for the transition/developing economies sub-sample is similar to developed economies though with the opposite sign – native-born workers in developing countries systematically receive lower wages than foreign-born workers. During the two decades, the unexplained wage gap – attributable to the labour market discrimination, differences in unobserved job characteristics, variation in unobserved skills and the institutional framework of labour market – has remained at a non-trivial magnitude.

Complementing the quantitative microanalysis, we have also provided a narrative evidence of the unexplained gap of native-born wages vis-à-vis immigrants and attempted to relate potential explanations to the key sets of factors identified in the literature: group differences in the labour force attachment due to labour market discrimination, differences in unobserved job characteristics, and differences in unobserved skills. Correlation analyses suggest that labour market discrimination is not of a first-order importance in the link between cross-country variation in the unexplained wage gap – in contrary to an often speculated determinant. A more important factor driving the cross-country variation of unexplained native-to-migrant wage gaps appear to be the cross-country variation in unobserved job characteristics (e.g., distribution between native-born and foreign-born workers by skill levels, temporary contract, complementarities between immigrant and native

workers and/or wage competition) and unobserved skills among foreign-born and native-born workers (e.g., imperfect transferability of migrants' skills, language proficiency, literacy skills, numeracy skills or problem solving skills, time spent in the host country by migrants). These results provide a robust cross-country evidence strengthening previous literature findings based on single country data.

Despite that at the individual level many labour migrants experience a significant increase in their income when they move from a developing home country to a developed host country, a differentiated pay for the same work offered by different socio-economic groups does not exclude untapped potential of economic gains at the aggregated level. In addition to ethical and social considerations, lower demand and lower wages for equally productive foreign workers results in a waste of valuable human capital resources. Our findings contribute to the growing body of literature that shows that eliminating distortions in the allocation of talent can result in sizeable productivity and welfare gains. For example, Hsieh et al. (2019) estimate large gains for the U.S. between 1960 and 2010 – their study focuses on race- and gender-based distortions. Kancs and Lecca (2018) find that although the immigrant integration (e.g., by the providing language and professional training) is costly for the host country budget, in the medium- to long-run, the social, economic and fiscal benefits can significantly outweigh the short-run immigrant integration costs in the EU.

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List of abbreviations and definitions

B-O   Blinder-Oaxaca

EU   European Union

ILO   International Labour Organization

LIS   Luxembourg Income Study

OECD   Organisation for Economic Co-operation and Development

UK   United Kingdom

US   United States

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Appendix

Appendix A: Data and variable construction

Table A.1: Country sample used in the empirical analysis

Country	Wave IV (~ 1995)	Wave V (~ 2000)	Wave VI (~ 2004)	Wave VII (~ 2007)	Wave VIII (~ 2010)	Wave IX (~ 2013)	Wave X (~ 2016)
Austria (AT)	AT 97 (1,778/189)	AT 00 (1,011/44)	AT 04 (3,154/499)	AT 07 (4,048/759)	AT 10 (4,575/843)	AT 13 (4,158/812)	AT 16 (4,343/866)
Brazil (BR)				BR 06 (71,379/170)	BR 09 (75,380/168)	BR 13 (71,694/204)	
Canada (CA)		CA 00 (5,298/1,396)	CA 04 (5,444/1,368)	CA 07 (5,178/1,413)	CA 10 (4,681/1,380)		
Chile (CL)				CL 06 (43,143/407)	CL 09 (39,495/420)	CL 13 (42,719/1,045)	CL 15 (53,314/1,639)
Czechia (CZ)	CZ 96 (25,925/80)		CZ 04 (3,549/44)	CZ 07 (7,564/73)	CZ 10 (6,887/69)	CZ 13 (6,162/68)	
Estonia (EE)				EE 07 (4,179/903)	EE 10 (3,668/637)	EE 13 (4,282/753)	
Germany (DE)	DE 95 (4,615/1,079)	DE 00 (8,403/1,308)	DE 04 (7,939/1,194)	DE 07 (7,776/1,022)	DE 10 (12,200/1,699)	DE 13 (10,079/1,898)	DE 15 (9,097/2,942)
Greece (GR)	GR 95 (1,998/96)		GR 04 (2,165/275)	GR 07 (1,102/110)	GR 10 (1,292/141)	GR 13 (1,959/156)	
Guatemala (GT)				GT 06 (4,934/43)	GT 11 (7,416/36)	GT 14 (12,799/42)	
Iceland (IS)			IS 04 (3,781/220)	IS 07 (3,410/268)	IS 10 (3,296/211)		
India (IN)			IN 04 (34,328/330)		IN 11 (37,902/433)		
Ireland (IE)	IE 96 (1,567/107)	IE 00 (1,595/86)	IE 04 (3,000/391)	IE 07 (2,915/393)	IE 10 (2,166/523)		
Israel (IL)				IL 07 (2,784/1,903)	IL 10 (3,383/1,915)	IL 14 (5,162/2,466)	IL 16 (5,659/2,390)
Italy (IT)	IT 95 (4,431/99)	IT 00 (4,338/148)	IT 04 (4,033/305)	IT 08 (3,909/475)	IT 10 (3,763/487)	IT 14 (3,375/476)	
Luxembourg (LU)	LU 97 (1,173/850)	LU 00 (975/982)	LU 04 (1,268/1,739)	LU 07 (1,217/2,827)	LU 10 (2,279/3,153)	LU 13 (1,706/2,258)	
The Netherlands (NL)			NL 04 (3,504/201)	NL 07 (4,448/223)	NL 10 (4,184/244)	NL 13 (4,132/225)	
Paraguay (PY)		PY 00 (5,882/376)	PY 04 (5,700/289)	PY 07 (3,985/141)	PY 10 (4,283/163)	PY 13 (5,095/156)	PY 16 (8,475/323)
South Africa (ZA)				ZA 08 (3,087/121)	ZA 10 (3,748/43)	ZA 12 (4,319/79)	
Spain (ES)			ES 04 (6,750/508)	ES 07 (10,385/1,083)	ES 10 (7,730/680)		

	US 97	US 00	US 04	CH 07 / US 07	CH 10 / US 10	CH 13 / US 13	US 16
Switzerland (CH)				CH 07 (4,923/1,665)	CH 10 (4,643/1,721)	CH 13 (4,598/1,471)	
The United States (US)	US 97 (48,445/8,158)	US 00 (81,076/13,761)	US 04 (75,339/13,858)	US 07 (73,880/14,962)	US 10 (68,487/14,881)	US 13 (47,018/11,022)	US 16 (64,115/14,835)

Note: Under each country we show the number of native/foreign born population. In our empirical analysis, the total number of natives across countries sums to 1,453,344 individuals, while the total number of immigrants across countries sums to 154,916 individuals.

Source: Luxembourg Income Study data.

Table A.2: Variable definition used in the decomposition analysis

Variable	LIS code	Description
Immigration status	IMMIGR	All persons who have that country as country of usual residence and (in order of priority): • whom the data provider defined as immigrants • who self-define them-selves as immigrants • who are the citizen/national of another country • who were born in another country
Hourly wage	GROSS1/NET1	Gross/net basic hourly wage rate for the main job. Overtime payments, bonuses and gratuities, family allowances and other social security payments made by employers, as well as ex gratia payments in kind supplementary to normal wage rates, are all excluded from the calculation of the basic gross hourly wage
Employment status	EMP	Indicator of an employment activity in the current period
Industry	INDA1	Industry classification of the main job into 3 categories: • agriculture • industry • services
Years of residence	YRSRESID	Cumulative number of years of residence in the country
Education	EDUC	Highest completed level of education: • low: less than secondary education completed (never attended, no completed education or education completed at the ISCED levels 0, 1 or 2) • medium: secondary education completed (completed ISCED levels 3 or 4) • high: tertiary education completed (completed ISCED levels 5 or 6)
Gender	SEX	Classification of persons according to their sex
Age	AGE	Age in years. Note that when original data provide age in intervals, values given are the lowest value of the interval. For example, the intervals 10-14 and 15-19 are coded as 10 and 15, respectively
Children	NCHILDREN	Number of own children living in household

Source: Luxembourg Income Study data.

Table A.3: Institutional macro-level variables

Variable	Source	Period covered	Country groups covered	Definition
Labour market discrimination				
Discrimination and violence against minorities index	Social Progress Imperative, Social Progress Index	Average 2004-2016 over available years	DC and TDC	The index captures discrimination, powerlessness, ethnic violence, communal violence, sectarian violence, and religious violence, measured on a scale on 0 (low pressures) to 10 (very high pressures)
Tolerance for immigrant score	Social Progress Imperative, Social Progress Index	Average 2004-2016 over available years	DC and TDC	The percentage of respondents answering yes to the question, "Is the city or area where you live a good place or not a good place to live for immigrants from other countries?" It takes values between 0 (=low tolerance) and 100 (=high tolerance).
Job characteristics				
Ratios of foreign-born to native-born in low skill employment	ILOSTAT, International labour migration statistics (ILMS) (https://ilostat.ilo.org/topics/labour-migration/)	Average 2010-2016 over available years	DC	Skill levels considered represent occupation categories based on the International Standard Classification of Occupation (ISCO) as follows. Skill level 1 (low): elementary occupations. Skill levels 3 and 4 (high): legislators, senior officials and managers; professionals; technicians and associate professionals (ILOSTAT 2020)
Ratios of foreign-born to native-born in high skill employment				
Ratio of foreign-born to native-born workers with a temporary contract for low educated workers	OECD (2015a)	Average 2012-2013 over available years	DC	The ratio is calculated as foreign-born to native-born workers with a temporary contract represented as percentages of total employment, (persons aged 15-64 not in education)
Ratio of foreign-born to native-born workers with a temporary contract for highly educated workers				
Share of migrant stock in the total population	United Nations Population Division, International migrant stock 2019	Average 1995-2015	DC and TDC	International migrant stock as a percentage of the total population (both sexes)
Unobserved skills				
Ratio of foreign-born to native-born overqualification	OECD (2015a)	Average 2012-2013 over available years	DC	Ratio of foreign-born to native-born overqualification rates among 15-64 year-olds who are not in education. Overqualification rate is defined as the share of people with tertiary-level qualifications who work in a job that is classified as low- or medium-skilled by the International Standard Classification of Occupations (OECD 2015a)
Share of immigrants born	OECD (2015a)	Average 2010-2011	DC and one TDC	Percentage immigrant populations aged 15 to 64 years old and born in a

Variable	Source	Period covered	Country groups covered	Definition
in a high-income country		over available years		high-income country of the total immigrant population
Ratio of foreign-born to native-born in literacy, numeracy and problem solving indicators	OECD, PIAAC	2012	DC and one TDC	The ratio of foreign-born to native-born in literacy, numeracy and problem solving is calculated as a simple average over the individual foreign-born to native-born ratios of indicators for literacy, numeracy and problem solving
Ratio of immigrants not speaking the host-country language to those that do	OECD (2015a)	2012	DC	The ratio of the share of immigrants not speaking the host-country language at home or are monolingual native speakers to the share of immigrants who host-country language most often spoken at home
Share of immigrants that are multilingual native speakers	OECD (2015a)	2012	DC	The share of immigrants who are multilingual native speakers

Notes: DC: developed countries; TDC: transition and developing countries.

Source: own processing based on existing data sources.

Proxies constructed to control for unobserved job characteristics: (i) the ratio of foreign-born to native-born in low skill employment and high skill employment from ILOSTAT, (ii) the ratio of foreign-born to native-born workers with a temporary contract for low-skill workers and for high-skill workers from OECD and (iii) the share of migration in the total population from the United Nations Population Division. The first set of variables provide an additional description of job characteristics in terms of tasks and duties associated with occupations which is more detailed compared to the occupation variable used in the B-O estimations which controls for the sector of employment (i.e., industry classification). The second set of variables account for inferior (non-standard) forms of employment, which typically feature lower pay and fewer benefits and is more widespread among migrants than natives. The non-standard forms of employment include, among others, temporary employment, part-time work, temporary agency work, seasonal work and dependent self-employment (Hotchkiss and Pitts 2007; ILO 2015, 2016; OECD 2015b; OECD/ILO 2018). With the share of migration in the total population variable we attempt to proxy the complementarity effect between immigrants and native workers in production. The complementarity effect emerges when immigrants and natives are imperfect substitutes in the production process, e.g., due to different skills, occupation segregation, etc., which may lead to raise in demand for complementary production tasks and skills of natives and thus enhance their wage or may rise price competition among migrant workers and exercise a downward pressure on their wages (D'Amuri et al. 2010; Manacorda et al. 2012; Ottaviano and Peri 2012).

Proxies constructed to control for account for unobserved skills: (i) the ratio of foreign-born to native-born over-qualification rates form OECD, and (ii) the share of immigrants born in a high-income country from OECD (iii) the ratio of foreign-born to native-born in literacy, numeracy and problem solving indicators from the Programme for the International Assessment of Adult Competencies (PIAAC) database of the OECD, (iv)

the ratio of immigrants not speaking the host-country language to those that do, (v) the share of immigrants that are multilingual native speakers. The first variable aims to capture imperfect transferability of migrants' skills from their origin to the destination country which is not straightforward to observe or measure in practice and it is usually unavailable in the standard datasets (including in the LIS database). The second variable measures the distance in unobserved skills (e.g., the quality of education and experience) between the labour force in home and host countries. The third variable accounts for unobserved human capital characteristics related to literacy, numeracy and problem-solving skills relevant for social and professional performance in the host country. The fourth and fifth variables aim to measure language proficiency of immigrants.

Appendix B: Validity of migrant share in the LIS database

To distinguish between the two labour market groups of interest – natives and immigrants – we use the individual's immigration status in the decomposition analysis. Unfortunately, the LIS data are not representative at the level of immigration status by country. To examine how similar our dataset is to administrative migration data, Figure B.1 presents the immigration rates obtained from the LIS database and corresponding figures from the World Development Indicators (WDI) database. By comparing the two data sources, we can conclude that – with the exception of Luxembourg – the immigration rates constructed from the two data bases are highly correlated. Overall, the LIS data appear broadly comparable to administrative migration data, validating the use of the LIS data for our purpose. This also addresses the concern that sensitive information such as the ethnicity or immigration status might be under-represented in survey-based individual-level data (see, e.g., Ciaian et al. 2018).

Figure B.1: Correlation of immigration rates in the LIS data with the World Bank data (around 2009/2010)
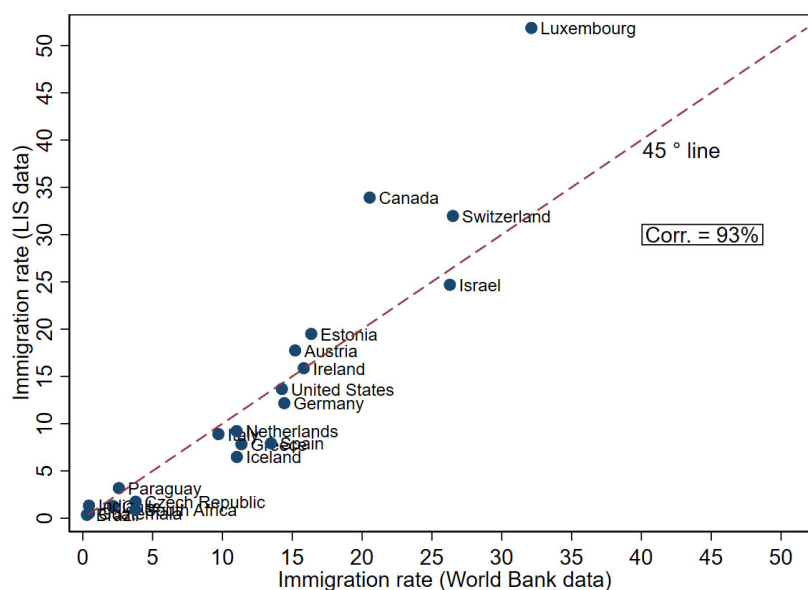
To further validate the LIS migration database, we compare the international migrant stocks in the UN censuses data with migrant stocks in LIS survey data. Data on international migrant stocks are extracted from the United Nations Population Division, Trends in Total Migrant Stock, where international migrant stock denotes the number of people born in a country other than that in which they live; it also includes refugees. The UN underlying data used to estimate the international migrant stock at a particular time are obtained from population censuses. The estimates are derived from the data on foreign-born population – people who have residence in one country but were born in another country. When data on the foreign-born population are not available, data on foreign population – that is, people who are citizens of a country other than the country in which they reside – are used as estimates.

As shown in Table B.1, at the aggregate country-group-level, the LIS data are well comparable to the UN censuses data. For example, in the 2011-2016 period, 68.6% of migrants to developed countries originated from developing countries whereas 31.4% originated from developed countries – according to the LIS data. According to the UN censuses data, the respective shares for the same period were 62.3% and 37.7%, summing up to 100% in both cases (see the last two columns in the first Table B.1). Hence, both numbers are of the same order of magnitude in the LIS and UN data bases. In the same period, 87.3% of migrants to developing countries originated from developing countries and 12.7% originated from developed countries – according to the LIS data. According to the UN censuses data, the respective shares for the same period were 88.1% and 11.9%. Again, both numbers are of the same order of magnitude in the LIS and UN data bases, which provides a further justification for the use of the LIS migration data in our study.

Table B.1: LIS data versus UN data, share of migrants from developed vs. developing countries

		1995-2000		2001-2010		2011-2016	
	Origin:	Developing	Developed	Developing	Developed	Developing	Developed
	Destination						
LIS data	Developed	63.9	36.1	67.0	33.0	68.6	31.4
UN data	Developed	54.7	45.3	60.2	39.8	62.3	37.7
LIS data	Developing	90.6	9.4	90.2	9.8	87.3	12.7
UN data	Developing	83.6	16.4	85.7	14.3	88.1	11.9

Notes: The Table shows the share of migrants from developed versus developing countries; the total in each period being 100%. For example, in the 1995-2000 period, 63.9% of migrants to developed countries originated from developing countries and 36.1% originated from developed countries (summing up to 100%) – according to the LIS data. According to the UN data, the respective shares for the same period were 54.7% and 45.3% (summing up to 100%).

Source: Luxembourg Income Study data; UN Migrant Stock by Origin and Destination (POP/1B/DB/98/5).

Table B.2: Structure of immigrant population

Origin:	1995-2000 Developing	1995-2000 Developed	2001-2010 Developing	2001-2010 Developed	2011-2016 Developing	2011-2016 Developed
Destination:						
Austria	229,341	716,380	300,388	905,744	417,068	1,219,048
Canada	2,657,868	2,530,479	3,968,441	2,451,665	5,227,415	2,467,242
Czechia	11,464	181,727	73,014	287,503	123,058	341,522
Estonia	12,215	270,419	11,121	214,675	12,747	179,707
Germany	3,119,575	5,108,944	3,662,844	5,944,512	4,571,879	7,104,403
Greece	304,168	680,590	349,404	906,524	339,952	887,201
Iceland	2,596	11,719	5,409	24,883	8,466	37,273
Ireland	49,072	239,650	118,576	541,219	139,357	657,053
Israel	726,630	1,095,117	715,481	1,204,578	725,661	1,258,376
Italy	1,043,596	904,725	2,185,471	2,685,871	2,721,211	3,318,315
Luxembourg	5,093	127,835	4,153	152,728	20,611	249,695
The Netherlands	1,024,503	426,748	1,246,524	537,795	1,410,139	729,416
Spain	692,818	645,859	3,232,900	1,960,746	3,655,182	2,342,524
Switzerland	355,350	1,169,443	484,383	1,455,927	644,305	1,849,907
The United States	25,620,762	6,011,792	35,480,363	6,240,605	43,149,919	6,270,095
Destination:						
Brazil	207,182	505,895	244,076	371,499	338,240	423,548
Chile	118,262	41,613	259,901	65,973	659,434	130,425
Guatemala	93,822	8,332	51,378	10,440	66,316	13,071
India	6,652,348	29,437	5,659,976	21,876	5,180,085	17,764
Paraguay	168,307	13,283	151,500	12,771	146,179	12,312
South Africa	773,751	236,634	1,370,802	362,114	3,220,148	800,328

Notes: UN classification of countries:
https://www.un.org/en/development/desa/policy/wesp/wesp_current/2014wesp_country_classification.pdf.

Source: United Nations Population Division, Trends in Total Migrant Stock.

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