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The earnings effects of occupational segregation in Europe: The role of gender and migration status [‡]

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Abstract

The concentration of different social groups in certain occupations creates and perpetuates inequalities inside and outside the labor market. This paper quantifies the economic and well-being consequences of occupational segregation by gender and migration status in 12 European countries. The effects are negative for most foreign workers, especially for women, who always derive larger welfare losses than men. In general, these losses are remarkably high in southeast Europe and smaller in the northwest, whereas immigrant men derive very small gains in Portugal and the UK. Female natives are also deprived in most countries. However, immigrantsÕ characteristics, particularly education, explain a significant part of these geographical disparities. In fact, while the UK is in a somewhat better position thanks to its immigrants' higher educational levels, the counterfactual analysis reinforces Portugal's good position, reflecting higher levels of labor market integration among its immigrant population.

Keywords: Occupational segregation, welfare, gender, immigration, Europe.

JEL Classification: D63, F22, J10.

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1. Introduction

Despite considerable social changes in the last decades, labor market inequalities for reasons of gender, race or migration status still exist in many countries. Females and immigrants tend to occupy positions at the bottom of the occupational ladder and earn lower wages than their male and native counterparts (Kaufman, 2010; Ballarino and Panichella, 2017). Even more importantly, the concentration of immigrants and women in insecure, low-paying jobs not only hinders employment and career options, but also narrows present and future economic independence, increasing the risk of falling into poverty. Thus, inequalities outside the labor market are created and perpetuated. Additionally, beyond human capital variables, job segregation is the main factor explaining gender pay gaps (Blau and Kahn, 2017). From a macroeconomic perspective, excluding or deterring certain demographic groups from entering some occupations results in both labor market inefficiencies and rigidities. Apart from wasting human resources, especially when barriers exist for highly skilled workers, the room for maneuvering needed for dealing with labor shortages is also reduced.

In the context of the Great Recession, increasing migration flows and the recent refugee crisis, immigrants' situation in European labor markets has become a hot topic of study, with large inequalities being detected. De la Rica et al. (2015) found large and persistent employment and wage gaps between immigrants and natives, especially among non-OECD immigrants and females, although cross-country differences still exist. Indeed, their integration in the European labor market seems characterized by a trade-off between unemployment risk and job quality (Reyneri and Fullin, 2011). Immigrants suffer a penalty in term of access to highly qualified jobs in countries where the risk of unemployment for immigrants is hardly bigger than for natives (Italy and Spain), whereas the opposite happens in places where immigrants have a greater unemployment risk than natives (Netherlands and Denmark). Regarding occupational segregation, the literature has put particular emphasis on gender segregation, finding relatively high levels for the EU as a whole (Bettio and Verashchagina, 2009). Few segregation studies account for migration status, but comparing the occupational distributions of EU- and non-EU immigrants with respect to natives, Dustmann and Frattini (2013) found higher segregation levels for non-EU immigrants. Segregation is still underestimated in these studies because they do not contemplate segregation resulting from both gender and migration status.

Nevertheless, research on occupational segregation tackling the intersection between gender and migration status has been scarce in Europe, as most studies are limited by the measurement tools employed. The most popular indices do not measure the segregation that each group experiences but the overall segregation, preventing us from knowing how job concentration particularly affects different groups. This matter is especially relevant when analyzing small groups, such as immigrants in Europe. Even if they are very segregated, those overall indices mainly capture the situation of the larger groups.

Overcoming this limitation, Alonso-Villar and Del Río (2010) proposed several local indices that allow the study of the specific situations of each group and quantify their levels of segregation. Exploiting those indices, the authors show that immigrant women suffer a double burden in Spain: They are more segregated than either native women or immigrant men (Del Río and Alonso-Villar, 2012b). Palencia-Esteban (2019) also used these indices to quantify the levels of segregation that male and female immigrants experienced in 20 European countries. In 2015, immigrants were least segregated in the UK, the Netherlands, Ireland and Switzerland; whereas Italy, Greece, Cyprus and Hungary presented the highest levels. Moreover, despite these geographical differences, male immigrants generally experienced less segregation than females. Using the most recent data available, the 2018 European Labour Force Survey, this paper updates previous studies on occupational segregation by gender and migration status in Europe.

Still, segregation in itself does not tell whether a situation is beneficial or detrimental for the groups. The quality of the occupations in which the groups are over- or underrepresented needs to be considered in order to explore its effects. Based on social welfare functions (SWFs), Alonso-Villar and Del Río (2017) developed a family of indices that uses wage information to quantify the welfare losses or gains that each group derives from segregation. Depending on whether the groups are concentrated in high- or low-paid jobs, the measures show which groups are advantaged or disadvantaged, and by how much. With the purpose of analyzing disparities in social welfare losses between European countries, we also borrow the graphical and analytical tools proposed by Del Río and Alonso-Villar (2018), following the literature on deprivation and poverty. This approach allows us to capture the welfare losses that the whole country experiences from the occupational sorting faced by all social groups -as some derive welfare gains, others experience losses, and their demographic size may vary.

Despite the availability of these measures, the welfare consequences that occupational segregation brings to different social groups and whole countries are still unstudied in Europe. This keeps us from knowing their implications and which social groups policymakers should first target in order to reduce labor market inequalities.

With the aim of filling these gaps and using the abovementioned indices, the paper contributes to the literature by quantifying, for the first time, the economic and well-being consequences associated with segregation for male and female natives/immigrants in 12 European countries. It also offers a broader picture by measuring the social welfare losses that each country experiences and discussing country-specific integration policies. Finally, analyzing whether cross-country disparities persist after controlling for individual characteristics further adds to the literature.

Section 2 describes the methodology and data. Section 3 offers an overview of occupational segregation by gender and migration status in Europe in 2018. Section 4 presents the welfare analysis. Section 5 builds counterfactual distributions, removing cross-country differences in immigrants' education, years of residence and origin, and checks whether geographical disparities in welfare persist after controlling for these characteristics. Section 6 concludes the paper.

2. Methodology and data

2.1 Local segregation measures

Although the dissimilarity index popularized by Duncan and Duncan (1955) was initially proposed to compare men and women, it has also been applied in multigroup contexts by making pairwise comparisons between the groups. The interpretation, however, becomes cumbersome in the last case, as the study is limited to analyzing how each group relates to another or to a reference group. Overcoming this limitation, researchers proposed multigroup segregation indices that measure overall segregation by simultaneously quantifying the disparities among all groups (Theil and Finizza, 1971; Silber, 1992; Reardon and Firebaugh, 2002; Frankel and Volij, 2011).

Alonso-Villar and Del Río (2010) took this a step further and derived local segregation indices and curves to separately quantify the segregation that each particular group experiences. They compare the occupational distribution of a target group with the occupational structure of the economy so that the group is segregated when both

distributions differ, meaning that it is over- and under-represented in some occupations. Moreover, these local indices are consistent with some well-known overall measures. The latter are weighted means of the local segregation indices applied to each of the mutually exclusive groups, with the weights being equal to their shares of the total workforce. We are interested in knowing about male and female immigrants' occupational segregation but, no matter how highly concentrated immigrants are, overall indices mainly capture the segregation of the biggest groups—that is, the natives. Thus, we use the following local indices in the empirical analysis:[1]

$$D^g = \frac{1}{2}\sum_j \left| \frac{c_j^g}{C^g} - \frac{t_j}{T} \right|$$

$$\Phi_1^g = \sum_j \frac{c_j^g}{C^g} ln \left(\frac{c_j^g / C^g}{t_j / T} \right)$$

where c_j^g denotes the number of individuals of group g in occupation j, t_j is the number of jobs in that occupation, $C^g = \sum_j c_j^g$ is the size of the group g in the economy and T= $\sum_j t_j$ is the total number of jobs in the economy.

The local segregation curves represent a complementary method for ranking distributions based on their segregation. The curves represent the cumulative proportion of employment on the horizontal axis and the cumulative proportion of the group in the vertical axis once occupations are ranked in ascending order of values $\frac{c_j^g}{t_j}$. Resembling the Lorenz curve and its dominance criterion, local segregation curves offer a similar partial ordering. The 45º line depicts a scenario without segregation, so curves closer to this line represent distributions with lower segregation. Thus, when the segregation curve of a distribution lies at no point below that of another and at some point above, the former distribution dominates. It will have a lower segregation than the latter for a wide range of indices that satisfy several desirable properties. As shown in Alonso-Villar and Del Río (2010), Φ_1^g and the related family of indices are consistent with this dominance criterion. D^g is not, but it offers an intuitive interpretation of the phenomenon. The index ranges from 0 to 1 and expresses the percentage of the group that would have to change

[1] Gradín's (2011) "localseg" stata command is used in Section 3.

occupations so as not to be segregated while keeping the occupational structure of the economy unchanged.

2.2 Well-being loss/gain of a group

Measuring segregation alone is not enough to assess a group's position in the labor market, as it depends not only on its possibilities of accessing all kind of occupations but also on the "quality" of the jobs that it tends to fill and not fill. The economic consequences of being segregated in low- or high-paid occupations are clearly not the same. Out of concern for this issue, a reduced number of studies incorporated occupational status in their segregation measures (Hutchens, 2009, 2012; Reardon, 2009; Del Río and Alonso-Villar, 2012a; Gradín, 2020), but none of them quantified the well-being losses and gains that the groups derive from their segregation. Only the indices developed by Alonso-Villar and Del Río (2017) and Del Río and Alonso-Villar (2015) measured its economic consequences, and are the ones we apply in this paper.

Following the authors, we denote the distribution of group g across the J occupations of the economy by $c^g \equiv (c_1^g, c_2^g, \ldots, c_J^g)$, the employment distribution of the economy across occupations by $t \equiv (t_1, t_2, \ldots, t_J)$ and the occupational wage distribution by $w \equiv (w_1, w_2, \ldots, w_J)$, with wj being the average wage of occupation j. T and C^g still represent the total number of workers in the economy and in the target group. To explore the advantages and disadvantages associated with group g's occupational sorting, we need, first, an indicator of the occupation's quality (proxied by wages in this case) and, second, a social welfare function that evaluates the well-being associated with the state (c^g; t; w).[2] In this way, the well-being of group g is defined as the welfare corresponding to an artificial income distribution with which each member of the group is given an "income" equal to $\frac{w_j}{\overline{w}}$, with w_j and $\overline{w}$ being the average wage of the occupation where she/he works and the average wage of the economy, respectively. The ratio represents the occupation´s quality.

On this basis, the well-being loss/gain that group g experiences due to its occupational segregation is defined as the gap that exists between the well-being of the group associated with state (c^g; t; w) and the well-being it would have with no segregation (i.e.,

[2] In this paper we will use the terms well-being and welfare interchangeably.

$c_j^g = \frac{C^g}{T} t_j \ \forall j$). We get the per capita well-being of the group by dividing its well-being by C^g so that it does not depend on its demographic size.

$$\Psi(c^g;\ \mathrm{t};\ \mathrm{w}) = \frac{1}{C^g}\left[\mathrm{SWF}(c^g;\ \mathrm{t};\ \mathrm{w}) - \mathrm{SWF}\left(\frac{C^g}{T}t;\ \mathrm{t};\ \mathrm{w}\right)\right]$$

Assuming basic normative properties of SWF,[3] Alonso-Villar and Del Río (2017) proposed the following family of indices to measure well-being loss/gain:[4]

$$\Psi_\varepsilon(c^g;\ \mathrm{t};\ \mathrm{w}) = \begin{cases} \sum_j \left(\frac{c_j^g}{C^g} - \frac{t_j}{T}\right)\frac{\left(\frac{w_j}{\bar{w}}\right)^\varepsilon - 1}{1-\varepsilon} & \varepsilon \neq 1 \\ \sum_j \left(\frac{c_j^g}{C^g} - \frac{t_j}{T}\right)\ln\frac{w_j}{\bar{w}} & \varepsilon = 1 \end{cases}$$

where $\varepsilon > 0$ is the inequality aversion parameter. The higher ε is, the larger the importance given to income disparities within the group. In the limit case where $\varepsilon = 0$, neutrality aversion is assumed, and $\Psi_0(c^g;\ \mathrm{t};\ \mathrm{w}) = \sum_j \left(\frac{c_j^g}{C^g} - \frac{t_j}{T}\right)\frac{w_j}{\bar{w}}$ is the Γ index proposed by Del Río and Alonso-Villar (2015) to measure the monetary, instead of well-being, loss/gain. Note that the Ψ_ε family does not consider within occupation wage inequalities between the groups. It only accounts for the advantages/disadvantages coming from segregation, possibly underestimating the total loss or gain that each group experiences in the labor market.[5]

2.3 Social welfare losses

The measures presented above quantify the objective well-being loss or gain that each group derives from its occupational segregation but does not assess the welfare losses of a whole economy. In doing so, we would need to aggregate the results obtained after applying Ψ_ε indices to each of the groups that conform to the labor market. For instance, this can be done by averaging the gains and losses of all the groups considered. However, this strategy assumes that the well-being gains of the advantaged groups compensate disadvantaged groups' losses, which might be undesirable. We solve this matter using the tools developed by Del Río and Alonso-Villar (2018) to measure social welfare losses:

[3] SWF is individualistic, strictly increasing, symmetric and additive.

[4] Pérez-Alonso's (2017) "welflossas" stata command is used in Section 4.

[5] In fact, these authors decompose the total losses/gains in two terms: One coming from occupational segregation and other from within-occupation wage disparities with respect to other groups. Data limitations prevent us from making the decomposition.

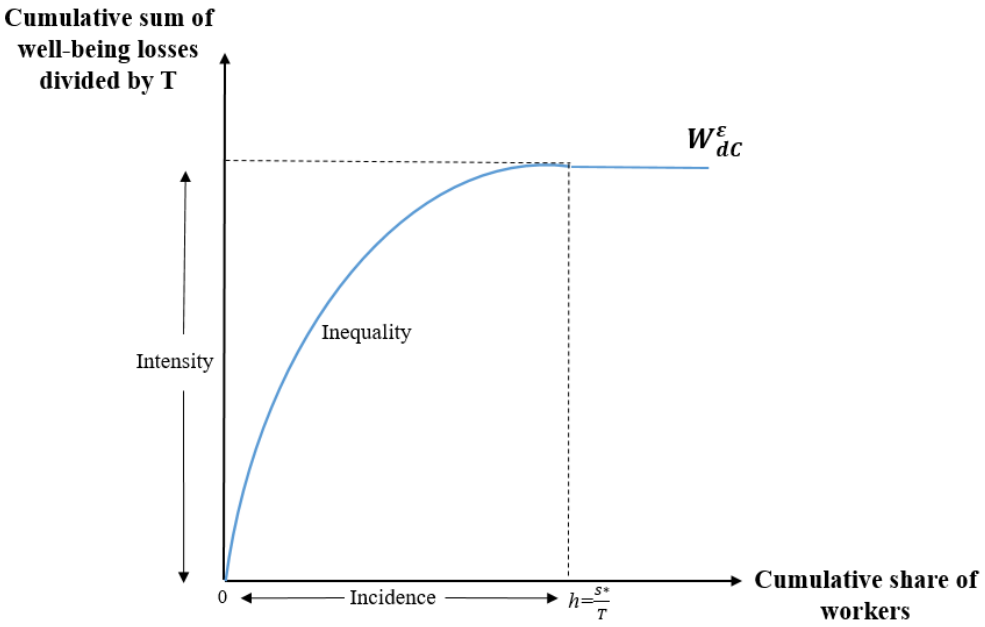
the *social welfare loss curve associated with segregation* (WLAS) and the FGT welfare loss indices associated with segregation.

The WLAS curve ranks the groups according to their welfare losses, from the highest to the lowest, after assigning a value of 0 to the groups with welfare gains. Denoting the *n*-dimensional vector displaying the demographic size of the *n* groups we have created by $C \equiv (C^1,\ldots, C^n)$ and the demographic share of the first *k* groups ($k = 1, \ldots, n$) by $p^k = \frac{C^1+\cdots+C^k}{T}$, the WLAS curve at point p^k is the weighted sum of the welfare losses experienced by the first *k* groups:

$$W_{dC}^{\varepsilon}(p^k) = \sum_{g=1}^{k} \frac{C^g}{T} d_g, \quad \text{where} \quad d_g = \begin{cases} 0 \; if \;\; \Psi_\varepsilon \geq 0 \\ |\Psi_\varepsilon| \; if \;\; \Psi_\varepsilon < 0 \end{cases}$$

As shown in Figure 1, the curve synthetizes a lot information. The point of the horizontal axis at which the curve becomes horizontal (*h*) reflects incidence, i.e., the share of the population that belongs to groups that experience welfare losses associated with their occupational sorting. Intensity, i.e., the per capita cumulative welfare loss, is captured in the maximum height of the curve, and the curvature that the WLAS curve has until point *h* represents inequality in the loss experienced by the disadvantaged groups.[6]

Figure 1. The social welfare loss curve associated with segregation (WLAS).



Source: Del Río and Alonso-Villar (2018).

[6] The curves were originally developed for poverty analysis by Jenkins and Lambert (1997) and were named the TIP curves, as they stand for the three Is of poverty: Incidence, Intensity, and Inequality.

Moreover, the dominance criteria associated with this curve allows ranking different economies when their curves do not cross. If a WLAS curve does not lie above the other curve and lies below at some point, the former dominates the latter, and indices satisfying some basic properties would conclude that its social welfare loss is smaller.

However, when the curves cross or the interest relies on quantifying social welfare losses, indices are needed. Del Río and Alonso-Villar (2018) adapted the popular FGT poverty indices (Foster et al., 1984) and proposed the following family of measures:

$$FGT_\alpha = \frac{1}{T}\sum_{s=1}^{s^*}(d_s)^\alpha,$$

where $\alpha \geq 0$ represents aversion to inequality in the loss that the disadvantaged groups experience; d_s is the well-being loss of worker *s*, which equals the per capita well-being loss of the belonging group; s^* is the number of individuals with $d_s > 0$.

These indices are only consistent with the WLAS dominance criteria when $\alpha > 1$. However, a correspondence exists between FGT_α and WLAS curves when $\alpha = 0$ or 1. FGT_0 measures incidence (the share of individuals with welfare losses: h) and FGT_1 intensity (the per capita welfare loss of society: W's height). FGT_2, which is consistent with the curve's dominance criteria, combines these two dimensions with inequality. Exploiting this link, the three indices are used in the analysis.

2.4 *Data*

The primary data source used is the second quarter of the 2018 European Labour Force Survey (LFS) provided by Eurostat. It includes 31 countries (the 27 EU member states, Iceland, Norway, Switzerland and the UK) and delivers detailed information on the labor market and demographic characteristics. Information on age and employment status is used to limit our sample to employed workers aged 16–64 years, and information on gender and country of birth is used to create the four groups of interest: male/female natives and male/female immigrants.

The LFS does not provide earnings data needed to measure occupational quality, so the 2014 Structure of Earnings Survey (SES), the last available wave, is used to estimate average hourly wages by occupation and input them into the LFS.[7] Several limitations are

[7] If the groups' shares in each occupation differed in the LFS and the SES, using the average wages estimated for each occupation in the latter database would bias our welfare results. Accounting for this possible bias, and given that the SES does not distinguish between natives and migrants, we separately estimated average wages by occupation for men and women. Then, we used information on gender to

attached to this merging process. First, the SES only provides information for 24 countries. Second, both surveys follow the International Standard Classification of Occupations (ISCO-08), but the level of disaggregation differs. The LFS provides occupations at the 3-digit-level (130 categories), whereas the SES uses the 2-digit-level (43 categories). Finally, the SES eliminates the observations for which the principal economic activity (measures through NACE Rev.2 classification) is either A (agriculture, forestry and fishing), T (activities of households as employers; undifferentiated goods- and services-producing activities of households for own use) or U (activities of extra-territorial organizations and bodies). As a result, the average hourly wages estimated for the occupations especially linked to those activities will be biased, and so will our welfare loss/gain estimates.

These problems are solved by following this strategy. First, this is done by keeping the 12 countries that fulfill three conditions: They have a large enough sample of immigrants in the LFS, are considered in the SES and represent the main European socioeconomic models.[8] Second, converting 3-digit-level occupations in the LFS into the 2-digit-level. Finally, as explained in detail in Appendix 1, the 2015 cross-sectional European Union Statistics on Income and Living Conditions (EU-SILC) database is used to correct the estimated wages of the occupations that suffer from the abovementioned limitation. This correction mainly affects two occupations: Agricultural, forestry and fishery laborers; as well as cleaners, helpers and personal care workers. These fields employ significant numbers of immigrants in several countries and are crucial for segregation and welfare analysis.

3. Occupational segregation by gender and immigration status

We start by analyzing the levels of segregation that immigrant men and women derive from their occupational sorting in the 12 selected European countries. In all these countries, immigrants' population shares remained relatively low in 2018, accounting for less than 20% of the labor force (see Table A3 in the Appendix).[9] In fact, male immigrants

impute those estimates in the LFS: Male (female) natives and male (female) immigrants working in the same occupation were assigned the same wage, and calculated the final average wages for each occupation. We have also checked that our results are robust when estimating the average wage of each occupation in the SES and directly imputing it in the LFS.

[8] We have southern (Spain, Italy and Portugal), western (France, Germany, the Netherlands and the UK), northern (Finland, Norway and Sweden) and eastern (Czech Republic and Slovenia) countries.

[9] Country codes are shown in Appendix Table A1.

in Germany and Sweden are the only groups that represent 10% of the working population, whereas immigrants' shares are particularly low in the Czech Republic and Finland, where neither male nor female immigrants represent 5%. The shares of female immigrants are also lower than those of their male counterparts except for in Portugal, where the proportion of females slightly exceeds that of males.

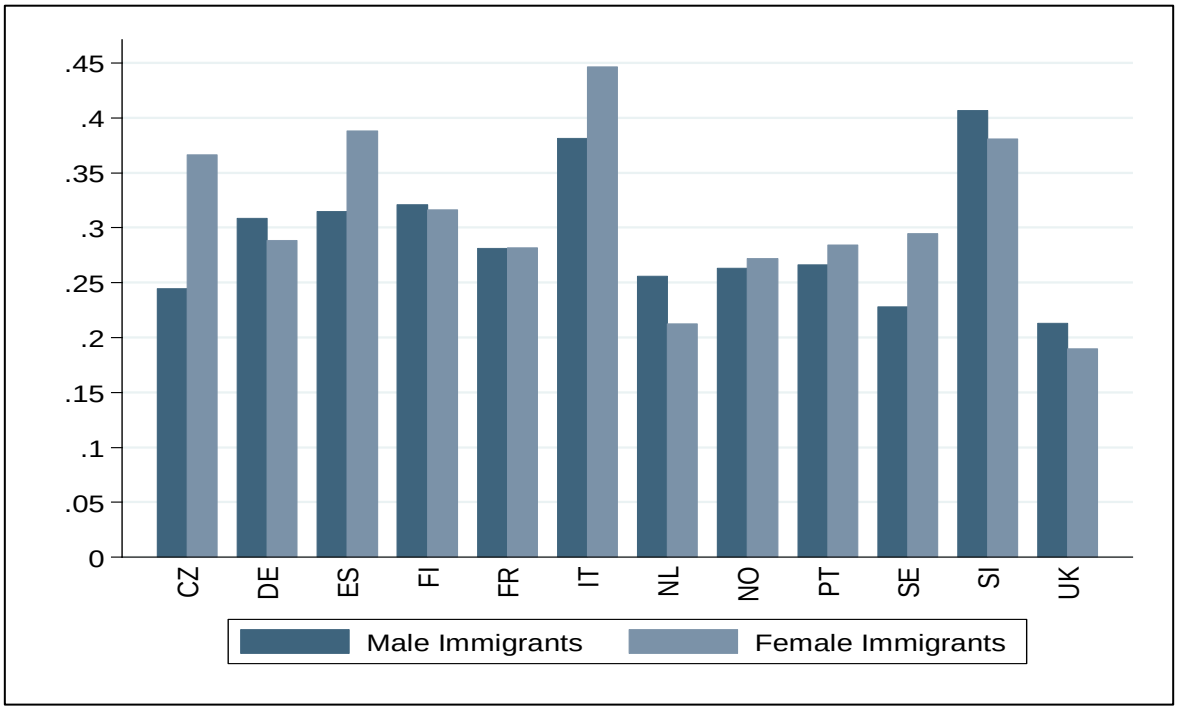
Figure 2 (as well as Table A3) reports the levels of occupational segregation for male and female immigrants and natives using the D^g index (and Φ_1^g) and the 2-digit-level occupational disaggregation (43 occupations). The levels of segregation are lower than the ones Palencia-Esteban (2019) obtained using occupations at the 3-digit level for the year 2015. Most of these disparities come from the number of occupations considered, as segregation increases and approaches previous results when using occupations at the 3-digit level.[10] Nevertheless, regardless of the occupational disaggregation used, remarkable changes are found in how immigrants' segregation relates to gender. In 2015, female immigrants generally presented larger segregation than their male counterparts. This is still the case in the Czech Republic, Spain, Italy and Sweden, but the levels are now similar in the remaining countries, and immigrant men even present larger segregation in Slovenia according to both indices. At any rate, male immigrants in the UK still present the lowest level of segregation (0.21), and female immigrants in Italy the highest (0.45), making the variation that the Dg index exhibits again larger for women.

The large cross-country differences visualized in Figure 2 also form a geographical pattern similar to the one found in 2015. The UK stands out for having the lowest segregation levels and is closely followed by the Netherlands, in the case of female immigrants, and by Sweden, in the case of men. Whereas around 20% of immigrant men and women would have to change occupations to make their segregation disappear while keeping the occupational structure of the economy unchanged in the UK, more than 40% of women (men) would have to do so in Italy (Slovenia). To get an idea of its implications, in absolute terms, around 646,000 and 474,000 immigrant women would have to move into another job in Italy and the UK, respectively, so as not to be occupationally segregated. Between these extremes, France and Germany rank in the middle, their segregation levels being around 30% for both groups.

[10] As already mentioned, the LFS provides occupations at the 3-digit level (130 occupations), allowing us to check the robustness of our results. We will make remarks when we find significant differences using more disaggregated data.

Altogether, regardless of the local index used, female immigrants' segregation is lower in the northwest countries and Portugal and higher in the eastern and remaining southern (Italy and Spain) countries[11]. The pattern is similar for men, although a few differences are visible: Finland has the third-highest segregation level, while the Czech Republic has notably improved position compared to its one for female immigrants.[12]

Figure 2. Male and female immigrants' occupational segregation (Dg index in %).



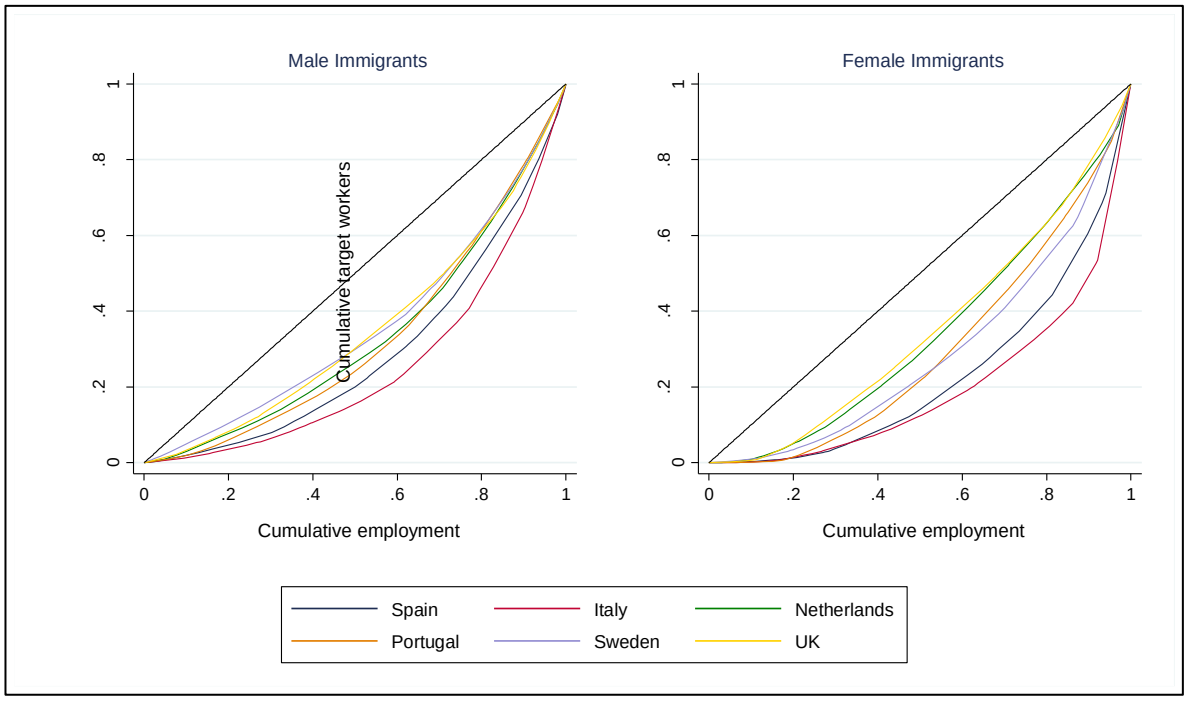
Source: EU-LFS 2018 Q2.

Apart from confirming these findings, the segregation curves reveal in which parts of the distribution the countries mainly differ and, more importantly, identify results that are robust to the chosen index. To illustrate the most extreme cases, Figure 3 just presents the curves of six countries. As shown, any index consistent with the dominance criterion associated with these curves will always rank Italy and Spain as more segregated than the UK, the Netherlands, Sweden and Portugal for both immigrant groups. Moreover, considering the 12 countries altogether, we have checked that the Italian segregation curve for female immigrants lies below all the others; for men, this is the case with the Slovenian segregation curve.

[11] Recall that we consider northern Europe as Norway, Sweden and Finland; southern Europe as Portugal, Spain and Italy; western Europe as the UK, France, the Netherlands and Germany; and eastern Europe as the Czech Republic and Slovenia.

[12] When we use occupations at the 3-digit level, the geographical pattern is maintained for females, whereas it slightly changes for males: Most remarkably, Portugal is no longer included in the least-segregated group.

Figure 3. Occupational segregation curves of male and female immigrants in six countries.



Source: EU-LFS 2018 Q2.

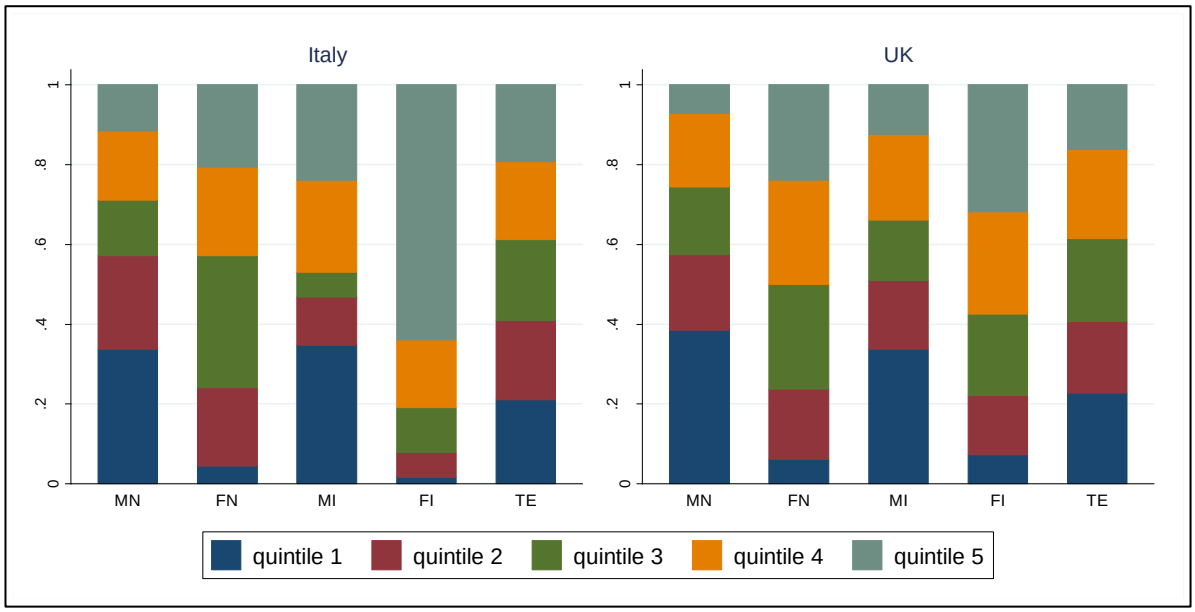
The results are less clear when it comes to the least segregated country. In the curves of male immigrants, Sweden lies above the UK in the first half of the distribution, but the situation is reversed thereafter. The indices corroborate this issue: Φ_1^g ranks Sweden as less segregated than the UK, whereas D^g reflects the opposite. We can only conclude that both countries' segregation levels are among the lowest. The cross of the curves is subtler for female immigrants, although both indices in this case show that segregation is lower in the UK than in the Netherlands.

Overall, Italy and the UK represent the main limiting cases, particularly when we look at the upper tails of the female immigrant curves. While it is true that "personal care workers" and "health professionals" constitute 10% of total employment in the UK but 20% of immigrant women's employment, that concentration is even larger in Italy. A striking 46% of Italian female immigrants are "cleaners and helpers" and "personal care workers," which is six times their share in the country's total employment.

Figure 4 delves deeper into the differences between these two countries from an additional perspective. Following Del Río and Alonso-Villar (2012b), we have built noncumulative quintiles of total employment after lining up occupations from the lowest to the highest presence of female immigrants. This way, each quintile accounts for 20% of total employment, but while the first quintile contains the occupations with the smallest share

of female immigrants, the fifth quintile includes those with the biggest proportion. Exploiting this structure, we plot the employment distribution across these quintiles for each group and identify whose distributions are more alike.

Figure 4. The distribution of the four groups across quintiles of total employment ranked by the presence of immigrant women in Italy and the UK.



Note: MN denotes male natives, FN female natives, MI male immigrants, FI female immigrants and TE total employment. Source: EU-LFS 2018 Q2.

Immigrant women are much more homogeneously distributed across quintiles in the UK than in Italy, where 60% are employed in the fifth quintile. Although in both countries close to 40% of immigrant men work in occupations with the smallest proportion of immigrant women (quintile 1), in contrast to the UK and the remaining countries, male immigrants are also present in the most feminized occupations in Italy: 6% and 5% are "personal services workers" and "cleaners and helpers," respectively. This is detrimental for both groups, since those occupations tend to be the most precarious and worst-paid. These results might be related to the lower educational levels that immigrants in Italy present, with 53% of men and 38% of women having not completed secondary education, but attitudes of natives may also play a role. The 2016 European Social Survey (ESS) shows that almost 20% of the Italian population would not allow the entrance of immigrants from poorer countries outside Europe. Indeed, 40% believe that immigration is bad for the country's economy—a value well above that seen in most countries.

Finally, looking at the broader picture, we see from Figure 4 that the occupational distributions of natives and immigrants are quite similar between men (bars 1 and 3) and also among women (bars 2 and 4), particularly in the UK. In fact, resembling the pattern

that immigrants follow, bars 1 and 2 illustrate that while native men are overrepresented and underrepresented, respectively, in occupations with the smallest and largest proportion of female immigrants, the opposite is true for native women. It is clear that beyond migration status, gender plays a major role in shaping certain careers.

4. Welfare analysis

Measuring segregation is insufficient for determining if occupational sorting brings gains or losses to the groups, because it depends on the charcateristics of the jobs where they mainly work. This section uses relative wages and well-being indices to examine whether and by how much the groups are advantaged or disadvantaged from segregation.

4.1 Monetary and well-being loss/gain of the immigrants

In most countries, no matter the chosen inequality aversion parameter, the monetary and well-being consequences of segregation are negative for immigrant workers. Portugal and the UK are the only exceptions. Although the previous section showed that the UK has the lowest segregation levels, Figure 5 surprisingly reveals that both male and female immigrants derive better welfare results in Portugal, having a per capita gain of 1% of the Portuguese average wage due to their distribution across occupations. In the case of the UK, male immigrants derive tiny gains regardless of the index used, whereas female immigrants have losses for all levels of inequality aversion.[13] Nevertheless, these losses are still lower in the UK than in the remaining countries for the Ψ_0 and Ψ_1 indices.

The reasons behind these relatively good results are not the same for both countries. First, the UK has historically been an immigration country. It was one of three EU countries that allowed workers from new member states (NMS) to immediately enter its labor market in 2004. Second, the point-based system implemented in 2008 was focused on attracting high-skilled workers, so the UK now receives the most-educated immigrants out of the EU countries. Table A2 shows that 51% of males and 58% of females hold tertiary degrees. This human capital could protect foreign workers, but the welfare results depicted in Figure 5 do not look promising, especially in the case of women.

[13] Given that, by definition, the weighted sum of the monetary losses/gains experienced by all mutually exclusive groups adds up to 0, some natives may be also disadvantaged in these countries. In the UK, for example, immigrant and native women experience losses, while native and immigrant men have advantages.

In fact, not only does the UK lack an overarching policy on labor market integration of migrants (Fernandez-Reino and Rienzo, 2019), but existing initiatives are confined to offering limited language courses and employment support (Marangazov, 2014). As a result, despite most foreign workers in the early 2000s being concentrated in high-skilled occupations, several low-skilled jobs—mainly process operatives—had the largest share of immigrants in 2008 (Rienzo, 2015; Migration Advisory Committee, 2018). Thus, even though immigrants are on average more qualified than natives, many new immigrants, especially from NMS, work in low-skilled occupations (Frattini, 2014).

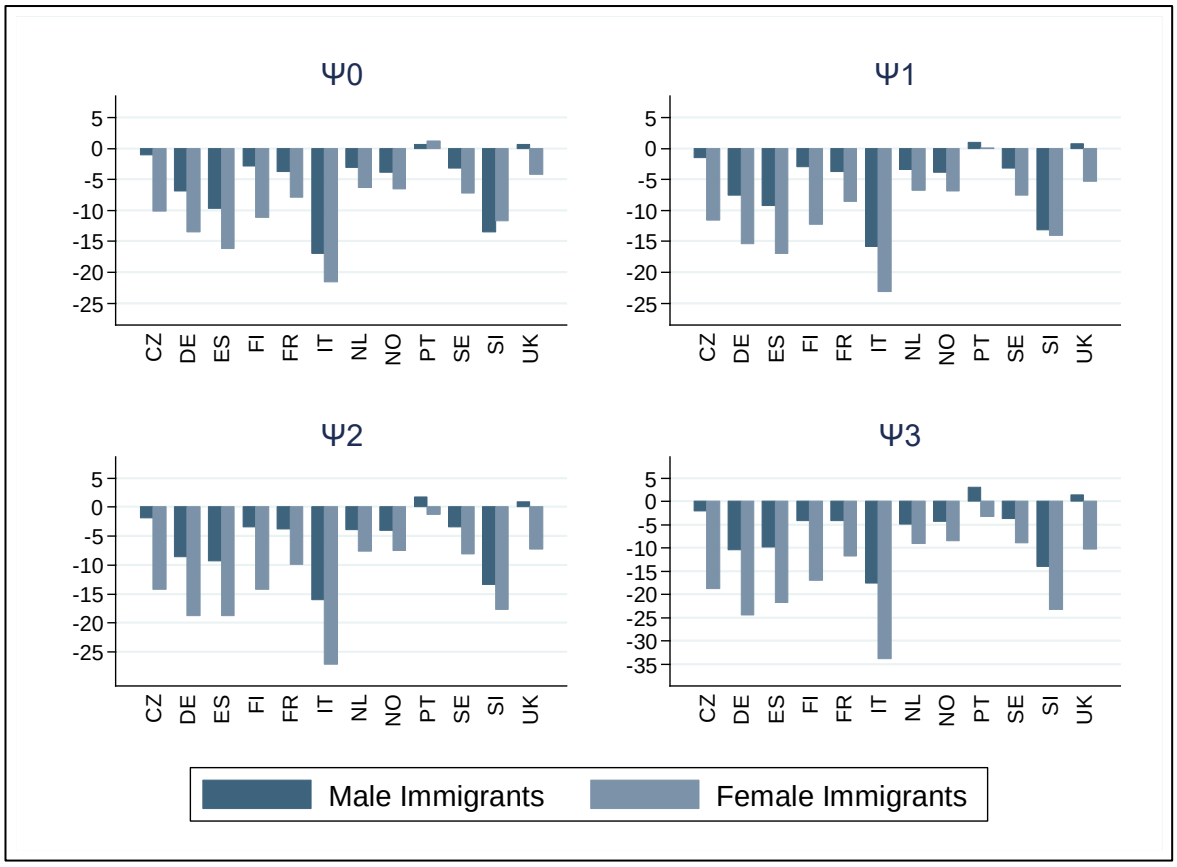
This polarized scenario remains in 2018, as we find that immigrants are overrepresented in very high- and low-skilled occupations. While this dual system makes male immigrants derive neither losses nor gains, the "badly" paid jobs where immigrant women are concentrated have the lowest wages on average. Thus, the gains arising from working in highly remunerated occupations do not compensate this negative effect for this last group, and women persistently experience losses.

On the other hand, immigrants are less educated in Portugal, with 28% of men and 40% of women having completed tertiary education, but that country's labor market and policies have allowed immigrants to access certain skilled and well-paid jobs, distinguishing itself from the other counties. Nonetheless, it is important to mention that Portugal's foreign population is not homogeneous, and its labor market integration has traditionally been segmented by origin. EU citizens usually have higher educational levels and work in the better-paid occupations, whereas immigrants from Portuguese-speaking African countries, central and eastern European countries and Brazil mainly participate in worse-paid jobs (Oliveira and Pires, 2010).

Since 2007, though, the Portuguese government has tried to attract high-skilled immigrants and prevent over-qualification scenarios by developing several legal changes and programs (Oliveira and Fonseca, 2013). For instance, as revisions incorporated into the Immigration Act simplified procedures and reduced bureaucratic requirements for all immigrants, the recognition of foreigners' academic titles became more transparent and uniform with Law-Decree 341/2007. Bilateral agreements were also signed to facilitate the circulation of students and skilled professionals, mainly in the health sector. The first National Action Plan for Immigrant Integration was developed and the EU Blue Card incorporated in 2012. Moreover, even though unemployment increased during the Great Recession, the workforce was upskilled because the crisis particularly affected non-EU

(less educated) foreigners, increasing the relative share of the Portuguese and EU28 highly educated workers (Schellinger, 2015). As a result, although we have confirmed that the Portuguese labor market is still segmented and that immigrants also participate in precarious jobs, the abovementioned policies seem to have eased their situation and made them the least disadvantaged immigrant group in the European context.

Figure 5. Male and female immigrants' welfare loss/gain ($\Psi_0, \Psi_1, \Psi_2, \Psi_3$ x 100).



Source: LFS 2018 Q2 and SES 2014.

Coming back to Figure 5, the Netherlands, Norway and Sweden present the smallest losses. Their labor markets have to some extent allowed immigrants to participate in well-paying jobs, although their low wage-inequality levels and broader integration policies have also played a role. In fact, apart from intra-EU immigrants, these countries have received large numbers of asylum applicants and refugees (Joyce, 2018), but the adaptation and insertion of such groups into each host country has been a major concern, particularly in Sweden and Norway. By consequence, despite variance in the scope, content and compulsory attendance requirements, all newcomers are offered language and civic orientation courses. Moreover, even if the Netherlands only provides labor market orientation, Sweden and Norway also offer workforce training and employment assistance.

More recently and despite past migration waves—mainly non-EU-15 immigrants and refugees—having poorer labor outcomes than natives (Dustmann et al., 2016), entry restrictions and policies have been tightened in response to the large refugee inflows that took place during 2015-2016. Nevertheless, our results suggest that their integration programs somehow eased immigrants' situations.

Closely following the northern countries, immigrant men in the Czech Republic, Finland and France also experience small losses. However, in contrast to the previous cases, female immigrants present notable losses. Apart from these women being more concentrated in low-paying occupations (around 30% are gathered just in services and sales), we have checked that these jobs pay less than those in which immigrant men are mainly employed. Additionally, although their integration policies vary substantially, the three countries are characterized by having limited coverage.

Although the Czech Republic has designed comprehensive integration policies, its strong reliance on nonprofit organizations and EU funds (which often target particular groups and exclude EU citizens) has created a fragmented supply of integration programs (Drbohlav and Valenta, 2014). Similarly, despite the broader scope and tools collected under the Finnish "Government Integration Programme for 2016-2019" (Oivo and Bruun, 2016), most programs are restricted to unemployed job-seekers as well as recipients of and applicants for social assistance (Koskela, 2014). From a different background, French integration policies have been primarily focused on disadvantaged neighborhoods, as the republican principle of equal treatment has prevented the implementation of considerable measures targeting particular groups (Escafré-Dublet, 2014). In fact, the Republican Integration Contract is the main integration program targeting newcomers, but it offers insufficient linguistic, economic and social integration (Taché, 2018).

Lastly, welfare losses reach the highest levels in Italy, Spain, Slovenia and Germany, which are precisely the countries that have the least-educated immigrants. The Ψ_0 index allows us to understand the magnitude of the losses: Immigrant women (men) in Italy lose on average 21% (17%) of the economy's average wage, while the other indices confirm that Italy has the largest losses regardless of the chosen aversion to inequality. Even with immigrants, particularly female ones, occupying the worst-paid jobs in these four countries, wage inequality and overconcentration of immigrants in low-paying jobs are remarkably high in Italy. Specifically, while none of the 10 occupations employing the largest amount of male immigrants have wages above the economy's average wage,

56% of female immigrants work as cleaners, personal care and personal service workers, whose wages are, as expected, drastically low.

Regarding their integration policies, these countries have followed different strategies, but they have not seemed to provide enough opportunities. In Germany, policies are mostly focused on refugee/asylum seekers and on attracting skilled workers (Rietig and Müller, 2016). However, the tightening of its asylum and refugee policies and the liberalization of its skilled labor migration regime, which mainly benefits highly skilled immigrants (SVR, 2019), have reduced the job opportunities of refugees and low-skilled foreign workers. From a different standpoint, Slovenia receives few immigrants, who mainly come from other ex-Yugoslav countries and share a similar culture. This common background can facilitate integration, but since Slovenia's EU accession in 2004, most immigrants have been considered "third country nationals" and suffered residence and employment restrictions (Pajnik and Bajt, 2011).

Italy and Spain share migration trajectories. Their economic booms in the 90s and 2000s attracted many foreign workers who often entered as irregular immigrants, but the impacts of the Great Recession and subsequent policy responses have varied. In Spain, immigrants were mainly entering the construction, domestic service and agricultural sectors, which offered immediate temporary contracts but were hardly hit by the economic crisis. Thus, when Spanish migration policies shifted from recruiting to restraining new entries and austerity policies became the norm, a lack of funding and comprehensive integration polices was reflected in the drastic unemployment levels that immigrants presented (López-Sala, 2013; Hooper, 2019). Italy, on the other hand, still considers immigration as a security problem and has focused on illegal migration (Scotto, 2017). Moreover, even though integration policies have overall been scarce and not homogeneous across regions due to its decentralized structure and drastic funding cuts (Caneva, 2014), rejection attitudes toward immigrants have increased pressure to tighten migration policies.

Looking at the overall picture, Figure 5 clearly illustrates the geographical pattern that we have indirectly presented. Welfare losses are higher in southern and eastern Europe, Germany and Finland, whereas these levels are smaller in Portugal and the remaining western and northern countries. Still, we should mention that Finland and the Czech Republic belong to the set of countries with fewer losses in the case of men. In general, this pattern resembles the one found for segregation, as the most segregated countries tend to have larger losses.

Finally, Figure 5 also reveals that female immigrants are more disadvantaged than male ones, even in the least segregated countries. Still, the well-being loss difference between these two groups is strikingly high in the Czech Republic: Monetary losses are nine percentage points (pp) higher for females than for males according to Ψ_0 (16 pp with Ψ_3). The intuition behind this extreme case is linked to the fact that the Czech Republic's two main immigrant groups fill different employment niches. According to Munich (2014), immigrants coming from other ex-communist countries are more likely to be women and to be overrepresented in low-skilled jobs, whereas employees from developed western countries are more likely to work in high-skilled jobs in large multinational companies. Given that this last group is dominated by men, we can understand why female immigrants experience larger welfare losses.

4.2 Welfare loss/gain of the four groups

As we have just seen, immigrants are more concentrated in low-paying jobs and mainly experience welfare losses from their occupational sorting. This means that other groups must be deriving gains. Addressing this concern, this section also considers natives' situation. Table 1 clusters the countries based on who experiences gains using Ψ_0 and Ψ_1 indices, and further separates them according to the ranking of the least disadvantaged group (see Table A3 for the exact loss/gain of each group).

As summarized, male natives are the only ones who derive welfare gains in the Czech Republic and most western and northern European countries. Female immigrants are the group with the largest losses in all these cases. Although both immigrant groups are more disadvantaged on the whole, female natives in the Czech Republic and Finland are worse off than immigrant men, with losses around 4% of each economy's average wage. As mentioned above, in the Czech Republic male immigrants usually work in highly skilled jobs in large multinational companies. Indeed, the share of managers and professionals is greater for immigrant men (11%) than native women (7%). Given their high wages, this seems to lead to smaller losses. In Finland, even though wage inequality is lower and good salaries are not so disproportionately high, the concentration of female natives in three of the occupations paying substantially below the total average wage (cleaning, personal care and personal services) is larger (20%) than for immigrant men (16%), and possibly results in slightly higher losses.

Table 1. Countries grouped based on the groups' monetary and welfare loss/gain.

Native male gains		All males gain	Small gains-losses
MN>0>FN>MI>FI	*MN>0>MI>FN>FI*	*MN>MI>0>FN>FI*	*MI ≈ FI ≥0≥ MN ≈ FN*
Germany France Netherlands Norway Sweden	Czech Republic Finland	UK	Portugal
All Natives gain			
MN>FN>0>MI>FI	*FN>MN>0>MI>FI*		*FN>MN>0>FI>MI*
Spain	Italy Slovenia (Ψ_1)		Slovenia (Ψ_0)

Note: *MN denotes male natives, FN female natives, MI male immigrants and FI female immigrants. From right to left, the ranking indicates the most disadvantaged groups (biggest loss).*

The UK and Portugal represent two special cases. On the one hand, the UK is the only country where all men (women) experience well-being gains (losses). Indeed, although female immigrants experience greater losses (which are the lowest among the analyzed countries), native women are the most segregated group in the country and somewhat suffer from labor market segmentation. Data shows that despite participating in very well-paying jobs, a surprising 25% of female natives work in three occupations paying close to or below 60% of the total average wage (again, cleaning, personal care and personal services). Thus, native UK women experience welfare losses of three pp. On the other hand, although in Portugal none of the four groups derive significant gains or losses when neutral or low inequality aversion is assumed, it is the migrant workers who present small gains.

In Italy, Slovenia and Spain (the most segregated countries), all natives derive gains while female immigrants experience the greatest losses. Surprisingly, female natives present larger gains than their male counterparts in the first two countries. In Italy, this situation is possibly linked to women's lower labor participation (European Commission, 2017). According to our data, they just represent 36% of total employment, the lowest value among the countries considered, but self-selection might be hidden behind those numbers. Nevertheless, we have checked that native women also participate in precarious jobs and that men's welfare gains are equal or above females' when inequality aversion increases. Regarding Slovenia, native women's labor participation is higher than in Italy, but the

situation is similar. Compared to native men, women are more concentrated in both very well and poorly payed jobs, which results in higher welfare gains for women under Ψ_0 and Ψ_1, but similar outcomes with Ψ_2 and Ψ_3.

4.3 Social welfare losses

The previous analysis measured the consequences that segregation has for each particular group, but given their different demographic sizes and that some derive advantages and others disadvantages, drawing conclusions for a whole country is not easy. This section estimates social welfare losses by using the WLAS curves and FGT indices to aggregate the monetary losses that Ψ_0 quantifies for the disadvantaged groups. Table 2 and Figure 6 show the results, which, as we will see, largely depend on the findings presented in sections 4.1 and 4.2.

We start by looking at FGT_0 to analyze incidence, i.e. the share of the population belonging to groups with monetary losses. As shown, more than 45% of the population experiences monetary losses in all countries but Slovenia, Italy and Spain (11%, 14% and 17%, respectively), where only immigrants are deprived. On the opposite end of the spectrum, the countries where female natives also derive losses (listed on the upper row of Table 1), present high incidence levels.

Table 2. Social welfare losses by country in 2018: FGT indices (x100) using Ψ_0.

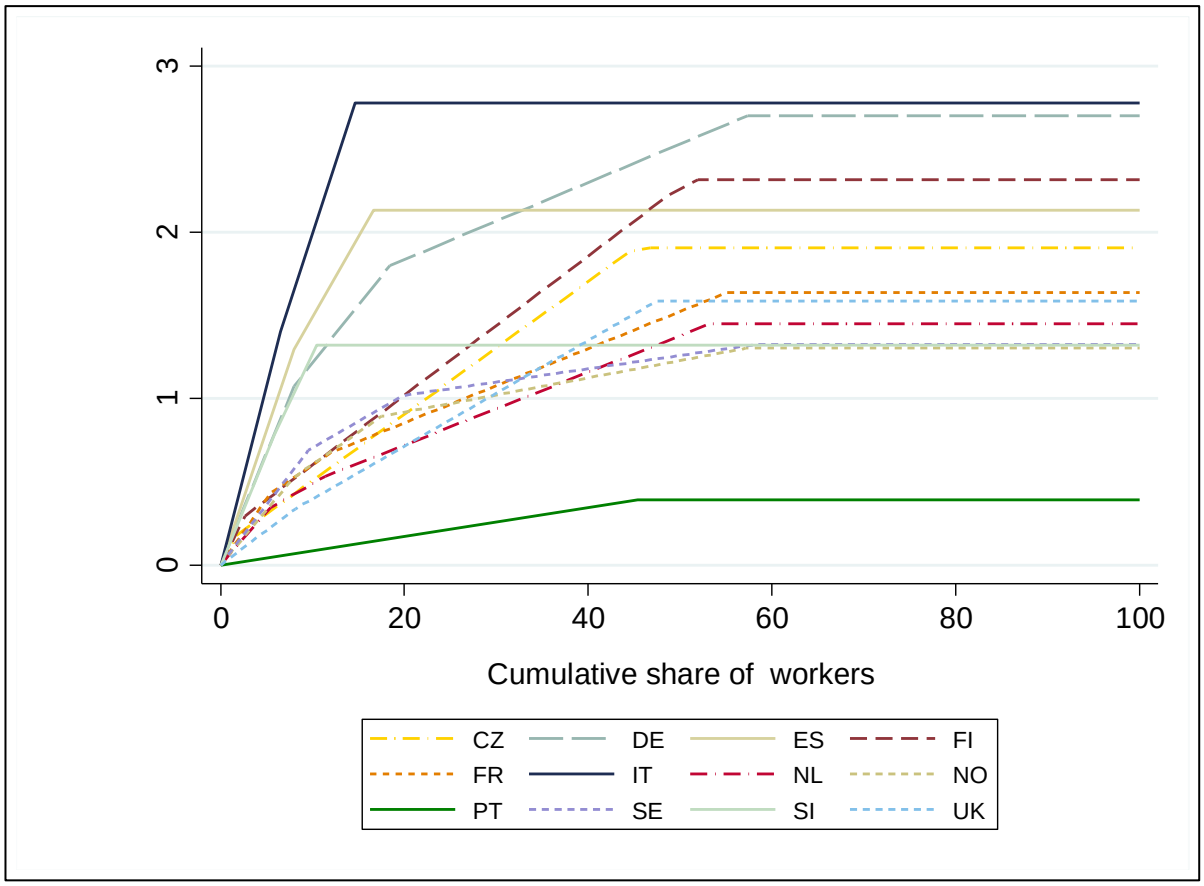
Country	FGT_0	FGT_1	FGT_2
CZ	46.5	1.90	0.09
DE	57.7	2.71	0.22
ES	16.6	2.13	0.29
FI	52.3	2.33	0.12
FR	55.2	1.64	0.06
IT	14.5	2.75	0.53
NL	53.5	1.46	0.05
NO	57.5	1.31	0.05
PT	45.3	0.39	0.00
SE	58.6	1.33	0.06
SI	10.8	1.37	0.17
UK	47.5	1.59	0.05

Source: LFS 2018 Q2 and SES 2014.

The per capita cumulative monetary loss (intensity) is captured by FGT_1 and in the maximum height of the WLAS curve. Intensity is greatest in Italy, Germany, Finland, Spain and the Czech Republic, whereas it is almost inexistent in Portugal. This time, the results come from the size of the losses that the deprived groups experience and, to a smaller extent, by their demographic dimensions. For instance, immigrants are the only disadvantaged groups in Italy and Spain, but they have the largest losses and, as result, high intensity levels. The losses are lower in Germany and Finland, but female natives are also disadvantaged, making the intensity high as well.[14]

The FGT_2 index combines incidence and intensity with inequality among groups. Taking the three dimensions altogether, the levels are extremely large in Italy (0.53), followed by Spain (0.29) and Germany (0.22). By contrast, at a great distance, we find Portugal, the UK, Norway and the Netherlands with values not exceeding 0.05.

Figure 6. The WLAS curve by country in 2018 using Ψ_0.



Source: LFS 2018 Q2 and SES 2014.

[14] In fact, in Finland the difference between natives' welfare outputs is around 9 pp, the highest among the countries considered.

The dominance criterion associated with the WLAS curves allows robust ranking of countries based on their social monetary losses. Given that the Italian and Portuguese curves lie above and below the others, respectively (Figure 6), social monetary losses are the highest in Italy and the lowest in Portugal for all measures consistent with the WLAS dominance criteria[15]. In our case, this means that Italy (Portugal) not only presents, as we have seen, the largest (smallest) losses according to FGT_0, FGT_1 and FGT_2, but for any FGT_α index where α >1.

Moreover, the graph also serves to detect other extreme situations. For instance, even if immigrants' losses are larger in Spain (which is dominated by most countries), the German and Finnish curves cross the Spanish one, reflecting their higher incidence and intensity levels. Indeed, the maximum height of the German WLAS curve almost reaches the Italian one, as their FGT_1 values are 2.71 and 2.75, respectively. From the opposite situation, with an FGT_1 of 1.37 and only being dominated by Sweden and Norway, Slovenia offers another example. The pronounced curvature of its WLAS curve reflects the severe losses experienced by immigrant men and women, whereas its height is small because so it is their population share.

5. Controlling for individual characteristics

So far, we have found significant differences in the welfare losses that immigrants and society as a whole derive from occupational segregation, but these geographical disparities may come from several sources. On the one hand, there are demand-side factors affecting job availability—for example, industrial composition, segmentation of the labor market or discriminatory practices (Piore, 1983; Standing, 1989; Phelps, 1972). On the other hand, supply-side factors related to individual characteristics such as education, experience or language proficiency also determine labor opportunities (Becker, 1962; Chiswick and Miller, 2008).

This section focuses on supply-side factors and analyzes whether geographical disparities in welfare loss and gain disappear when immigrants have the same characteristics across Europe. We want to see whether, for instance, the better results found in Portugal and the UK remain after homogenizing immigrant workers' profiles. Due to data availability, we

[15] We have checked that the dominance remains when we increase inequality aversion and use Ψ_1 or Ψ_2.

controlled for education, years of residence and origin.[16] Specifically, education follows the International Standard Classification of Education (ISCED) and is divided into low (uncompleted secondary education), medium (completed secondary education) and high (completed tertiary education). Years of residence are also classified into three categories: fewer than 5 years, between 5 and 10 years, and more than 10 years. Origin indicates whether the immigrant was born inside or outside an EU-28 country.

Having these controls, we follow DiNardo et al. (1996) and Gradín (2013) to create counterfactual distributions and remove the cross-country heterogeneity in immigrants' characteristics. This propensity score method reweights the observations such that the covariates capturing immigrants' attributes follow the distribution that the corresponding group presents in a reference country (the UK in our case). The shares of highly educated and EU-28 immigrants are among the highest in this country, so considering the doors that education and European citizenship might open, we believe it is a proper reference.

To determine the effect that having a particular set of attributes has on immigrant men or women's welfare, we only estimate the reweights for the immigrant group that is under study, keeping the original weights for the other three groups, and calculate men's or women's conditional welfare loss or gain. In doing so, we separately apply the next steps for immigrant men and women in each country. First, we classify the group into mutually exclusive subgroups based on their education, years of residence and region of birth. Then, we build the counterfactual density function that country *A* would have if group g was given the distribution of covariates that the corresponding group has in the UK while keeping the distribution of the subgroups unchanged across occupations in *A*. Denoting the group by g and the vector of covariates by *z*, group g's reweights are estimated as follows:

$$\Upsilon_z = \frac{\frac{\Pr(g = UK|\, z)}{\Pr(g = UK)}}{\frac{\Pr(g = A|\, z)}{\Pr(g = A)}} = \frac{\Pr(g = A)}{\Pr(g = UK)} \frac{\Pr(g = UK|\, z)}{\Pr(\, g = A|\, z)}$$

The first element on the right-hand side is the ratio between group g's population samples in both countries. The second component is calculated by pooling these samples and using

[16] The LFS also provides their age, but since it is highly correlated with years of residence and the latter shows more variation across countries, age was not considered. Unfortunately, we do not have information about language proficiency.

a logit specification to estimate the probability that an individual from group g with attributes z belongs to the UK rather than to country A:

$$\Pr(g = UK|\, z) = \frac{\exp(z\hat{\beta})}{1 + \exp(z\hat{\beta})}$$

where $\hat{\beta}$ is the vector containing the estimated coefficients.

Applying Ψ_ε measures to this counterfactual distribution, we calculate conditional welfare loss/gain ($\boldsymbol{\Psi_\varepsilon}^*$) and decompose group g's (unconditional) welfare difference between country A and the UK as follows:[17]

$$\Psi_\varepsilon\,{}_g^A - \Psi_\varepsilon\,{}_g^{UK} = \underbrace{\Psi_\varepsilon\,{}_g^A - \boldsymbol{\Psi_\varepsilon}\,{}_{\boldsymbol{g}}^{\boldsymbol{A^*}}}_{\text{Compositional Effect}} + \underbrace{\boldsymbol{\Psi_\varepsilon}\,{}_{\boldsymbol{g}}^{\boldsymbol{A^*}} - \Psi_\varepsilon\,{}_g^{UK}}_{\text{Intrinsic Welfare Effect}}$$

The "compositional effect" is related to our supply-side factors. It quantifies the geographical disparities that are explained by covariates z, and can further be disaggregated into the detailed contribution that each factor makes using the Shapley decomposition (Gradín, 2013). The "intrinsic welfare effect" is the unexplained term, i.e., it is the difference that remain after homogenizing group g*'s* characteristics across countries.[18]

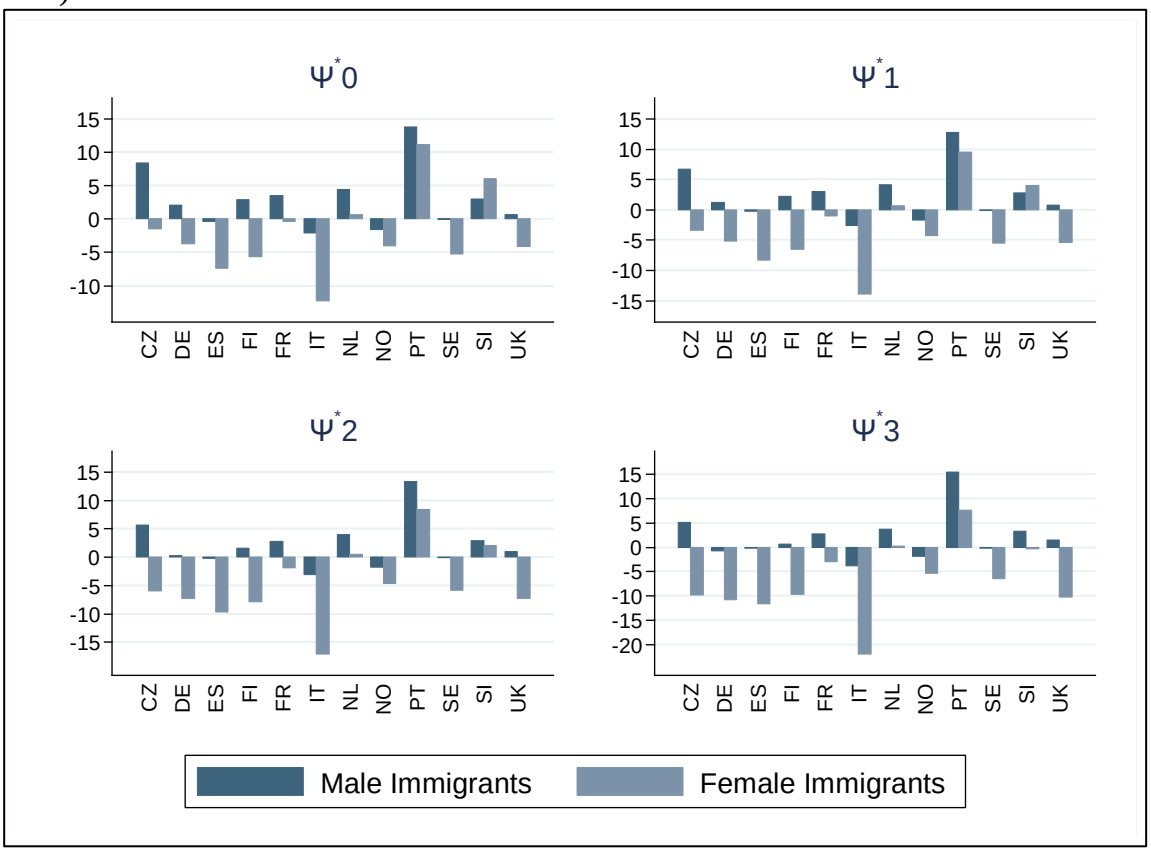
Now we will analyze the monetary and well-being losses or gains that male and female immigrants would derive across Europe if they all followed the same distribution of covariates that male and female immigrants have in the UK (Figure 7 and Table A3). We found notable differences compared to the unconditional case (Figure 5). Most remarkably, all countries would see immigrants' welfare losses reduced or turned into gains, especially in the case of men, while Portugal would increase its gains. Therefore, immigrants in the UK would no longer be among the least disadvantaged. It seems that the UK's better position in the European context is driven by its immigrants' characteristics.

[17] Observations with missing covariates are dropped in the conditional analysis. We have also used this sub-sample to re-estimate unconditional welfare losses/gains and rigorously measure the compositional effect. The unconditional results remain unchanged using this reduced sample.

[18] See Gradín et al. (2015) for further details.

The Shapley decomposition[19] reveals that education makes the largest contribution by far to the compositional effect. It is equal to or above 85% in all countries but Sweden, where its contribution is around 60-70% depending on the index used. Given that the UK has the most educated immigrants, conditional welfare and the compositional effect largely depend on the share and the occupations where highly and poorly educated immigrants are more concentrated. In fact, Germany, Spain, Italy and Slovenia have the least educated foreign workers and experience the greatest changes in welfare. On the contrary, the compositional effect is the smallest in Sweden and Norway, where the share of immigrants with completed tertiary education is already high.

Figure 7. Male and female immigrants' conditional welfare losses/gains ($\Psi_0^*, \Psi_1^*, \Psi_2^*, \Psi_3^*$ x 100).



Source: EU-LFS 2018 Q2 and SES 2014.

As might be expected, the occupations employing the best-educated immigrants generally pay higher wages. However, notable cross-country differences were also detected. In Spain and Italy, a significant share of immigrants still works in low-paying jobs. While 14% of educated females are "cleaners and helpers" and 10% of educated males are "personal service workers" in Spain, 16% of women are "personal care workers" and 6%

[19] Results available upon request.

of men are "cleaners and helpers" in Italy. Highly educated immigrants also work in some low-paying jobs in several other countries, but either the share is smaller or the wages are closer to the average wage of the economy, resulting in better conditional welfare outcomes.

At the same time, the wages of the well-paying jobs in which educated immigrant men are concentrated are higher than those in which educated immigrant women work. This partly explains why females still present greater conditional welfare losses. Moreover, this occurs even if the share of immigrant women with completed tertiary education (58%) is higher than for men (51%), as in this counterfactual scenario immigrants present the educational distribution that the corresponding group has in the UK and women are more educated.

All in all, counterfactual analysis reveals that immigrants' characteristics, particularly education, explain a significant part of the geographical disparities found on welfare. If male and female immigrants had the same characteristics they have in the UK, monetary and well-being losses would decline everywhere, especially in places with small proportions of highly educated immigrants such as Germany and the eastern and southern countries. Yet, since some educated immigrants work in low-paying jobs in Spain and Italy, their immigrants would still have the highest welfare losses. Conversely, the counterfactual analysis also shows that the good position of immigrant workers in Portugal is not the result of their comparative good individual characteristics (as in the case of the UK), but their better integration in the Portuguese labor market. Finally, despite considerable improvements, female immigrants would still derive losses in most countries for two main reasons: The share of educated females working in low-paying jobs is higher than men's, and it is men who are concentrated in the best-paying occupations.

6. Conclusions

It is well known that immigrants and females tend to fill employment niches characterized by having worse working conditions and lower salaries, but the welfare consequences arising from occupational segregation by gender and migration status have not yet been studied in Europe. This papers quantifies the monetary and well-being gains or losses that male and female immigrants derived in 2018 from their occupational sorting in 12 European countries.

In line with Palencia-Esteban (2019), this research shows that immigrants are generally less segregated in northwest Europe and Portugal but present higher levels in the eastern and remaining southern countries (Italy and Spain). Most surprisingly, in contrast to previous findings, female immigrants are more segregated than men only in 4 of the 12 countries analyzed (the Czech Republic, Spain, Italy and Sweden), as their levels are similar in the other countries. However, even though the monetary and well-being consequences arising from segregation are negative for most foreign workers, welfare losses are greater for females.

Although immigrants tend to be overrepresented in low-paying jobs, cross-country differences were also detected. Immigrants derive tiny welfare gains in Portugal and (for males) the UK. Welfare losses for females are still relatively small in the UK, but also in the Netherlands, Norway and Sweden partly due to their low wage inequality. On the contrary, losses reach their highest levels in Spain, Germany, Slovenia and particularly in Italy. Per capita, female and male immigrants in Italy lose 21% and 16% of the Italian economy's average wage due to segregation. In general, this pattern resembles the one found with segregation, as the most segregated countries also have greater losses.

Female natives are also disadvantaged in serval countries. This issue, together with immigrants' low population shares, largely determines the social welfare losses that each country presents. First, the share of the population experiencing monetary losses is small in the countries where only immigrants are disadvantaged (Slovenia, Italy and Spain), as incidence reaches 45% wherever female natives are also disadvantaged. Second, intensity largely depends on the size of the losses experienced by the groups. Given that immigrants derive the largest monetary losses in Italy and Spain, these countries present high intensity levels together with Germany, Finland and the Czech Republic. In contrast, the losses are so small in Portugal that its per capita cumulative monetary loss almost equals 0. The dominance criteria associated with the WLAS curves confirms that social monetary losses are clearly the highest in Italy and the lowest in Portugal.

According to the counterfactual analysis, immigrants' origins, years of residence and, in particular, education explain a significant part of the geographical disparities found on welfare. If female and male immigrants in all countries had the same characteristics as those in the UK, monetary and well-being losses would be reduced everywhere and even turn into gains in certain cases. In the European context, the UK is in a somewhat better position thanks to its immigrants' higher educational levels. Nevertheless, Portugal's

good situation is reinforced in the counterfactual analysis, reflecting higher levels of labor market integration among its immigrant population.

Overall, although data limitations have not allowed us to study welfare losses and gains arising from within-occupation wage inequalities between groups, we have comprehensively discussed how different the welfare consequences associated with occupational segregation are across Europe. The results call for policies that address these labor market inequalities, as such disparities extend to other relevant dimensions and put social cohesion at risk.

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APPENDIX 1: Correcting wage estimations.

Looking at the LFS, we checked which occupations are included in activities A, T and U, thus detecting the jobs mainly affected by the aforementioned wage estimation inaccuracies in the SES. Occupations 61 (market-oriented skilled agricultural workers) and 92 (agricultural, forestry and fishery laborers) will have biased wages due to their links with activity A, and occupations 91 (cleaners and helpers) and 53 (personal care workers) are biased for activity T. Activity U employs a reduced number of individuals and was eliminated from the sample. The share of armed forces members was also small and was removed.

Then, we used the 2015 cross-sectional EU-SILC database[20] to separately estimate the average hourly wages of men and women who work in activity A/T and occupations 61, 92/91,53. However, directly extrapolating these values to the LFS, where the remaining wages have been inputted from the SES, may blur the analysis. Using EU-SILC, we estimated the total average wage of the economy for men and women,[21] and then calculated the percentages that their respective average wages in each of the four occupations represent in their total average wage. Combining these percentages with the total average wage we estimated in the LFS using data inputted from the SES, biased wages were corrected and the analysis is refined.

Getting reliable estimates from EU-SILC requires a minimum number of observations of men and women working in the problematic activities and occupations, but the sample is only large enough in Spain, Italy, Portugal and France. However, according to the LFS, activities A/T employ a significant number of individuals in Spain, Italy and Portugal; activity T in France; and activity A in Slovenia. Thus, given data limitations in Slovenia, we only corrected wages for the first four countries and dropped the observations for occupations 61/92 (91/53) and activity A (T) in the remaining countries. We believe that this procedure will not largely affect our final results, as these occupations at most represent 3% and 4% of total employment in Finland and Slovenia. Finally, protective service workers in Germany and street and related sales-service workers in France and Italy do not exist in the SES, so their wages cannot be estimated and were eliminated from the LFS.

[20] First, the income reference period is the calendar year previous to the survey year for most countries, so survey year 2015 was used to get income data from 2014. Second, we kept the working population aged 17 to 64 and working full- or part-time all year so that hourly wages were consistently estimated using annual earnings and worked months and hours. We trimmed the tails of the wage distribution at the 5% and 99% quantiles for robustness.

[21] The average wage was calculated for an economy that resembles the structure of the SES: Economic activities A, T and U were dropped.

APPENDIX 2: Tables and results

Table A1. Country codes

CODE	COUNTRY NAME
CZ	Czech Republic
DE	Germany
ES	Spain
FI	Finland
FR	France
IT	Italy
NL	Netherlands
NO	Norway
PT	Portugal
SE	Sweden
SI	Slovenia
UK	United Kingdom

Table A2. Educational Level, Years of Residence, Age and Origin of the Immigrants in 2018.

		Education			Years of Residence			Age			Origin						
	Country	Low	Medium	High	0-5	6-10	10 +	16-29	30-49	50-64	EU28	Europe out EU28	Other Africa	North Africa, Near & Middle East	East & South Asia	Lain America	North America, Oceania
Male immigrant																	
	CZ	0.102	0.592	0.306	0.114	0.203	0.683	0.132	0.610	0.258	0.545	0.283	0.001	0.039	0.101	0.006	0.024
	DE	0.286	0.462	0.252	0.210	0.146	0.644	0.164	0.556	0.280	0.417	0.278	0.030	0.181	0.064	0.016	0.014
	ES	0.411	0.323	0.265	0.105	0.107	0.789	0.165	0.639	0.196	0.308	0.037	0.041	0.153	0.079	0.375	0.007
	FI	0.283	0.450	0.267	0.121	0.226	0.653	0.176	0.624	0.200	0.432	0.200	0.071	0.092	0.148	0.032	0.025
	FR	0.333	0.344	0.322	0.087	0.129	0.784	0.123	0.529	0.348	0.236	0.083	0.205	0.353	0.068	0.043	0.011
	IT	0.531	0.360	0.109	0.053	0.170	0.777	0.139	0.655	0.206	0.263	0.233	0.079	0.139	0.178	0.096	0.012
	NL	0.278	0.418	0.303	0.103	0.121	0.777	0.170	0.537	0.293	0.274	0.167	0.082	0.176	0.119	0.153	0.028
	NO	0.186	0.429	0.385	0.230	0.302	0.468	0.160	0.609	0.231	0.516	0.098	0.086	0.089	0.142	0.035	0.034
	PT	0.360	0.356	0.283	0.086	0.060	0.854	0.144	0.613	0.243	0.274	0.096	0.395	0.002	0.019	0.190	0.025
	SE	0.281	0.292	0.427	0.235	0.198	0.566	0.198	0.551	0.252	0.255	0.182	0.097	0.277	0.109	0.058	0.023
	SI	0.178	0.694	0.128	0.113	0.133	0.754	0.116	0.538	0.346	0.000	1.000	0.000	0.000	0.000	0.000	0.000
	UK	0.145	0.346	0.508	0.251	0.176	0.573	0.187	0.613	0.200	0.412	0.041	0.129	0.039	0.275	0.042	0.063
Female immigrant																	
	CZ	0.140	0.534	0.326	0.094	0.176	0.730	0.116	0.628	0.256	0.520	0.339	0.005	0.024	0.097	0.003	0.012
	DE	0.251	0.462	0.287	0.149	0.128	0.723	0.158	0.562	0.280	0.433	0.276	0.021	0.158	0.073	0.028	0.012
	ES	0.323	0.356	0.321	0.111	0.128	0.761	0.171	0.638	0.191	0.285	0.055	0.020	0.064	0.055	0.516	0.006
	FI	0.208	0.443	0.349	0.123	0.215	0.662	0.179	0.601	0.220	0.381	0.288	0.031	0.036	0.221	0.024	0.020
	FR	0.289	0.309	0.401	0.085	0.113	0.802	0.128	0.523	0.349	0.291	0.074	0.192	0.280	0.090	0.057	0.017
	IT	0.377	0.417	0.206	0.041	0.181	0.778	0.102	0.615	0.283	0.370	0.267	0.039	0.051	0.110	0.144	0.019
	NL	0.204	0.435	0.362	0.084	0.119	0.796	0.177	0.556	0.266	0.306	0.122	0.066	0.123	0.142	0.215	0.027
	NO	0.173	0.355	0.472	0.200	0.280	0.520	0.181	0.612	0.208	0.450	0.118	0.067	0.061	0.226	0.050	0.029
	PT	0.257	0.344	0.399	0.082	0.059	0.859	0.123	0.638	0.238	0.313	0.072	0.385	0.001	0.006	0.200	0.021
	SE	0.201	0.284	0.515	0.164	0.188	0.647	0.168	0.562	0.270	0.301	0.194	0.078	0.183	0.161	0.065	0.017
	SI	0.259	0.478	0.262	0.118	0.199	0.683	0.144	0.486	0.370	0.000	1.000	0.000	0.000	0.000	0.000	0.000
	UK	0.108	0.314	0.579	0.209	0.191	0.600	0.189	0.597	0.214	0.437	0.034	0.154	0.026	0.223	0.055	0.071

Table A3. Occupational segregation and welfare loss/gain of natives and immigrants in 2018.

			SEGREGATION		**WELFARE**				**CONDITIONAL WELFARE**			
			Local		Monetary	Well-being			Monetary	Well-being		
Country	Group	Population-shares	D^g	Φ_1^g	Ψ_0	Ψ_1	Ψ_2	Ψ_3	$\Psi_0{}^*$	$\Psi_1{}^*$	$\Psi_2{}^*$	$\Psi_3{}^*$
CZ	Male native	0.5346	0.2390	0.1568	0.0356	0.0360	0.0408	0.0506	0.0332	0.0340	0.0390	0.0490
CZ	Female native	0.4248	0.2945	0.2745	-0.0400	-0.0397	-0.0443	-0.0547	-0.0415	-0.0412	-0.0459	-0.0565
CZ	Male migrant	0.0228	0.2446	0.2029	-0.0106	-0.0149	-0.0184	-0.0210	0.0842	0.0670	0.0565	0.0514
CZ	Female migrant	0.0178	0.3663	0.4460	-0.1009	-0.1154	-0.1426	-0.1875	-0.0154	-0.0335	-0.0595	-0.0985
DE	Male native	0.4233	0.2084	0.1275	0.0641	0.0643	0.0702	0.0829	0.0525	0.0537	0.0599	0.0726
DE	Female native	0.3917	0.2505	0.1910	-0.0232	-0.0181	-0.0145	-0.0118	-0.0317	-0.0274	-0.0252	-0.0248
DE	Male migrant	0.1053	0.3086	0.2628	-0.0693	-0.0751	-0.0862	-0.1046	0.0204	0.0119	0.0031	-0.0073
DE	Female migrant	0.0797	0.2884	0.3124	-0.1349	-0.1534	-0.1877	-0.2445	-0.0377	-0.0515	-0.0735	-0.1080
ES	Male native	0.4558	0.2233	0.1494	0.0401	0.0450	0.0524	0.0627	0.0310	0.0366	0.0443	0.0547
ES	Female native	0.3779	0.2501	0.2141	0.0081	0.0028	-0.0022	-0.0072	0.0004	-0.0047	-0.0101	-0.0160
ES	Male migrant	0.0860	0.3146	0.2876	-0.0973	-0.0924	-0.0928	-0.0982	-0.0041	-0.0029	-0.0022	-0.0019
ES	Female migrant	0.0802	0.3879	0.5203	-0.1617	-0.1700	-0.1880	-0.2168	-0.0736	-0.0827	-0.0968	-0.1168
FI	Male native	0.4766	0.2577	0.1759	0.0490	0.0508	0.0553	0.0627	0.0469	0.0490	0.0537	0.0614
FI	Female native	0.4652	0.2620	0.2095	-0.0419	-0.0430	-0.0462	-0.0518	-0.0433	-0.0446	-0.0480	-0.0539
FI	Male migrant	0.0316	0.3208	0.3110	-0.0283	-0.0297	-0.0338	-0.0408	0.0288	0.0224	0.0153	0.0068
FI	Female migrant	0.0267	0.3164	0.3889	-0.1112	-0.1230	-0.1421	-0.1702	-0.0567	-0.0655	-0.0786	-0.0970
FR	Male native	0.4479	0.2312	0.1497	0.0366	0.0360	0.0378	0.0419	0.0312	0.0312	0.0334	0.0377
FR	Female native	0.4325	0.2466	0.1857	-0.0223	-0.0209	-0.0210	-0.0226	-0.0266	-0.0253	-0.0257	-0.0279
FR	Male migrant	0.0654	0.2812	0.2530	-0.0375	-0.0373	-0.0384	-0.0407	0.0347	0.0302	0.0276	0.0267
FR	Female migrant	0.0543	0.2816	0.2890	-0.0792	-0.0861	-0.0984	-0.1170	-0.0041	-0.0108	-0.0193	-0.0300
IT	Male native	0.4898	0.1874	0.1101	0.0208	0.0262	0.0356	0.0494	0.0076	0.0145	0.0245	0.0383
IT	Female native	0.3655	0.2572	0.2189	0.0474	0.0405	0.0356	0.0323	0.0404	0.0338	0.0285	0.0241
IT	Male migrant	0.0793	0.3814	0.4084	-0.1696	-0.1581	-0.1605	-0.1754	-0.0209	-0.0258	-0.0310	-0.0378
IT	Female migrant	0.0654	0.4463	0.7146	-0.2151	-0.2315	-0.2714	-0.3381	-0.1227	-0.1393	-0.1707	-0.2198

NL	Male native	0.4647	0.2092	0.1246	0.0313	0.0300	0.0307	0.0333	0.0260	0.0248	0.0253	0.0275
NL	Female native	0.4215	0.2346	0.1827	-0.0219	-0.0196	-0.0185	-0.0182	-0.0263	-0.0243	-0.0237	-0.0243
NL	Male migrant	0.0598	0.2559	0.1757	-0.0313	-0.0340	-0.0393	-0.0485	0.0444	0.0413	0.0390	0.0372
NL	Female migrant	0.0540	0.2122	0.1944	-0.0637	-0.0676	-0.0761	-0.0906	0.0063	0.0063	0.0051	0.0028
NO	Male native	0.4253	0.2144	0.1367	0.0309	0.0304	0.0312	0.0333	0.0282	0.0278	0.0287	0.0309
NO	Female native	0.3981	0.2339	0.1903	-0.0103	-0.0089	-0.0082	-0.0082	-0.0126	-0.0113	-0.0108	-0.0111
NO	Male migrant	0.0957	0.2630	0.1934	-0.0384	-0.0391	-0.0404	-0.0422	-0.0161	-0.0169	-0.0179	-0.0192
NO	Female migrant	0.0808	0.2718	0.2984	-0.0660	-0.0694	-0.0756	-0.0849	-0.0407	-0.0429	-0.0471	-0.0535
PT	Male native	0.4533	0.2371	0.1758	-0.0086	0.0003	0.0124	0.0305	-0.0152	-0.0057	0.0067	0.0248
PT	Female native	0.4472	0.2379	0.2058	0.0067	-0.0014	-0.0129	-0.0303	0.0012	-0.0065	-0.0183	-0.0365
PT	Male migrant	0.0475	0.2663	0.1921	0.0066	0.0100	0.0176	0.0309	0.1379	0.1279	0.1334	0.1548
PT	Female migrant	0.0521	0.2841	0.3030	0.0114	0.0009	-0.0128	-0.0329	0.1117	0.0948	0.0841	0.0760
SE	Male native	0.4140	0.2127	0.1343	0.0322	0.0330	0.0348	0.0378	0.0283	0.0292	0.0311	0.0339
SE	Female native	0.3870	0.2110	0.1523	-0.0080	-0.0079	-0.0081	-0.0085	-0.0103	-0.0104	-0.0108	-0.0115
SE	Male migrant	0.1029	0.2281	0.1323	-0.0321	-0.0324	-0.0338	-0.0364	-0.0010	-0.0011	-0.0015	-0.0022
SE	Female migrant	0.0961	0.2945	0.2927	-0.0722	-0.0754	-0.0810	-0.0894	-0.0527	-0.0549	-0.0589	-0.0651
SI	Male native	0.4748	0.2019	0.1153	0.0033	0.0074	0.0134	0.0224	-0.0073	-0.0029	0.0031	0.0117
SI	Female native	0.4172	0.2499	0.1976	0.0291	0.0268	0.0244	0.0213	0.0197	0.0175	0.0145	0.0100
SI	Male migrant	0.0602	0.4064	0.5310	-0.1344	-0.1321	-0.1342	-0.1401	0.0296	0.0275	0.0284	0.0328
SI	Female migrant	0.0479	0.3809	0.4988	-0.1171	-0.1409	-0.1770	-0.2318	0.0601	0.0397	0.0200	-0.0030
UK	Male native	0.4293	0.2141	0.1269	0.0356	0.0432	0.0556	0.0750	0.0356	0.0431	0.0555	0.0749
UK	Female native	0.3941	0.2413	0.1908	-0.0318	-0.0377	-0.0478	-0.0639	-0.0318	-0.0378	-0.0479	-0.0640
UK	Male migrant	0.0953	0.2131	0.1454	0.0064	0.0069	0.0091	0.0135	0.0068	0.0074	0.0098	0.0143
UK	Female migrant	0.0813	0.1897	0.1679	-0.0415	-0.0533	-0.0723	-0.1020	-0.0416	-0.0536	-0.0727	-0.1024