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ABSTRACT

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Theoretical arguments and previous country-level evidence indicate that immigrants are more fluid than natives in responding to changing labor shortages across countries, skill-groups or industries. The diversity across EU member states enables us to test this hypothesis across various institutional, economic and policy contexts. Drawing on the EU LFS and EU SILC datasets we study the relationship between residual wage premia as a measure of labor shortages in different skill-industry-country cells and the shares of migrants and natives working in these cells. We find that immigrants' responsiveness to labor market shortages exceeds that of natives in the EU15, in particular in member states with higher unemployment rates, higher levels of (recent) immigration, and more open immigration and integration policies; but also those with barriers to citizenship acquisition or family reunification. Whereas higher welfare expenditures seem to exert a lock-in effect, a comparison across different types of welfare states indicates that institutional complementarities neutralize that effect.

JEL Classification: J15, J24, J61, J68

Keywords: labor supply, skill matching, migration, labor shortage, welfare state, institutions, policy

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1. Introduction

Immigrant mobility is viewed as a vehicle of labor market adjustment that may help economies to adjust to sectoral shifts, demographic changes, or other shocks due to external factors (see e.g. Kahanec and Zimmermann, 2016, or Ritzen and Zimmermann, 2014). In segmented labor markets with low labor mobility, adjustment to such shocks is sluggish, and shortages and redundancies abound. An inflow of immigrant workers into sectors suffering labor or skill shortages, and their outflow from declining sectors, may offer an effective mechanism through which such imbalances are reduced.

Labor shortages reflect imperfect or sluggish adjustment to changes in the labor market, resulting in economic costs of non-trivial magnitude. Lucifora and Origo (2002) estimate these costs in the short-run and long-run, as well as the direct and indirect costs of skill shortages in a set of European countries in the late 1990s, and conclude that costs generated by skill gaps average around 7% of GDP. A number of other studies have found that skill shortages negatively affect labor productivity, for example when firms fill jobs with over- or under-skilled workers, or do not fill them at all (Tang and Wang 2005; Bennet and McGuinness 2009; Quintini 2011). An important consequence of skill shortages is the impact on wages, as firms may be forced to raise wages in order to attract relatively scarce skilled labor. The shortage of high-skilled workers might decrease the innovation potential in the economy. If shortages lead to wage increases in selected sectors, this can result in widened wage differentials across skills levels and larger inequalities (Lucifora and Origo, 2002; Neugart and Schömann, 2002).

The theoretical argument outlined by Borjas (2001) proposes that immigrants are more responsive to changing labor shortages than natives. If we conceptualize the costs of labor mobility as including the costs of parting with the region, occupation, or sector of origin,

requalification and overcoming institutional barriers, then for immigrants, unlike natives, some costs are sunk. As a result, labor and skill shortages, and the resulting wage premia, should influence immigrants' decision as to where to locate in the destination country more than they influence natives. Existing studies have confirmed this outcome in the US labor market (Borjas, 2001) and the UK (Dustmann, Frattini and Preston, 2012).

Anderson and Ruhs (2008) argue that the elasticity of labor supply with respect to wages can differ across different groups of workers, sectors and occupations. They propose that immigrants' responsiveness to labor shortages may differ across country contexts. This paper's main contribution to the literature is that we explore the diversity across EU member states to study how immigrants' relative responsiveness to labor shortages varies across institutional contexts. We ask two key questions. First, are immigrants more, or less, responsive than natives to labor shortages in EU labor markets? Second, under what economic, institutional or policy contexts do immigrants respond to labor market shortages more (and under what less) fluidly than the natives?

We study these questions using the EU Labor Force Survey (EU-LFS) in combination with the EU Statistics on Income and Living Conditions (EU-SILC) as our main sources of data. Due to the relatively low numbers of immigrants residing in the EU member states that joined the EU in 2004, 2007 and 2013, we limit our sample to the EU15 countries. [1] Our empirical strategy expands on that used by Borjas (2001) and Dustmann, Frattini and Preston (2012), which we amend to study the effect of economic, institutional and policy contexts on how immigrants, relative to natives, respond to labor and skill shortages.[2] In particular we test how responsiveness to labor shortages differs with respect to GDP level, unemployment rate,

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[1] Including Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, the United Kingdom.
[2] See also Guzi et al., 2014.

the generosity of welfare spending, immigrant integration programs, openness to admitting immigrant workers, migration rate and the scale of recent immigration.

We proceed as follows. In the following section we introduce the theoretical model. We then develop a measure of labor and skill shortages and an empirical framework evaluating the average responsiveness of immigrants, relative to natives, to such shortages. In the next step we report the results of the baseline finding and measure the variation in immigrants' responsiveness to labor and skill shortages across various contexts. Finally, we discuss the results and their policy implications, and conclude.

2. Theoretical model

To understand EU natives and immigrants' location decisions, we develop a theoretical model in the spirit of Borjas (2001). Consider an initial allocation of EU natives and immigrants across the EU member states C and skill-industry groups K. Denote W_{kc} the wage that a worker in group $k \in K$ earns in country $c \in C$. For simplicity we assume that requalification or any other adjustment costs A_{kc} pertaining to skill-industry group k and country c are fixed and equal for all individuals, and that W_{kc} is net of any such costs.

The decision about mobility in the labor market is formalized first for an EU native and then for a foreign worker. An EU native worker considers moving from her initial country C_0 and skill-industry group K_0 to another member state or skill-industry group if

$$0 < I = \max_{c \in C, k \in K}(W_{kc}) - W_{K_0 C_0} - D, \tag{1}$$

where D measures the costs of parting with their country or skill-industry group of origin, K_0 and C_0, and includes any pecuniary costs of out-migration, but also non-pecuniary

psychological costs related to the disutility of separation from social, professional or family networks, which are for simplicity's sake assumed to be fixed.

It follows that whenever $D > 0$ there is room for variation in wages W_{kc} across countries and among native workers with the same human capital, and hence inefficient allocation of natives across countries and skill-industry groups. We assume that the distribution of capital is sticky, and hence capital movement generally does not eliminate wage differentials across countries and natives with the same human capital.

The decision for immigrant workers from outside the EU to come to the EU is governed by

$$I = \max_{c \in C, k \in K}(W_{kc}) - W_{K_F C_F} - (D + B_c), \tag{2}$$

where $W_{K_F C_F}$ denotes the immigrant's wage in their non-EU country of origin, and B_c denotes their migration costs reflecting the institutional, legal or labor market barriers specific to country c that are borne solely by immigrants. Such costs include any restrictions stipulated in their work or residence permits, or related to their foreign citizenship, limiting their job or geographic mobility in the EU. These costs depend on economic, institutional or policy variables characterizing host labor markets. For example, transferability of residence and work rights and qualifications within and across EU member states facilitates immigrants' responsiveness to wage incentives. Similarly, transferability of rights to social welfare services probably has a positive effect, too. These effects are compounded if they also concern family members. Immigration policy may also affect immigrants' responsiveness if the selection of immigrants upon entry affects observed or unobserved costs of future migration. On the other hand, policies and institutions that restrict migrants to

certain regions, countries or jobs, or restrict the transferability of their rights and human capital tend to limit their responsiveness to wage differentials.[3]

We assume that immigrants move to the EU for economic reasons only if $I > 0$, i.e. the wage increment resulting from their immigration to the EU compensates for the costs of migration.[4] Furthermore, among the countries and skill-industry groups available in the EU, the model assumes that immigrants choose the one offering the highest wage.[5] An important implication of this model is that immigrants should be more sensitive to wage differentials across EU countries and skill-industry groups than the natives of those countries. This is because immigrants in the EU have already arrived in the EU, and hence the costs D of parting with their source environments are sunk for them upon arrival; these costs are still positive for the EU country natives. It also follows that immigrants' sensitivity to wage variation should be mainly due to the locational decisions of newly arriving immigrants, since immigrants' sensitivity to wage differentials will decline gradually with years since migration, as they become attached to their destinations and skill-industry groups in a similar way to the natives.[6]

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[3] Some of these costs may affect natives as well. We assume that due to foreign citizenship or immigration history, such costs are larger for immigrants than natives, and without loss of generality normalize B_c to be zero for the natives.

[4] $I > 0$ does not necessarily hold for immigrants who have moved for other than economic reasons, including refugees or dependent migrants such as spouses or minors. We also assume that immigrants have perfect information about I.

[5] In reality D and requalification costs may differ across destination or source countries, skill-industry groups, or individuals. For example, the various languages spoken in the EU may vary in their distance from the immigrants' native language, and hence the cost of learning the destination country's language may differ across destinations and immigrants' native languages. Although this is an important consideration, for the argument we develop in this section it is sufficient that costs D are sunk for immigrants, but not for comparable EU-country natives. The model could be straightforwardly extended to include more complex inter-temporal decisions and to treat wages and migration costs as stochastic variables, in which case the key relationships would hold in terms of expected present values.

[6] See e.g. Constant, Gataullina and Zimmermann (2009) and de Palo, Faini and Venturini (2006) on immigrant assimilation in host societies and labor markets.

Our theoretical model thus implies that immigration can increase the efficiency of host labor markets by providing European economies with fluid labor that by improving the allocation of labor across countries and skill-industry groups greases the wheels of the European labor markets. On the other hand, this mechanism may be impeded by immigrants' adjustment in, and growing attachment to host labor markets, as well as any barriers to mobility specifically pertaining to their immigrant status. The degree to which this occurs may interact with economic, institutional or policy variables characterizing the host economy. Hence, the responsiveness of immigrants to wage differentials (relative to the natives) under various economic, institutional or policy contexts is an empirical question.

3. Methodology and empirical framework

3.1 Measuring labor shortages and immigrant-native relative supply

There are two key variables of interest in our baseline model: labor shortages and the relative labor supply of immigrants and natives across countries and skill-industry groups. We proxy labor shortages at the level of skill-industry-country cells by wage premiums, the part of wages that remains unexplained after compositional differences across cells are netted out. Specifically, a wage index pertaining to skill-industry-country cells is computed for each year separately using a log-wage regression of the form

$$W_{ikct} = X_{ikct}\beta + \gamma_{kct} + \varepsilon_{ikct}, \tag{3}$$

where W is the log wage of worker i who belongs to skill-industry group k in country c and year t, X is a vector of worker i's characteristics including gender, education, work experience and work experience squared, and ε is the error term. We normalize wage and all variables in vector X to have zero means in each year t. γ_{kct} gives a vector of fixed effects for

skill-industry-country cells, which can be interpreted as the (adjusted) percent wage differential between the average wage of individuals in the particular cell and the mean wage for a given year in the EU (adjusted for any differences in the individual characteristics listed above).

We next calculate the measure of relative supply of migrants and natives for skill-industry-country cells. Following Borjas (2001) we define the index of relative labor supply Z_{kct} for skill-industry-country cells in each year t separately as

$$Z_{kct} = \frac{M_{kct}/M_t}{N_{kct}/N_t}, \tag{4}$$

where M_{kct} is the number of immigrants belonging to skill-industry group k and country c in year t while M_t is the total number of immigrants in the EU15 in year t. The denominator similarly indicates the relative supply of natives N_{kct}/N_t in the particular cell and year t. The index equals 1 when immigrants and native workers belonging to the same skill-industry group have the same geographic distribution. The index would be greater than one if immigrants in skill-industry group k were overrepresented in country c. When no immigrants are present in a particular group then the index equals 0.

3.2 The empirical model

Our baseline empirical framework is developed following Borjas (2001). To measure the relative responsiveness of immigrants to skill shortages across skill-industry-country cells we adopt a first-difference regression model as follows:

$$\Delta Z_{kct} = \beta_1 \Delta \gamma_{kct-1} + \delta_k + \delta_c + \delta_t + \mu_{kct}, \tag{5}$$

where the first-differenced wage index $\Delta\gamma_{kct}$ is lagged by one year, as the reaction of workers to labor shortages is likely to be lagged. The model also includes group, country and year fixed effects, δ_k, δ_c and δ_t, respectively, which control for any specific factors that might change the relative supply of immigrants. In the empirical section, the model is also augmented with the lagged values of country-level unemployment rate and GDP growth, to account for variation in economic conditions between countries and over time. We estimate this model using the Ordinary Least Squares method. Because the observations represent averages at the cell level, every observation is weighted by the total number of individuals in the cell.[7]

3.3 The economic, institutional and policy determinants of immigrants' responsiveness to labor shortages

To determine whether and how the responsiveness of immigrants, relative to natives, depends on economic, institutional and policy contexts, we augment our baseline model by allowing immigrants' responsiveness to vary across countries with different contexts. Specifically, we adopt a variation of the first-difference model of Equation (5) as follows:

$$\Delta Z_{kct} = \beta_1 \Delta\gamma_{kct-1} + \beta_2 \Delta\gamma_{kct-1}\theta_{ct-1} + \beta_3 \theta_{ct-1} + \delta_k + \delta_c + \delta_t + \mu_{kct}, \qquad (6)$$

where θ_{ct} is an indicator variable measuring the economic, institutional or policy context in country c and year t. This indicator variable attains value 1 when the studied context is present and 0 otherwise. If the underlying context variable is continuous, such as the share of total social expenditures in GDP, we dichotomize it by setting $\theta_{ct} = 1$ in countries whose average value of this variable during the studied period is above the median across all

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[7] Analytic weights (aweights in Stata) are typically appropriate when analysis is based on data containing averages.

countries, and zero otherwise. In this way the indicator identifies countries with more generous welfare spending.

Adding the interaction term to the model changes the interpretation of the key coefficients. In a model without the interaction term, β_1 can be interpreted as the direct effect of a labor shortage on the relative supply of immigrants. The interaction term reflects the fact that immigrants' responsiveness to labor shortages may be different in different contexts. Hence, in a model with the interaction term, the effect of a labor shortage on the relative supply of immigrants is not limited to β_1, but is equal to $\beta_1 + \beta_2 \theta_{ct}$. β_1 is then interpreted as the effect of a labor shortage on immigrants' responsiveness when $\theta_{ct} = 0$ (e.g. in countries with below-the-median welfare expenditures) and $\beta_1 + \beta_2$ is the effect of a skill shortage when $\theta_{ct} = 1$ (e.g. in countries with above-the-median welfare expenditures). The introduction of interaction terms hence enables us to shed light on the heterogeneity of immigrants' relative responsiveness to labor shortages across skill-industry-country cells under different contexts.

3.4 The data

The analysis in this paper combines data from the EU-LFS and EU-SILC. Both data sets are representative household surveys conducted annually in all member states of the EU, and follow the international standard classification of economic activity (coded according to NACE) and occupation (coded according to ISCO). Thanks to its large sample size, the EU-LFS provides reasonably reliable information about the share of foreign-born and native population across skill and industry cells in each country, although it may underestimate irregular migrants.[8] We use the information on workers' earnings from the EU-SILC to

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[8] The EU-LFS has been used in several studies that analyze immigration in Europe, as it uniquely provides both cross-country and longitudinal dimensions (e.g. Dustmann and Frattini, 2011; D'Amuri and Peri, 2014).

measure labor shortages across skill-industry-country cells, as explained earlier. Additional variables, such as national GDP annual growth, GDP per capita, and total unemployment rate, were obtained from the World Bank (2014). Migration variables such as the annual inflow and stock of immigrants in the EU and the share of total social expenditure on GDP are taken from OECD (2014, 2015).

The majority of immigrants in the EU are concentrated in the EU15 countries (Kahanec and Zaiceva, 2009), hence to ensure sufficient sample sizes, we limit our study to these countries. For each of the EU15 countries we partition the labor force into skill-industry-country cells defined by four skill levels based on the ISCO classification (see Appendix, Table A1) and nine industry groups based on the NACE classification (see Appendix, Table A2). This categorization generates 36 groups, for each of which we calculate labor shortage and the index of relative supply of migrants, in each country and year, which we develop to measure the responsiveness of migrants to identified shortages. Any cells with an insufficient number of respondents were dropped from the analysis. The final sample distinguishes 3,238 skill-industry-country cells comprising all EU15 countries in the period 2004-2012.[9]

We define a worker as an immigrant if he or she was born abroad. We distinguish immigrants born in one of the EU15 member states (but residing in another one) and those born outside the EU15 countries, including those born in the new EU member states (2004, 2007 and 2013 enlargements).[10] Workers born and residing in a given member state are classified as natives.

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[9] In the individual analysis, the sample is always limited to employed individuals between 20 and 60 years old. In each country, skill-industry groups are selected if they include at least 50 observations in the EU-LFS database and at least 20 observations in the EU-SILC database. Unfortunately the sample is not balanced with respect to country and year. In the 2004 EU-SILC dataset Germany, the Netherlands, and the United Kingdom are missing, and in the 2011 EU-SILC Ireland is missing. In the EU-LFS data we cannot identify the origin of respondents in Germany, Italy and the United Kingdom in 2004, nor in Ireland during the years 2004, 2005, 2011 and 2012.

[10] This grouping is determined by the level of detail provided in the EU-LFS datasets, where foreigners' country of birth is distinguished only by region. For Germany, nationality is used instead of country of birth.

This definition of immigrants enables us to look at and comparatively evaluate two types of immigrants, those from the EU15 and those from outside the EU15. However we should be careful when interpreting natives' mobility within EU15 countries: if a native of EU15 country A moves to EU15 country B, her status changes from "native" to "EU15 immigrant". Conversely, natives of country A returning from country B to country A switch their status from "EU15 immigrant" to "native". Comparisons between non-EU15 immigrants and natives are therefore problematic, because some "native" moves are not counted (e.g. whenever natives move to another country). In effect, the changes in Z_{kct} may overestimate the relative mobility of non-EU15 immigrants vis-à-vis native mobility. The comparison of EU15 immigrants with natives is less problematic, because each departure measured among the immigrants (natives) corresponds to an arrival measured among the natives (immigrants).

We respond to this problem in the analysis by testing the responsiveness of non-EU15 immigrants to labor shortages vis-à-vis the combined group of natives and EU15 immigrants. This approach is most directly comparable to Borjas (2001) and Dustmann, Frattini and Preston, (2012), as it takes the whole EU15 as the point of reference for the definition of immigrants and natives (i.e. similarly to "US" or "UK" in the two studies mentioned above, respectively).

This research design enables us to exploit the diversity of economic, institutional and policy contexts across the EU15 member states and identify their role in the relative responsiveness of immigrants and natives to labor market shortages. Moreover, it provides for a comparative evaluation of EU15 immigrants and non-EU15 immigrants vis-à-vis the natives defined at the level of member states, as well as non-EU15 immigrants vis-à-vis the combined group of natives and EU15 immigrants, hence "natives" defined at the level of the EU15 as a whole. Such comparison provides a further test for the "immigration grease" hypothesis, studying it

both in the context of free mobility within the EU15 and under the mobility restrictions governing immigration to the EU15 from non-EU15 countries.[11]

Tables A3 and A4 in the Appendix show the distribution of immigrants Z and wage index W across industries and skills, respectively. According to the relative supply index, immigrant workers are primarily concentrated in construction; transportation, accommodation and food; and public administration and social work; they are least concentrated in the education sector. In Table A4 we observe a steep skill gradient in the density of immigrants across occupational groups, with higher concentrations in less skilled occupations. As expected, the wage premium is higher in more skilled occupations. Tables A3 and A4 also show that there is substantial variation in Z and W across industries and occupations and over time, providing for identification of the key parameters β_1 and β_2.

4. Results

4.1 The baseline model

The results of the baseline model (Equation 5) are presented in Table 1.[12] The dependent variable is the supply of immigrants relative to natives in skill-industry-country cells expressed in first difference. We distinguish two definitions of natives: people residing in their member state of birth, and those both born and residing anywhere in the EU15; we denote the former group of natives "MS" and the latter "MS+EU15". We also distinguish two immigrant groups: immigrants born in EU15 countries and those born outside the EU15.

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[11] Year fixed effects help to account for the fact that immigration from new member states is governed by different rules than immigration from third countries.

[12] The first-stage model (3) yields results typical for models of that type; these are available upon request.

The positive estimates for labor shortage indicate that the relative supply of immigrants in a particular skill-industry group rose in those countries where the wage offered to that skill group also rose. The sensitivity of immigrant supply to wage premiums, however, differs across immigrant groups. In particular the coefficient for immigrants of EU15 origin, although positive, is not significant at the conventional levels (t-stat is 1.53). In contrast, non-EU15 immigrants are very responsive to wage changes and the estimated coefficient can be interpreted in terms of the relative elasticity of supply of immigrants and natives: $\varepsilon = \frac{dln(Z)}{dln(W)}$. The wage index measures the average log-wages in each skill-industry-country cell, so that $\varepsilon = \frac{\beta_1}{Z}$. As the mean value of Z is 1.31, the estimate in column 2 implies an elasticity of supply of 0.16 for non-EU15 immigrants relative to natives.[13]

This key result confirming that immigrants are more responsive to labor shortages than natives are is robust to the inclusion of the unemployment rate and growth rate of GDP per capita to the model specification. The regression results reported in columns 4-6 remain very similar in magnitude, with the coefficient for non-EU15 immigrants becoming slightly less significant and the coefficients for EU15 immigrants becoming somewhat more significant.[14] In our further analysis we proceed with this more general specification.

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[13] Borjas (2001) estimates an elasticity of 1.3 for new immigrants in the US. In the UK, the estimates for new immigrants imply an elasticity of 2 (Dustmann et al 2012). Our estimates for recent immigrants introduced in Table 4 imply an elasticity of 0.18. The relative supply elasticities tend to be more positive for men than for women. The implied elasticity from the regression re-estimated in a sample of all males is 0.29, which is consistent with the hypothesis that male migration is mostly labor migration.

[14] The relative supply of immigrants attains maximum values of 193 and 21 for the supply of immigrants from EU15 and non-EU15 origins, respectively. Not surprisingly the index is the highest in Luxembourg, which has the largest share of immigrants in the EU, of whom more than 80% are of EU15 origin (based on EU-LFS). We replicate the analysis based on a sample without Luxembourg to confirm the robustness of our findings. Both estimated coefficients obtained for EU15 immigrants are lower than in the baseline model (Table 1 columns 1 and 4) and not significant at the conventional level (coefficients equal to 0.13 with t-stats of 1.35). The estimates for non-EU15 immigrants remain essentially the same and retain their significance. These results are available from the authors upon request.

Table 1: Immigrant responsiveness to labor shortages (baseline model)

Immigrants	EU15	non-EU15	non-EU15	EU15	non-EU15	non-EU15
Natives	MS	MS	MS+EU15	MS	MS	MS+EU15
	(1)	(2)	(3)	(4)	(5)	(6)
Labor shortage	0.198	0.209 **	0.197 **	0.204 *	0.186 **	0.175 *
	(0.129)	(0.088)	(0.087)	(0.121)	(0.092)	(0.091)
GDP growth				0.009	0.013 **	0.013 **
				(0.008)	(0.005)	(0.005)
Unemployment rate				-0.002	-0.013 ***	-0.013 ***
				(0.006)	(0.004)	(0.004)
R2	0.017	0.048	0.049	0.017	0.06	0.061
N	2452	2452	2452	2452	2452	2452

Source: Own calculations based on EU-SILC, EU-LFS, and WDI data.

Notes: The dependent variable is the supply of immigrants relative to natives in the particular skill-industry-country group expressed in first difference. MS stands for "member state", referring to the level of definition of natives. The labor shortage for the same group is also expressed in first difference. All variables are lagged and models include cell, year and country fixed effects. All regressions are weighted by the number of observations for the skill-industry-country group in year t. Standard errors are in parentheses, *,**,*** identify significance at 10, 5, 1 per cent levels, respectively.

The significant estimate in Table 1 for the influence of unemployment rate for immigrants of non-EU15 origin implies that relative to the natives, immigrants are more sensitive to labor market conditions in a given country. As unemployment in the country increases, the immigrant labor force declines relative to the native labor force, and vice versa. The estimate for GDP is also positive and significant, implying that economic changes tend to influence the supply of non-EU15 immigrants more than that of the natives. These effects are of the same signs but statistically insignificant for immigrants of EU15 origin. These results provide further support for the hypothesis that immigrants respond to market incentives and opportunities more fluidly than natives.

The theoretical model developed above does not provide unequivocal predictions as to whether EU15 or non-EU15 immigrants should be expected to be relatively more fluid, since for EU15 immigrants (who enjoy free movement within the EU but whose migration spells

tend to be longer than among non-EU15 immigrants) costs *B* are likely to be small, but costs *D* high. Our empirical results suggest that the lock-in effect of *D* may outweigh the benefits of lower *B,* as the effects for EU15 immigrants are statistically less significant than those for immigrants from outside the EU15 countries. That the coefficients in columns 3 and 6 are slightly smaller than those in columns 2 and 5, respectively, supports our expectation that measuring natives at the level of member states underestimates the mobility of natives measured at the EU15 level.

One important concern with the interpretation of our results is the direction of causality, for example in a situation when the inflow of immigrants affects wages in the local market. The specification of our model includes lagged variables to partly mitigate this problem. Dustmann et al (2012) argue that if immigrants increase the relative supply of labor in a given skill group, this should cause wages to go down for that group and therefore the estimated coefficients can be interpreted as a lower bound.

4.2 The behavior of immigrants during the Great Recession and under different economic
contexts

An implication of the theoretical model corroborated by our baseline results presented above is that the immigrant workforce serves as a cushion against economic shocks, and that migrants are the first to move if economic conditions deteriorate. To shed light on this hypothesis we test the effect of the Great Recession (started in 2008) on the responsiveness of migrants to labor shortages using the model in Equation 6. We construct a crisis indicator θ_{ct} that takes value 1 in crisis years identified by a lower GDP level (expressed in the constant PPP prices per capita) relative to the year preceding the crisis, and value 0 in non-crisis years.

Table A5 in the Appendix documents that all countries in the EU15 experienced a period of crisis, although variation exists between them as to the timing and duration of the crisis.

The results reported in Table 2 confirm that the main parameters remain virtually unchanged compared to the baseline model, even if their statistical significance is somewhat lower. The estimates imply that immigrants, especially those of non-EU15 origin, remained more flexible than the EU15 countries' native populations during the recession period.

Table 2: Immigrant responsiveness to labor shortages during the Great Recession

Immigrants	EU15		non-EU15		non-EU15	
Natives	MS		MS		MS+EU15	
	(1)		(2)		(3)	
Labor shortage in no-crisis years ($\beta1$)	0.248	*	0.177	*	0.168	*
	(0.133)		(0.098)		(0.097)	
Labor shortage in crisis years ($\beta1+\beta2$)	0.111		0.177	*	0.164	
	(0.129)		(0.101)		(0.1)	
r2	0.017		0.06		0.061	
N	2452		2452		2452	

Source: Own calculations based on EU-SILC, EU-LFS, and WDI data.

Note: See notes to Table 1.

It might be, however, that the relationship between responsiveness to labor shortages and the level of economic development is more resilient, reflecting a country's long-term level of economic development rather than relatively short-term events such as the Great Recession. We therefore introduce dummy variables and interaction terms to test how responsiveness to labor shortages differs with respect to GDP level, unemployment rate and the generosity of welfare spending. We estimate three separate models with dummy variables indicating whether a country has an above- median level of GDP, unemployment rate, or share of total social expenditure in GDP in the studied period ($\theta_{ct} = 1$; zero otherwise). This way we pick up long-term differentials between the countries rather than short-term variation in these

variables. Table A6 in the Appendix illustrates the partition of countries according to these variables and shows that economic conditions in the EU15 are diverse and that each of these three economic variables pick up unique dimensions of their economic development.

Our results, reported in Table 3, confirm those from the previous section, as the effect of labor shortage does not differ between economically weaker and stronger countries, as measured by GDP per capita. On the other hand, the effect of labor shortage on the responsiveness of non-EU15 immigrants in countries with above-median unemployment rates is statistically significant, with a coefficient of 0.33; this is almost double that found in the baseline model and about double the coefficient in countries with below-median unemployment rates. This finding is remarkable, as it indicates that immigrants respond particularly fluidly to labor shortages in the countries that need such response the most.

The findings reported in Table 3 further imply that non-EU15 immigrant workers are more responsive to labor market shortages in countries that are less generous in terms of total social expenditure relative to GDP.[15] This result is in line with the notion that higher welfare expenditures may increase immigrants' reservation wages or offer them other attractive options through active labor market policy programs, locking them into their existing status and making them more similar to native workers in terms of their mobility.

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[15] Greece, Ireland, Luxembourg, the Netherlands, Portugal, Spain and the United Kingdom have below-median expenditure.

Table 3: Immigrant responsiveness to labor shortages, by economic conditions

Immigrants Natives	EU15 MS (1)	non-EU15 MS (2)		non-EU15 MS+EU15 (3)	
Low GDP countries (β1)	0.17	0.217		0.214	
	(0.113)	(0.166)		(0.167)	
High GDP countries (β1+β2)	0.191	0.105		0.085	
	(0.233)	(0.091)		(0.086)	
Low unemployment rate countries (β1)	0.277	0.161	*	0.145	*
	(0.227)	(0.089)		(0.086)	
High unemployment rate countries (β1+β2)	0.141	0.333	**	0.328	**
	(0.154)	(0.164)		(0.164)	
Low social expenditure countries (β1)	0.2	0.37	***	0.352	***
	(0.265)	(0.135)		(0.134)	
High social expenditure countries (β1+β2)	0.207	0.025		0.02	
	(0.136)	(0.118)		(0.117)	

Source: Based on EU-SILC, EU-LFS, and WDI data.

Note: See note to Table 1. The results from interactions are estimated from three separate regressions based on the average level of GDP per capita (in PPP constant prices), unemployment rate, and total social expenditure over the studied period.

4.3 Immigration history and policy

European countries differ greatly as to the characteristics of their immigrant population and their immigration policy. In this section we test how the relative responsiveness of immigrants to labor shortages is affected by the scale of immigration, the rate of recent immigration, and the openness of the country's immigration policy. We calculate the scale of immigration as the share of foreign-born individuals in the working age population using data from the EU-LFS. The rate of recent immigration is determined from OECD statistics as the ratio of cumulative immigrant inflow during the period 2004-2012 to the total immigrant population in 2012. The openness of immigration policy determines the costs of immigration and therefore the type of migrants who enter the country, and hence may affect their responsiveness to labor market shortages. We use a measure developed by Ruhs (2011), who constructs an index of openness to admitting immigrant workers, as of 2009. These variables are described in Tables A6 and A7 in the Appendix. We split the countries into two groups,

with the median as the threshold, and introduce interaction variables with the labor shortage variable as in the previous sections.

Our findings, presented in Table 4, show that immigrants are more responsive than natives to labor shortages in high-immigration countries. This may suggest that a larger immigrant population encourages greater mobility among the immigrant workforce and lower migration or adjustment costs, by more effectively transmitting information about the economic environment. Our estimates further imply that immigrants are more responsive to labor shortages in countries with relatively more recent immigration.[16] This finding corroborates the notion developed in the theoretical section of this paper that fresh immigrants are expected to be more responsive to the changing economic environment than those who moved longer ago. In spite of positive point estimates, the flexibility of immigrants of EU15 origin does not statistically differ from that of natives, across countries with varied recent migration experiences.

The results reported in Table 4 further confirm that more open immigration programs are advantageous for both EU15 and non-EU15 immigrants, as measured by their mobility in the labor market relative to natives.[17] The magnitude of effect in immigrant-friendly labor markets for non-EU15 immigrants, the group directly affected by the immigration policies, is significant and positive; and very similar to the estimate obtained from the baseline model. Our estimates further imply that immigrants of EU15 origin are particularly responsive to labor shortages relative to natives in countries that operate more open labor immigration policies. A possible explanation of this strong effect for EU15 immigrants could be that increased competition from non-EU15 immigrants makes EU15 immigrants more responsive

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[16] The group of countries with high migration rates includes Austria, Belgium, Ireland, Luxembourg, Spain, Sweden and the United Kingdom. The group with high recent immigration includes Austria, Germany, Ireland, the Netherlands, Portugal, Spain, and Sweden.

[17] The group with open migration policies includes Belgium, Denmark, France, Germany, Greece, Sweden and the United Kingdom.

to labor market opportunities in states that are more open to immigration from non-EU15 origins.

Table 4: Immigrant responsiveness to labor shortages in the immigration context

Immigrants	EU15		non-EU15		non-EU15	
Natives	MS		MS		MS+EU15	
	(1)		(2)		(3)	
Low migration rate ($\beta 1$)	0.249	*	0.11		0.102	
	(0.128)		(0.135)		(0.135)	
High migration rate ($\beta 1 + \beta 2$)	0.157		0.265	**	0.251	**
	(0.241)		(0.125)		(0.123)	
Low recent immigration ($\beta 1$)	0.197		0.062		0.045	
	(0.278)		(0.167)		(0.168)	
High recent immigration ($\beta 1 + \beta 2$)	0.208		0.266	**	0.259	**
	(0.146)		(0.105)		(0.103)	
Restricted migration policy ($\beta 1$)	-0.145		0.149		0.154	
	(0.140)		(0.178)		(0.178)	
Open migration policy ($\beta 1 + \beta 2$)	0.311	**	0.21	**	0.194	**
	(0.124)		(0.098)		(0.098)	

Source: Based on EU-SILC, EU-LFS, WDI and Ruhs (2011) data.

Note: See note to Table 1. Migration variables are described in Tables A6 and A7.

4.4 Immigrant integration policies

The theoretical model developed above implies that institutions and policies lowering the costs of adjustment, requalification, or occupational mobility should, in general, increase workers' responsiveness to skill shortages, although lock-in effects may set in with time spent in the destination. Indeed, Ruhs (2011) argues that various barriers prevent immigrants from switching jobs, obtaining permanent residence or reuniting with their families; all of these hinder their professional mobility and career advancement. In this section we evaluate the impact of national integration policies on immigrants' responsiveness to labor shortages using the Migrant Integration Policy Index (MIPEX), constructed in 2010. This index is based on a wide range of 148 policy sub-indicators determined on the basis of expert surveys (Huddelston et al., 2011) and consistently measures the quality of integration policies across

the EU. The sub-indicators are summarized as an overall score in seven fields: labor market mobility, family reunion, education, long-term residence, political participation, access to citizenship, and anti-discrimination.

We apply a similar approach to that used in the previous sections, introducing interactions of the labor shortage variable with an indicator variable that equals 1 for countries with a favorable integration policy (as before, the median score defines a threshold) and 0 otherwise. Table A8 in the Appendix shows each country's MIPEX score, and the figures in bold indicate values above the median in the respective category. The quality of legislation towards immigrants differs to a great extent, both across the countries and between the categories. Only two countries (Sweden and Portugal) operate favorable policies in all seven categories (see Table A8).

The results reported in Table 5 for each group of immigrants and natives confirm that immigrants from non-EU15 origins are generally more responsive to labor shortages than natives in countries with favorable integration policies. This is also confirmed by the interaction term with the overall MIPEX index, which bears a positive and significant coefficient in countries with above-median quality integration policies, but an insignificant coefficient in countries with unfavorable policies.

There are a few notable exceptions, however. In countries with *less* developed family or education integration programs, immigrants remain more responsive to labor shortages than natives, which may seem counterintuitive. However, this result may also indicate that better integration policies assimilate immigrants into host societies such that they are more strongly tied to their host environment and thus behave more similarly to natives. In effect, although better integration policies may lower some of the costs of migration (e.g. recognition of qualifications), they may increase others (e.g. the psychological costs of leaving a familiar

environment and social networks). These effects are consistent with the notion that integration policies lowering immigrants' migration costs facilitate immigrants' mobility and those increasing the pool of dependent immigrants or facilitating integration in local social networks or environments decrease their mobility.

Similarly, legislation providing better access to citizenship keeps non-EU15 immigrants in their chosen location more permanently, so that they behave more like natives, whereas in countries with less favorable rules governing citizenship acquisition immigrants remain more mobile than natives. This finding is consistent with the argument above: as obtaining citizenship is a measure of formal integration into the host society, in countries with better access to citizenship migrants may be hesitant to move to another member state so as not to jeopardize their possibility of acquiring their host country's citizenship. Immigrants are then more likely to invest in host-country-specific human and social capital, which locks them into their host country.

It is interesting to observe that access to citizenship and long-term residence appear to have opposite effects on non-EU15 immigrants' responsiveness to labor shortages. Whereas citizenship creates a lock-in effect, as we have just described, access to long-term residence seems to come with rights that enable immigrants to be more mobile across skill-industry groups and countries. Those rights may include unrestricted access to jobs, the possibility to leave and re-enter the country more easily, and the right to reside anywhere in the host country. The impact of integration policies on migrants' responsiveness to labor shortages may however be of more complex nature, and further study would be needed in order to establish causal links in this area.

Table 5: Immigrant responsiveness to labor shortage under different integration programs

Immigrants Natives	EU15 MS (1)		non- EU15 MS (2)		non-EU15 MS+EU15 (3)	
Unfavorable overall integration (β1)	0.197		0.134		0.115	
	(0.230)		(0.140)		(0.139)	
Favorable overall integration (β1+β2)	0.211		0.245	**	0.241	**
	(0.147)		(0.114)		(0.113)	
Unfavorable labor mobility (β1)	0.053		0.099		0.084	
	(0.292)		(0.177)		(0.176)	
Favorable labor mobility (β1+β2)	0.305	**	0.245	**	0.236	**
	(0.14)		(0.1)		(0.098)	
Unfavorable family reunion (β1)	0.183		0.236	**	0.225	*
	(0.157)		(0.116)		(0.115)	
Favorable family reunion (β1+β2)	0.223		0.141		0.129	
	(0.212)		(0.137)		(0.136)	
Unfavorable education policy (β1)	0.173		0.262	*	0.256	*
	(0.147)		(0.151)		(0.150)	
Favorable education policy (β1+β2)	0.239		0.1		0.082	
	(0.241)		(0.091)		(0.089)	
Unfavorable political participation (β1)	0.163		0.216		0.214	
	(0.132)		(0.181)		(0.182)	
Favorable political participation (β1+β2)	0.233		0.164	*	0.147	*
	(0.21)		(0.085)		(0.081)	
Restricting long-term residence (β1)	0.212		0.126		0.109	
	(0.206)		(0.129)		(0.127)	
Accessible long-term residence (β1+β2)	0.192		0.267	**	0.263	**
	(0.157)		(0.122)		(0.122)	
Unfavorable access to citizenship (β1)	0.169		0.345	***	0.336	***
	(0.159)		(0.131)		(0.130)	
Favorable access to citizenship (β1+β2)	0.237		0.034		0.021	
	(0.236)		(0.128)		(0.126)	
Unfavorable anti-discrimination policy (β1)	0.117		0.237		0.225	
	(0.250)		(0.163)		(0.161)	
Favorable anti-discrimination policy (β1+β2)	0.286	**	0.138	*	0.127	
	(0.141)		(0.084)		(0.083)	

Source: Based on EU-SILC, EU-LFS, WDI data and MIPEX index.

Note: See note to Table 1. Countries are divided into two groups based on the performance of their integration policies in each of seven areas measured by 2010 MIPEX index: labor market mobility, family reunion, education, political participation, long term residence, access to citizenship, anti-discrimination (see Table A6).

As intra-EU15 immigrants enjoy the benefits of free movement within the EU and an equal position in the labor market to that of natives – policies that may be expected to override the role of general integration policies – we expected integration policies to have a larger impact on immigrants of non-EU15 origin than on those of EU15 origin. Table 5 indeed shows that the responsiveness coefficients for non-EU15 immigrants are statistically significant much more often than for EU15 immigrants. On the other hand, there are two exceptions to this rule. One is that favorable policies supporting immigrants' mobility in the labor market help immigrants from all origins, EU15 and non-EU15, to realize their potential and increase their responsiveness to labor shortages. The second is that the point estimate on immigrants' responsiveness is higher and attains a higher level of statistical significance for EU15 than non-EU15 immigrants in countries with favorable antidiscrimination policies. These results imply that labor market mobility and antidiscrimination measures have more profound effects in the society, affecting the broader categories of immigrants.

4.5 The role of welfare state institutions

Although we show above that the size of the welfare state, measured as the share of total social expenditures in the country's GDP, is associated with lower immigrant mobility, welfare state institutions may play more complex roles in determining the responsiveness of immigrants and natives to labor shortages. These effects may arise through immigrants' integration into welfare state institutions, and the transferability of their social welfare entitlements and rights, but also through the welfare state's impact on their reservation wages. In this context Giulietti et al (2014) show that immigrants are not particularly attracted to European countries with more generous welfare spending. To test how welfare state institutions shape the relative responsiveness of immigrants and natives to labor shortages,

we adapt welfare regime typology developed by Esping-Andersen (1990) and extended by Ferrera (1996). Essentially, we divide the EU15 member states into four groups representing different welfare state institutions:

1. The continental Christian democratic welfare state, represented by Austria, Belgium, France, Germany, Luxembourg, and the Netherlands.

2. The Mediterranean Christian democratic welfare state, represented by Greece, Italy, Portugal and Spain.

3. The social democratic (Nordic) welfare state, represented by Denmark, Finland and Sweden.

4. The liberal welfare state, represented by Ireland and the United Kingdom.

Christian democratic welfare regimes are characterized by having scaled-up efforts in recent years to integrate immigrants, but have varied ease of and barriers to access to their labor markets, with relatively easier access in the Mediterranean sub-category. The continental sub-category is characterized by relatively high levels of immigrant segregation in the labor market.[18] The liberal and social democratic welfare states are both characterized by high integration efforts at rather different levels of economic migration (high in liberal welfare states and low in social democratic welfare states).

To test whether these institutional contexts have any effect on immigrant responsiveness to labor market shortages, we amend Equation 6 to account for the diversity of welfare states in the EU and estimate it including the interaction terms of labor shortage with all welfare state types described above. The estimates reported in Table 6 imply that only in social democratic welfare states and for EU15 immigrants is the (positive) estimated coefficient statistically

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[18] For a comprehensive review see Table 1 in Guzi, Kahanec and Mytna Kurekova (2014).

significant. In general the comparison across welfare state types does not support the hypothesis that more generous welfare states would exhibit lower relative immigrant responsiveness to labor shortages. In fact, the estimated coefficients are lower in the liberal welfare states than in the other types of welfare states. Hence, whereas our results above show that larger spending on social expenditures relative to GDP is associated with lower relative immigrant responsiveness to labor shortages (see Table 3), the results reported in Table 6 indicate that more generous welfare states do not necessarily inhibit immigrants' mobility. Rather, these results provide support for the notion that the role of the welfare state, and that of welfare generosity, is more complex and may be shaped by various institutional complementarities.

Table 6: Immigrant responsiveness to labor shortage and the role of the welfare state

| Immigrants | EU15 | | non-EU15 | non-EU15 |
| Natives | MS | | MS | MS+EU15 |
	(1)		(2)	(3)
Labor shortage in AT,BE,FR, DE, LU, NL	0.273		0.138	0.098
	(0.466)		(0.146)	(0.135)
Labor shortage in ES,IT,GR,PT	0.088		0.227	0.234
	0.125		0.259	0.26
Labor shortage in DK,FI,SE	0.335	**	0.155	0.148
	0.161		0.097	0.095
Labor shortage in IE,UK	-0.94	**	-0.03	0.004
	0.366		0.233	0.225

Note: See note to Table 1.

5. Conclusions

Since the seminal paper by Borjas (2001), immigrants have been considered a more mobile type of labor force, responding to imbalances more fluidly than natives. The literature has, however, not yet answered an important question relevant from both the academic and policy perspective: how robust is the notion of immigrant grease with respect to various economic, institutional or policy contexts?

This paper has addressed this question in the context of the EU15, a set of countries that share basic characteristics (advanced liberal market democracies), but differ in many economic, institutional and policy variables. Looking at the EU15 using the EU LFS, EU-SILC and several other auxiliary datasets has enabled us to exploit this diversity and study how it affects the way in which immigrants and natives respond to labor market shortages.

Our empirical strategy, based on a model similar to Borjas (2001), but augmented to account for economic, institutional and policy diversity across the EU15, has resulted in a key finding confirming that economic, institutional and policy context matter for immigrants' relative responsiveness to labor market shortages.

Specifically, our baseline finding that immigrants are at least as much and regularly more responsive to labor shortages than natives is robust across all the studied contexts. In particular, almost none of our results indicate that immigrants would be less fluid than natives in responding to labor shortages. Of the two negative coefficients, for liberal welfare states and countries with restrictive migration policy (for EU15 immigrants), only the first is statistically different from zero. In contrast, in a number of contexts immigrants are shown, at a statistically significant level, to be more responsive to wage changes than the native labor force.

Immigrants appear to be more responsive to labor shortages in high-unemployment countries, and also in countries with relatively low welfare expenditures. The economic recession which began in 2008 had no significant impact on the responsiveness of immigrants to wage changes. Our results further show that countries with larger scale of immigration, higher rate of recent immigration, or more open migration policy exhibit significantly more fluid immigrant work forces than native labor forces. Immigrants are also relatively more responsive to labor shortages in countries with more favorable labor mobility, political participation, long-term residence and antidiscrimination integration policies, as measured by the MIPEX index. The same is true for the overall MIPEX index. On the other hand, immigrants are more mobile in countries with *less* favorable citizenship or family-reunion policies, which is consistent with a supposed citizenship acquisition lock-in effect and the stabilizing effect of dependent immigrants.

Finally, we show that the role of the welfare state may involve various institutional complementarities beyond the effects of welfare generosity measured as the share of social expenditures in GDP. More generous welfare state types do not seem to have less-responsive immigrant populations than their less-generous counterparts; on the contrary, immigrants are more responsive to labor shortage than natives in welfare-generous social democratic welfare states compared to more frugal liberal welfare states.

We also find that EU15 immigrants are similarly responsive vis-à-vis the natives as their non-EU15 colleagues are in some contexts, but we find statistically significant positive results for non-EU15 immigrants in more contexts than for immigrants of EU15 origin. This indicates that compared to the more recent non-EU15 immigrants the lock-in effect for the EU15 immigrants, who generally have a longer history in (and hence are more attached to) their host countries, outweighs the effect of free mobility that they enjoy in the EU15.

As for the limitations of our study, the analysis presented does not permit causal interpretations, since the studied economic, institutional and policy contexts cannot always be seen as fully exogenous. Similarly, although labor shortages are lagged by one period and are measured regardless of the immigrant status of workers in a cell, due to some serial correlation the immigrant-native relative labor supply could still affect skill premia across cells. However, such reverse channels can be argued to reinforce our results, as they tend to attenuate the studied effects (Dustmann et al., 2012). Our study shows that the coefficient of labor-shortage is significantly positive in some but not all economic, institutional or policy contexts in the EU15. This is an important result that deserves further study. We find the role of the welfare state especially intriguing and this requires further quantitative and qualitative investigation. Our results also indicate that policies matter, and that whereas some policies seem to enable immigrants to respond to changing labor market conditions, others may be inhibiting immigrant workers' mobility. As immigrants' labor market mobility provides for the more efficient allocation of labor in host labor markets, policies that inhibit their mobility are costly in terms of forgone GDP.

References

Anderson, B., & Ruhs, M. (2008). *A need for migrant labour? The micro-level determinants of staff shortages and implications for a skills based immigration policy.* COMPAS: Oxford University Press.

Bennett, J., & McGuinness, S. (2009). Assessing the impact of skill shortages on the productivity performance of high-tech firms in Northern Ireland. *Applied Economics*, *41*(6), 727–737.

Borjas, G. J. (2001). Does Immigration Grease the Wheels of the Labor Market? *Brookings Papers on Economic Activity*, *32*(1), 69–134.

Constant, A. F., Gataullina, L., & Zimmermann, K. F. (2009). Ethnosizing immigrants. *Journal of Economic Behavior and Organization*, *69*(3), 274–287. doi:10.1016/j.jebo.2008.10.005

D'Amuri, F., & Peri, G. (2014). Immigration, jobs and employment protection: Evidence from Europe before and during the Great Recession. *Journal of the European Economic Association*. *12*(2), 432-464.

de Palo, D., Faini, R., & Venturini, A. (2006). The Social Assimilation of Immigrants. IZA Discussion Paper 2439, IZA - Institute for the Study of Labor, Bonn.

Dustmann, C., & Frattini, T. (2011). Immigration: the European experience. *Centro Studi Luca d'Agliano Development Studies Working Paper*, (326).

Dustmann, C., Frattini, T., & Preston, I. (2012). *Can immigration constitute a sensible solution to sub-national and regional labour shortages?* Report for the Migration Advisory Committee.

Esping-Andersen, G. (1990). *The Three Worlds of Welfare Capitalism. The Three Worlds of Welfare Capitalism.* New Jersey: Princeton University Press.

Ferrera, M. (1996). The "Southern Model" of Welfare in Social Europe. *Journal of European Social Policy*. doi:10.1177/095892879600600102

Giulietti, C., Guzi, M., Kahanec, M., & Zimmermann, K. F. (2013). Unemployment benefits and immigration: evidence from the EU. *International Journal of Manpower*, *34*(1), 24–38.

Guzi, M., Kahanec, M., & Mýtna Kureková, L. (2014). Does Immigration Grease the Wheels of European Labour Markets? KING Project Economics Unit Desk Research Paper & In-Depth Study n. 18. ISMU, Milano

Huddleston, T., Niessen, J., Chaoimh, E. N., & White, E. (2011). Migrant Integration Policy Index III. Brussels: British Council and Migration Policy Group.

Kahanec, M., & Zaiceva, A. (2009). Labor market outcomes of immigrants and non-citizens in the EU: An East-West comparison. *International Journal of Manpower*, *30*(1/2), 97–115.

Kahanec, M., & Zimmermann, K. F. (2016). *Labor Migration, EU Enlargement, and the Great Recession*. Berlin, Heidelberg: Springer, forthcoming.

Lucifora, C., & Origo, F. (2002). The economic cost of the skill gap in Europe. *Istituto per La Ricerca Sociale, Milan, Italy*.

Neugart, M., & Schömann, K. (2002). Employment Outlooks: Why Forecast the Labour Market and for Whom? *WZB Discussion Paper*, *FS I 02-20*.

OECD. (2014). Social Expenditure Database, Data retrieved on 04 August 2014 from http://www.oecd-ilibrary.org/.

OECD. (2015). International Migration Database, Data retrieved on 15 February 2015 from http://www.oecd-ilibrary.org/.

Quintini, G. (2011). *Over-Qualified or Under- Skilled? A Review of Existing Literature*. Paris: OECD Publishing.

Ritzen, J., & Zimmermann, K.F. (2014) A vibrant European labor market with full employment. *IZA Journal of European Labor Studies*, 3:10.

Ruhs, M. (2011). Openess, skills and rights: An empirical analysis of labour immigration programmes in 46 high- and middle-income countries. *Center on Migration, Policy and Society Working Paper*, (88).

Tang, J., & Wang, W. (2005). Product market competition, skill shortages and productivity: Evidence from Canadian manufacturing firms. *Journal of Productivity Analysis, 23*(3), 317-339.

World Bank. (2014). Data retrieved on 29 November, 2014, from World Development Indicators Online (WDI) database.

Appendix

Table A1 Definition of skill group

Occupation category (ISCO-1)	Skill group
1 Legislators, senior officials and managers	high
2 Professionals	high
3 Technicians and associate professionals	high
4 Clerks	intermediate general
5 Service workers and shop and market sales workers	intermediate general
6 Skilled agricultural and fishery workers	intermediate specific
7 Craft and related workers	intermediate specific
8 Plant and machine operators and assemblers	intermediate specific
9 Elementary occupations	low

Table A2 Definition of industry group

Economic activity	NACE coding	Industry group
Manufacturing, mining and quarrying and other industry	C,D, E	1
Construction	F	2
Wholesale and retail trade	G	3
Transportation and storage, accommodation and food service	H,I	4
Information and communication, financial and insurance activities	J,K	5
Education	M	6
Human health	N	7
Public administration, defense, and social work activities	O, P, Q	8
Agriculture, forestry and fishing	A, B	9

Table A3 The relative supply of immigrants and wage index by industry, in EU15

Year	1	2	3	4	5	6	7	8	9
Relative supply of immigrants									
2004	1.01	1.81	0.83	1.45	0.88	0.59	0.87	1.29	0.73
2005	1.04	1.78	0.84	1.66	0.94	0.57	0.92	1.30	0.79
2006	1.07	1.83	0.88	1.74	0.90	0.55	1.00	1.33	0.89
2007	1.06	1.98	0.94	1.82	0.97	0.51	0.93	1.28	0.93
2008	1.08	1.89	0.98	1.66	1.00	0.53	0.90	1.38	0.81
2009	1.03	1.73	0.97	1.68	0.98	0.53	0.92	1.55	0.97
2010	1.01	1.66	0.97	1.60	0.99	0.53	0.98	1.70	0.98
2011	0.97	1.59	0.93	1.59	1.01	0.57	0.94	1.61	0.97
2012	0.94	1.46	0.93	1.64	1.04	0.60	0.96	1.58	1.17
Wage index									
2004	-0.03	-0.17	-0.17	-0.09	0.08	0.04	0.01	-0.06	-0.68
2005	0.03	-0.07	-0.11	-0.05	0.16	0.07	0.04	0.00	-0.56
2006	0.05	-0.05	-0.13	-0.06	0.14	0.09	0.03	0.01	-0.53
2007	0.06	-0.06	-0.12	-0.08	0.14	0.08	0.03	0.00	-0.64
2008	0.07	-0.05	-0.11	-0.01	0.13	0.08	0.04	0.01	-0.63
2009	0.06	-0.06	-0.11	-0.02	0.10	0.09	0.04	0.00	-0.67
2010	0.03	-0.09	-0.12	-0.04	0.07	0.06	-0.01	-0.01	-0.71
2011	0.06	-0.06	-0.14	-0.05	0.07	0.04	-0.02	-0.01	-0.59

Source: Own calculations based on EU-SILC and EU-LFS data.

Note: The relative supply of immigrants is calculated as the share of non EU15 immigrants relative to the group "MS+EU15" (see Section 4.1). Statistics are average values for the EU15 countries, distinguished by nine industry groups defined in Table A2: 1 Manufacturing, 2 Construction, 3 Wholesale and trade, 4 Transportation, accommodation and food, 5 Communication and financial, 6 Education, 7 Health, 8 Public administration and social work, 9 Agriculture and fishing.

Table A4 Relative supply of immigrants and wage index by skill, in EU15

Year	High	Intermediate general	Intermediate specific	Low
Relative supply of immigrants				
2004	0.65	0.97	1.12	3.30
2005	0.70	0.99	1.21	3.17
2006	0.68	1.05	1.26	3.41
2007	0.65	1.08	1.31	3.60
2008	0.63	1.10	1.36	3.63
2009	0.61	1.09	1.33	3.97
2010	0.62	1.06	1.28	4.29
2011	0.61	1.06	1.24	4.11
2012	0.64	1.07	1.21	4.09
Wage index				
2004	0.14	-0.14	-0.25	-0.37
2005	0.19	-0.10	-0.15	-0.31
2006	0.20	-0.12	-0.13	-0.32
2007	0.20	-0.11	-0.14	-0.35
2008	0.21	-0.10	-0.13	-0.33
2009	0.20	-0.11	-0.15	-0.39
2010	0.18	-0.14	-0.18	-0.39
2011	0.19	-0.14	-0.17	-0.41

Source: Own calculations based on EU-SILC and EU-LFS data.

Note: The relative supply of immigrants is calculated as the share of non EU15 immigrants relative to the group "MS+EU15". Statistics are average values for the EU15 countries, distinguished by four skill groups defined in Table A1.

Table A5 The period of the Great Recession, identified by drop in GDP levels

Country	2004	2005	2006	2007	2008	2009	2010	2011	2012
AT	39248	39918	41178	42539	42963	**41181**	**41787**	**42888**	43139
BE	38446	38905	39679	40525	40602	**39149**	**39610**	**39840**	**39494**
DE	36560	36831	38237	39540	40044	**38080**	39668	40980	41966
DK	41780	42684	43988	44487	**43880**	**41172**	**41558**	**41831**	**41524**
ES	31975	32566	33325	33852	33613	**32040**	**31829**	**31732**	**31198**
FI	36067	36992	38476	40357	40287	**36671**	**37732**	**38618**	**38047**
FR	35256	35630	36256	36856	**36621**	**35286**	**35718**	**36264**	**36085**
GR	28535	29088	30593	31576	**31442**	**30454**	**29035**	**27046**	**25229**
IE	44396	46081	47318	48261	**46265**	**42874**	**42188**	**42946**	**42919**
IT	35602	35758	36435	36861	**36194**	**34050**	**34531**	**34626**	**33715**
LU	86699	89868	92811	97410	**94981**	**88058**	**89147**	**88848**	**86587**
NL	40142	40868	42187	43746	44362	**42516**	**42944**	**43148**	**42453**
PT	25431	25581	25905	26465	**26425**	**25632**	**26116**	**25828**	**25095**
SE	38128	39177	40631	41667	**41090**	**38693**	40880	41763	41840
UK	34579	35454	36163	37113	**36538**	**34388**	**34686**	**34800**	**34658**

Source: WDI

Note: Figures in bold mark the crisis period that is identified by a drop in GDP levels (expressed in the constant PPP prices per capita) in comparison to the year immediately preceding the beginning of the crisis.

Table A6 Economic conditions and immigrant population in the EU15

Country	Log GDP	Unemployment rate	Total social expenditure	Migration rate	Rate of recent immigration
PT	10.16	**9.58**	23.89	0.08	**0.93**
GR	10.28	**12.12**	22.44	0.09	0.53
ES	10.39	**14.91**	23.68	**0.15**	**0.98**
IT	10.47	**7.83**	**26.43**	0.09	0.79
UK	10.48	6.55	22.30	**0.13**	0.82
FR	10.49	**8.87**	**30.94**	0.12	0.34
FI	10.55	7.76	**27.37**	0.04	0.80
DE	10.58	**7.95**	26.30	0.10	**0.83**
BE	**10.59**	7.81	**27.97**	**0.14**	0.73
SE	**10.61**	7.42	**28.40**	**0.16**	**0.99**
AT	**10.64**	4.51	**27.59**	**0.17**	**0.89**
NL	**10.66**	4.09	22.18	0.13	**1.04**
DK	**10.66**	5.56	**28.71**	0.09	0.74
IE	**10.72**	**8.18**	19.96	**0.15**	**0.99**
LU	**11.41**	4.78	22.40	**0.43**	0.59

Source: EU-LFS, OECD and WDI

Note: Reported values are average values across the period 2004-2012. GDP per capita in constant PPP prices and the % of unemployed in the labor force are taken from WDI. The share of total social expenditure on GDP is taken from OECD. Migration rate is calculated

from EU-LFS as the share of foreign-born individuals in the working age population. The share of recent migrants is calculated as the sum of immigrant inflows over the period, relative to the stock of immigrants in 2012, using OECD statistics. Countries are sorted by GDP. Figures in bold indicate values above the median in the respective category.

Table A7 Index measuring the degree of openness to admitting immigrant workers

Country	Program	Index
AT	Settlement Permit-Key Worker Migrant Programme (AUT)	0.556
IE	Work Permit Scheme (IRE)	0.569
IT	Non-Seasonal (ITA)	0.569
PT	Residency visa (POR)	0.583
ES	General Regime (ESP)	0.625
FI	Ordinary Residence Permit (FIN)	0.639
NL	General labour scheme (NED)	0.639
UK	Tier 2-Skilled workers(General) (Points Based System) (UK)	**0.653**
FR	Temporary permit for tempor. work (3-12month) (FRA)	**0.667**
GR	Residence Permit for Regular Staff (GR)	**0.667**
BE	Work Permit type B (BEL)	**0.694**
DK	The Green Card Scheme (DEN)	**0.708**
DE	Settlement Permit (GER)	**0.722**
SE	General Work Permit Programme (SWE)	**0.722**
LU	N/A	N/A

Source: Ruhs (2011)

Note: Countries are sorted by the index. Figures in bold indicate values above the median.

Table A8 Migrant Integration Policy Index (MIPEX) 2010

Country	Labor mobility	Family reunion	Education	Political participation	Long-term residence	Citizenship	Anti-discrim.	Overall
AT	56	41	44	33	58	22	40	42
IE	39	34	25	**79**	43	58	**63**	49
GR	50	49	42	40	56	57	50	49
FR	49	52	29	44	46	59	**77**	51
DK	**73**	37	**51**	**62**	**66**	33	47	53
UK	55	54	**58**	53	31	**59**	**86**	57
DE	**77**	**60**	43	**64**	50	**59**	48	57
LU	48	**67**	**52**	78	56	**66**	48	**59**
IT	**69**	**74**	41	50	**66**	**63**	62	**60**
ES	**84**	**85**	48	56	**78**	39	49	**63**
BE	53	**68**	**66**	59	**79**	**69**	**79**	**67**
NL	**85**	58	**51**	79	**68**	**66**	**68**	**68**
FI	**71**	**70**	**63**	87	58	57	**78**	**69**
PT	**94**	**91**	**63**	70	**69**	**82**	**84**	**79**
SE	**100**	**84**	**77**	75	**78**	**79**	**88**	**83**

Source: www.mipex.eu

Note: Countries are sorted by the overall score. Figures in bold indicate values above the median in the respective category.