KING

Knowledge for INtegration Governance

Does Immigration Grease the Wheels of European Labour Markets?

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The KING project's objective is to elaborate a report on the **state of play** of migrant integration in Europe through an interdisciplinary approach and to provide decision- and policy-makers with **evidence-based recommendations** on the design of migrant integration-related policies and on the way they should be articulated between different policy-making levels of governance.

Migrant integration is a truly multi-faceted process. The contribution of the insights offered by different disciplines is thus essential in order better to grasp the various aspects of the presence of migrants in European societies. This is why **multidisciplinarity** is at the core of the KING research project, whose Advisory Board comprises experts of seven different disciplines:

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The project consists in the conduct of preliminary desk research to be followed by an empirical in-depth analysis of specific key topics identified within the desk research. To carry out these two tasks, each Advisory Board member chose and coordinated a team of two to five researchers, who have been assigned a range of topics to cover.

The present paper belongs to the series of contributions produced by the researchers of the "Economics" team directed by Professors Martin Kahanec and Alessandra Venturini :

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Demography		

The project is coordinated by the **ISMU Foundation**, based in Milan (Italy).

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Does immigration grease the wheels of European labour markets?∗

DESK RESEARCH

1. INTRODUCTION

European countries have been suffering from structural inefficiencies in their labour markets, characterized by labour and skill shortages and mismatches. The economic costs of these inefficiencies in Europe can be substantial. Lucifora and Origo (2002) estimate that the short-term and long-term direct and indirect costs of skill shortages are around 7% of GDP. Quintini (2011) underlines that skill shortages negatively affect labour productivity. Haskell and Martin (1993) find that an increase in skilled labour shortage in the UK in the mid-1980s decreased productivity growth by 0.7% annually, while unskilled labour shortage produced no significant effect. A number of other studies have found that skill shortages have negative effects on labour productivity in Canada (Tang and Wang, 2005), Northern Ireland (Bennet and McGuinness, 2009) and the UK (Foley et al., 1993).

A further important consequence of skill shortages is their impact on wages. Firms may be forced to raise wages in order to attract relatively scarce skilled labour, and these increased wages may affect trade and the competitive capacity of export oriented sectors (indirect effect), and put pressure on inflation (direct effect). Shortage-induced wage increases in selected sectors can result in widened wage differentials across skills levels and larger inequalities (Lucifora and Origo, 2002; Neugart and Schömann, 2002). Moreover, productivity is lower when firms fill high-skilled jobs with low-skilled workers, or do not fill them at all. A shortage of high-skilled workers decreases the innovation potential in the economy.

Labour market flexibility is a general precondition for labour market adjustment in times of sectoral shifts, demographic changes, or other changes due to external factors. In segmented labour markets with low mobility among the resident workers, adjustment to such changes is sluggish, and shortages and redundancies abound. An inflow of mobile workers from abroad into sectors suffering shortages may offer an effective vehicle for improving this adjustment. However, analysis investigating to what extent migrants have historically filled such shortages is scarce; existing studies focus either on the US labour market (Borjas, 2001) or on internal labour mobility (Dustmann, Frattini and Preston, 2012).

In this paper we address this issue, and ask two key questions. First, are migrants more, or less, responsive to labour shortages in EU labour markets than the natives? Second, are there any particular institutional or policy contexts in which migrants respond to labour market shortages better than in other contexts? We first review the key findings from the literature. We then develop an empirical framework evaluating migrants' responsiveness to labour shortages under various institutional and policy contexts. Finally, we

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discuss our results and draw conclusions.

2. MIGRATION AND LABOUR MARKET SHORTAGES: WHAT DO WE KNOW?

2.1. Factors of international mobility

Among the key factors of international labour mobility are
- Actual and expected economic differentials between countries (GDP differentials, employment and unemployment rates, or job vacancy ratio);
- Individual socio-economic characteristics (human capital endowments, skills, age, marital status, gender, occupation, and labour market status);
- Presence of diasporas/networks;
- Geographical distance and other migration barriers.

Before we set out to investigate whether migrants tend to move into sectors where there are labour shortages, it is useful to review briefly what the literature tells us about the drivers of international mobility. The neoclassical theory of migration, which claims that migration is primarily stimulated by rational economic considerations of relative benefits and costs (Todaro and Smith 2006) continues to dominate labour migration research, especially in economics. Under the assumption of full employment, this theory predicts a linear relationship between wage differentials and migration flows (Bauer and Zimmermann, 1999; Massey et al., 1993; Borjas, 2008). Wage differentials of 30% or above have been seen as necessary for migration's benefits to override its costs (Mansoor and Quillin, 2007; Krieger and Maître, 2006). In the extended neoclassical models, migration is determined by expected rather than actual earnings, and the key variable is earnings weighted by the probability of employment (Bauer and Zimmermann, 1999; Massey et al., 1993).

Human capital theory enriches the baseline neoclassical framework by incorporating individual socio-demographic characteristics as an important determinant of migration at the micro-level (Bauer and Zimmermann, 1999, Sjaadstad, 1962). Human capital endowments, skills, age, marital status, gender, occupation, and labour market status, as well as individual preferences and expectations strongly affect migration choices. Heterogeneity between individuals is an important factor, and different individuals in the same sending country demonstrate different propensities to migrate and different preferences in terms of their destination countries (Bonin et al., 2008). Propensity to migrate generally decreases with age, and typically increases with education level (Bauer and Zimmermann, 1999). Migrants tend to be relatively (more highly) skilled, since this on average increases the chances of their success.

Borjas (1987) investigated skill selectivity among immigrants in the US labour market and in particular analyzed the relationship between the income distribution and migrants' skills. He showed that immigrants from countries with higher income inequality tend to be less skilled (negatively self-selected) than the average worker in both their host and source countries. Borjas argued that earnings outcomes differ between immigrants with the same measurable skills but from different countries of origin due to variations in the political and economic conditions in their countries of origin at the time of migration (cf. Chiswick, 2000; Liebig and Sousa-Poza, 2004; Fourage and Ester, 2007).

Related to the neoclassical theory is the push-pull framework which continues to emphasize the economic

context of the flow of workers (Bauer and Zimmermann, 1999). Push-pull factors introduce relational aspects into thinking about migration and compose dyadic frames in which migration flows are studied empirically. Further scholars have variously shown that migration flows may also be significantly affected by historical immigration from a certain origin (i.e. diaspora or network effects) and economic variables such as GDP differentials, employment and unemployment rates, and job vacancy ratio (Czaika, 2012; Giulietti et al., 2013; Fertig and Kahanec, 2013; Kahanec et al., 2009).

In a recent study, Kim and Cohen (2010) use a sample of migration flows from 230 countries of origin to 17 Western countries in the period 1950 to 2007 to identify the demographic, geographic, and socio-economic factors that influence these flows. They find that demographic and geographic factors are of key importance: sending and receiving countries' population sizes and infant mortality rates, the distance between capital cities, and the destination country's land area are statistically significant in explaining much of the variation in migration flows. Interestingly, the authors also find that an older population structure in the destination country and a younger population structure in the sending country were associated with higher migration flows.

Among other factors, Borjas (1999) finds that welfare generosity has some effect on migration within the US; however, this has been shown to be either weak or non-existent by a number of more recent studies (DeGiorgi and Pelizzari, 2009; Pedersen et al., 2008; Giulietti et al., 2013).

2.2. Shortages in the labour market

Labour shortages signal imperfections and sluggish adjustment in the labour market, and result in economic costs of non-trivial magnitude.

Measuring labour shortages is a complex task. Measures that have been proposed include:
- unemployment-to-vacancies ratio,
- wage premium increase,
- labour supply elasticity,
- employers' reports of difficulty filling vacancies,
- normative, statistical and self-declared skill mismatches.

Labour shortages can be conceptualized as a potential driver of migration both across and within national borders. A theoretical and conceptual debate is ongoing as to the nature of labour shortages. Economists generally hold the view that shortages indicate a temporary state of disequilibrium; in an unconstrained market, supply and demand tend to match and, in time the markets clear (i.e. inevitably approach Quadrant I in Figure 1). From this perspective, shortages are a result of low wages; if wages rise, labour supply reallocates. Others have contributed to the debate by shifting the focus away from wage behaviour, and acknowledging that institutional constraints might be responsible for a lag in wage and supply adaptation (Franke & Sobel, 1970; Neugart & Schömann, 2002; Veneri, 1999). Various types of market failure exist in capital markets, labour markets, or due to information asymmetries. Poor hiring practices or a lack of information might therefore contribute to the labour market's delayed adaptation to change. Additionally, the structure of labour market, its regulation, industrial relations, and skill formation systems all potentially influence hiring and firing practices and firms' workforce development strategies, as well as individuals' decisions about skill acquisition (Andersen and van de Werfhorst, 2010; Lassnigg, 2008; Streeck, 2012; van de Werfhorst, 2011; van de Werfhorst, 2004;).

Anderson and Ruhs (2008) argue that elasticity of labour supply with respect to wages can differ across

different groups of workers, sectors and occupations. For example, a wage increase of 'x' may be sufficient to increase domestic labour supply adequately in sector 'y' but not in sector 'z'. This could be because sector 'z' is associated with difficult employment conditions, has a low status in the society, or because the domestic workers lack the relevant skills for sector 'z' and need to be (re)trained, which may take significant time, and hence delay the response. Anderson and Ruhs advocate that careful analysis is needed to define the conditions under which immigration is a sensible response to staff shortages, and to evaluate alternative solutions that might be more or less feasible for a particular occupation or group of workers.
Several other studies have demonstrated that structural and cyclical factors contribute to skill shortages (Lassnigg, 2008; Quintini, 2011). Cyclical shortages appear during periods of economic boom, and are reduced very quickly when the economy slows down. Structural shortages arise due to more profound changes in the economy, such as the introduction of new technology, which requires skills not immediately available in the labour market. Adjustment to these changes requires time, as both wages and education/training systems need to adapt. Even if the markets do eventually clear, the time needed for that to happen generates costs. Migration can serve as a flexible adjustment mechanism in these conditions, when other alternatives require significant time to implement.

Trendle (2008) argues that labour shortages are socially defined: a shortage can be considered to exist if there are fewer workers in an occupation than what the socially desired number (e.g. society demands a certain number of doctors). In these shortage situations, the labour market is not necessarily in disequilibrium, but the social outcome it generates (e.g. long waiting periods) is socially unsatisfying.

2.3. Review of definitions of labour market inefficiencies

The term *labour shortage* has no universally accepted definition. It is used to denote a shortfall of individuals in the workforce but also to refer to a gap (mismatch) between the available workers and the available jobs in the economy (Trendle, 2008). Labour shortage is generally understood to describe a state of disequilibrium in the labour market due to excess demand (Zimmermann, Bonin, Fahr, and Hinte, 2007). Defined in the most basic sense, labour shortages arise where the demand for workers in a particular occupation exceeds the supply of workers who are qualified, available and willing to do that type of work (Veneri, 1999). A shortage may arise in the short-term, from sudden shifts in consumption patterns or trade patterns, or have a more long-term character due to structural changes in the economy, typically caused by technological progress. Striestka-Ilina (2007) proposes use of the term in a more general way to denote an overall shortage of labour at national level in various sectors and occupations, referring mainly to an overall quantitative deficiency in the workforce.

Skill shortages are a more specific way of advancing the concept of labour shortages. Skill shortages can have a number of forms, and call for different policy interventions (Rutkowski 2009). For example, a *skill shortage* might occur among workers in specific occupations which demand specific skills that cannot easily be substituted; this might happen, for example, in the aftermath of economic restructuring biased towards skill-specific production. A second type of *skill shortage* is possible when workers are available with occupational skills that are in demand, but these workers *lack other essential skills*, such as IT skills or soft skills (this is known as a *soft-skills gap)* (see also Anderson and Ruhs, 2008; Trendle, 2008). Striestka-Ilina (2007) uses the term *skill gap* to describe a qualitative mismatch between the supply or availability of human resources and the requirements of the labour market, for example when employers are not satisfied with the overall skill-set of the workforce. A *mismatch* is generally defined as the shortage of certain skills and simultaneous excess of other skills (Arratibel et al, 2007; Rutkowski, 2009). Different kinds of mismatches that may occur on the labour market include: *qualitative mismatch,* when workers' qualifications do not match the qualification profiles of job vacancies; *spatial mismatch,*, when unemployed persons seeking work and firms offering suitable jobs are located in different regions, and the jobs and/or

the individuals are insufficiently mobile; and *preference mismatch,* when unemployed persons or labour market entrants are unwilling to take up certain types of work even though they have the relevant qualifications, due to inadequate remuneration, perceived inadequacies in the working conditions, or poor occupational status. Mismatches can be reinforced by information deficits when supply does not meet labour demand due to a lack of information (Boswell, Stiller, and Straubhaar, 2004; Anderson and Ruhs, 2008).

Labour market mismatches arise from skill shortages that are often themselves a combination of different kinds of mismatches. The existence of skill or labour shortages is usually identified by employers having considerable difficulty in filling vacancies for an occupation, or specialized skill needs within that occupation, at the current levels of remuneration and conditions for employment, and in a reasonably accessible location (Trendle2008).

Quintini (2011) classifies and defines skill imbalances in the following way: skill shortage describes a situation in which employers are unable to employ workers with the necessary skills; a skill mismatch, skill deficit or skill gap occurs when the available workers' skills do not match job requirements; skill underutilization or a qualifications mismatch describes the situation in which workers are better qualified than their position requires (over-skilled). The author suggests that skill shortages can be due to labour shortages, geographical mismatch or an insufficiency of workers with specific skills.

In his study on imbalances in pan-European skill supply and demand, Kriechel (2013) uses the skill mismatch conceptualization introduced by Sattinger (2012), which defines short-run and long-run qualitative skill mismatches. Short-run qualitative mismatches refer to mismatches resulting from imperfect information (these are temporary) while long-run qualitative mismatches are structural in nature and result from changes in the qualifications and skills required for jobs. Skill mismatches force companies to make adjustments, reduce their productivity levels, and diminish economic growth prospects. They also lead to over-qualification among workers (working at a job below one's educational level). Over-qualification can cause companies to lose productivity and workers to receive lower wages.

Figure 1, adopted from Constant and Tien (2011), summarizes the difference between labour shortage and mismatch in a useful way, based on the Beveridge curve and the relationship between vacancy rate and unemployment rate.

Figure 1 - Application of the Beveridge Curve to identify labour market disequilibria
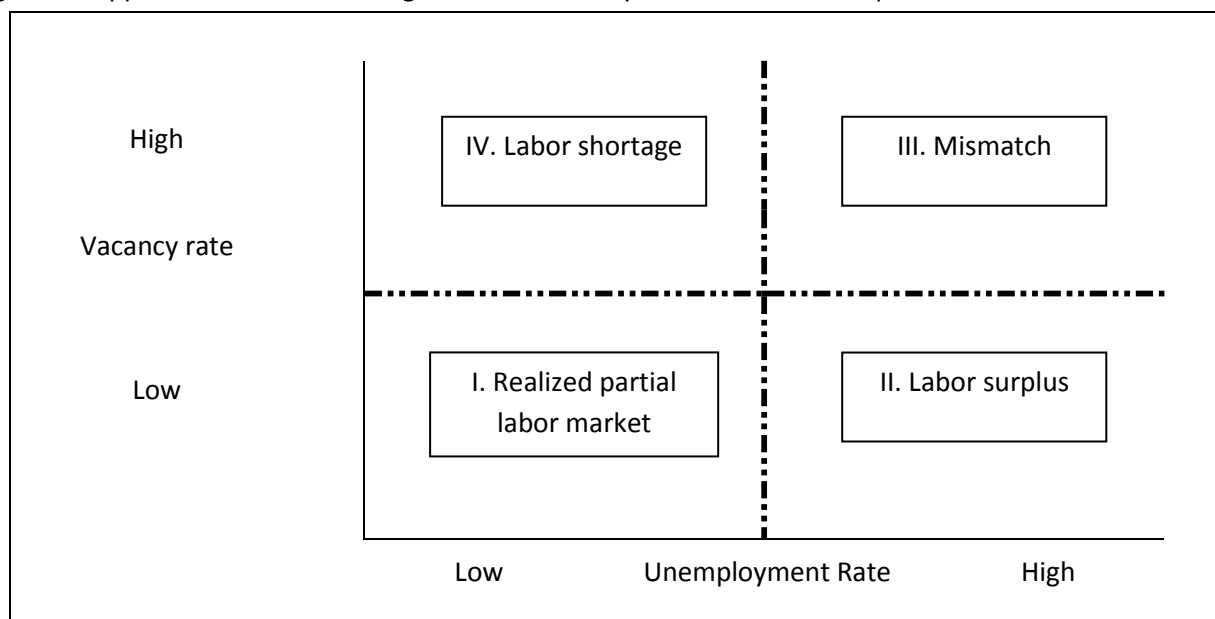
Source: Institut der deutschen Wirtschaft (2004) in Constant and Tien (2011)
Vacancy rate is the ratio of vacancies to employed workers in the labor market. Unemloyment rate is the ratio of the number of unemployed people to the active labor force.

2.4. The measurement of skill shortages and mismatches

Measuring skill shortages and skill gaps is complex, and a range of different approaches can be found in the literature. A standard (but static) measure of skills shortage is the vacancy rate, which is the ratio of vacancies to employed workers in the labour market by skill (education level/ISCED) or occupational group (ISCO). The higher the number of vacancies relative to workers is, the more severe the shortage of a given type of labour is considered to be (see also Rutkowski, 2009; Zimmermann et al., 2007). If the opposite is true, and there are a high number of unemployed people, and a low vacancy rate, we are looking at a job shortage rather than a skill shortage; an absolute job shortage is characterized by high levels of unemployment across occupations, skill levels and regions, and is also indicative of problems in the labour market.

A common approach to measure skill or occupational mismatches is to compute the unemployment-to-vacancies (U/V) ratio, which shows the number of jobseekers per job opening (Obadić, 2006; Padoa-Schioppa, 1991; Rutkowski, 2009). A large variation in the resulting indexes across occupational (or educational) groups signals a large skill mismatch in the economy. A high U/V ratio across occupations means that there is a lack of jobs rather than a skill mismatch. Alternative methods for estimating skill mismatches would be to compare the distribution of occupational groups among the unemployed by computing the variance of relative unemployment rates, or to look at the shares of unemployed and vacancies for manual and for non-manual workers (Padoa-Schioppa, 1991). Lassnigg (2008) applies a summarized mismatch index to measure mismatch in Austria over time, while Kureková (2011) applies the occupational unemployment rate variance index to estimate the development of occupational mismatch in eight CEE countries over time. Research that has used more sophisticated indicators to assess labour market dynamics across subsections (occupations, skills, regions) has reached inconclusive and conflicting findings when estimating labour market mismatches with different variance indices (Obadic, 2006; Padoa-Schioppa, 1991; Layard et al., 2005).

Zimmermann et al. (2007) suggest that in order to identify occupations with shortages, it is necessary to look at multiple indicators, such as unemployment and vacancy rates, employment growth, wage growth, and their changes in time. However, synthesizing these different measures into one condensed indicator to be used in quantitative analysis is not a trivial matter. For example, Zimmermann, et al. (2007) developed various procedures to merge indicators that may signal labour shortages into a summarizing indicator, but found too much variation between the different indicators to deliver a convincing conclusion for immigration policy. Similarly, Veneri (1999) argues that snapshots of the labour market over time enable us to assess changes in demand and supply for a particular occupation. On the demand side, therefore, trends in vacancy data need to be evaluated along with other labour market indicators, such as changes in employment, wages and unemployment. In addition to hard data, he also considers anecdotal evidence (e.g. newspaper articles) to be a valuable source of information about labour shortages. To evaluate current and potential labour market shortages, information on supply should also be considered, including data on demographic characteristics, education by field of study, the skill specificity requirements of a given occupation, and employers' requirements regarding education and training.

Martin and Ruhs (2011) suggest that there is no universal method for identifying labour or skill shortages, but that shortages should be analyzed together with wages and other labour market indicators. The authors suggest that labour shortage should be defined top-down, meaning that industries considered to have labour shortages should demonstrate high employment growth and a relatively low unemployment rate. Applying this approach, Veneri (1999) found no shortages in IT, construction and nursing, even though shortages were reported by those industries. On the other hand, a bottom-up approach applied by Migration Advisory Committee in the UK, based on evidence from employers, found shortages of project managers in property development and construction, even though these were not reported at the national level.

Cohen (1995) used a complex set of six top-down indicators for 193 occupational groups: occupational unemployment rate and change in occupational employment; change in wages; long-term expected growth of the occupation; total replacement demand for the occupation; number of certifications for employment of foreign workers; and vocational specifications required. He projected demand for a number of highly-skilled positions, but according to Martin (2012), his efforts were largely unsuccessful. Veneri (1999) meanwhile determines that three criteria reveal the presence of labour shortages in 68 occupations in the 1990s: employment growth at least 50% higher than the average across other occupations, growth in median wage at least 30% higher than the average across occupations, and occupational unemployment rate at least 30% lower than the average. Using these thresholds, he did not find shortages in some occupations in which employers claimed there to be a shortage (in particular computer workers and construction workers).

The above studies use aggregate macro-level data to estimate labour and skill shortages. An alternative way of measuring shortages is to use employers' own assessments, which is a more direct way of estimating the existence of shortages. The length of time it takes for the employer to fill a vacancy, or the share of employers who report difficulty in recruitment are possible measures (Constant and Tien, 2011; Lucifora and Origo, 2002; Quintini, 2011). Lucifora and Origo (2002) define external and internal skill shortages, using the number of hard-to-fill vacancies as a measure of external skill shortage, and the divergence between a firm's current skill level and that needed to meet its business goals as a proxy for internal skill shortage (conceptualization) of shortage. Nevertheless, using this type of survey data brings with it problems in terms of the international comparability and frequency of surveys. For other weaknesses of this method, see Boswell et al. (2004).

In addition to studies proxying labour market imbalances (gaps, shortages, mismatches) on an aggregate level, further approaches have studied mismatch on the individual level, focusing on the issues of over-education and/or over-skilling. Among them, Byrne and McGuinness (2009) point out that recent literature

on mismatches emphasizes over-skilling rather than over-education, and defines over-skilling as the situation in which an employed worker reports that their skills are not fully utilized in their job. The study's authors suggest that over-education analysis is not a precise tool with which to measure skill mismatch, as it does not include individual human capital skills acquired during employment; they argue that over-skilling is a much more robust measure of mismatch. They also claim that little attention has been devoted to labour market mismatches among migrant and native ethnic minority groups, with some scholars attributing ethnic differences in over-education either to discrimination, different educational "quality", lower level job experience, or different career mobility stages.

Quintini (2011) points out that qualification mismatch can be measured by normative, statistical and self-declared approaches. The normative approach establishes a priori matched qualifications for a certain job category. The statistical approach calculates the educational distribution of each occupation and considers workers whose skills lie outside that by more than one standard deviation to be mismatched. The self-declared approach uses questionnaires among workers focused on the correlation between their educational level and job requirements. Having analyzed the available literature relevant to OECD countries, the author concludes that Spain and the UK demonstrate, on average, the largest incidence of over-qualification. However, the results vary according to the measurement approaches applied. The literature is inconclusive concerning the question as to whether over-qualification is a permanent or transitory phenomenon.

According to Quintini (2011), skill shortages can be measured by employers' assessment (through surveys), various measures of job vacancies, vacancy rates (used to draw the Beveridge Curve) and wage growth. The vacancy rate approach is dependent on the quality of vacancy data, which can be focused on low-skilled positions and underestimate more highly skilled segments. The wage-growth approach is also limited, as it does not include non-financial incentives. While we acknowledge this limitation, data availability is limited for comparative cross-country research, and we do therefore use unexplained wage premiums in host countries as an indicator of labour shortage in our empirical section.

2.5. Can migrants fill labour shortages?

The literature proposes that migration is a vehicle for labour market adjustment, and suggests that immigrants bring useful skills into their host country and fill labour shortages.

Migration may increase but also decrease natives' incentives to acquire skills and lead to path-dependency and reliance on migrants.

Overreliance on measurement of skill shortages to guide migration policy decisions may be misleading.

A number of studies argue that immigrants bring in valuable skills, but warn that their potential is often not fully realized, due to mismatches between immigrants' skills and the jobs they actually take, which are typically below their (formal) skill level.

On the policy level, many countries have addressed skill shortages through active immigration policies, as well as through other means, such as encouraging tertiary education (Quintini 2011). The extent to which migration and migration policy can address the issue of labour shortages and skill gaps in a host country's labour market has been widely debated. Martin and Ruhs (2011) suggest several methods which employers may use to eliminate labour shortages, such as increasing wages, providing training for less skilled workers, changing production processes, increasing imports, and recruiting immigrant workers; the last can lead to

over-dependence on immigrants in some sectors. Several studies suggest that managed migration can solve labour shortage problems (Boswell et al, 2004; Kahanec and Zimmermann, 2010). Anderson and Ruhs (2008) argue, however, that migration could decrease training incentives and lead to path-dependency and reliance on immigrant labour (if immigrants constitute a large share of the workforce, it might be problematic for employers to switch to another alternative); furthermore, low-skilled migration might delay the introduction of more capital-intensive production techniques. In their study of German immigration and skill shortages, Zimmermann et al. (2007) conclude that the high unemployment rate in Germany should not be used as an argument against selective, controlled immigration.

Kurekova (2011) analyzes the impact of migration on skill shortages in migrant sending countries in Central and Eastern Europe (CEE) and finds that immigration to these countries (as destination countries) has served as a complementary tool in managing skill shortages in certain sectors of the CEE labour market resulting from developments including emigration. She also argues that a structural mismatch between vacancies and workers' skills led to increased immigration into the new member states due to a lack of well-matched national labour force (see also Kahanec and Zimmermann, 2010). Similarly, in 2003 and 2004, Poland experienced high inflows of migrants from Ukraine, Belarus and Russia (Frelak and Kazmierkiewicz, 2007; Iglicka, 2005). These inflows might indicate patterns of substitution in the Polish labour market by non-EU immigrants.

A study by Ruhs, Anderson and McNeil (2011) on labour market shortages and immigration policy tries to address the key question of how to connect immigration admission policy with the destination country's labour market needs while recognizing the controversy surrounding the political debate about filling labour and skill shortages with immigrant labour. Employers often claim that labour shortages should be filled by immigrants, because native workers are either not willing or not qualified to perform certain jobs, while labour unions often propose that immigrant employment is mere exploitation of cheap labour.

According to the Ruhs, Anderson and McNeil (2011), employers may prefer to employ immigrants because they have higher skills and a better "attitude" to work. Due to their self-selection to migration and their immigrant status, immigrants generally have lower wage and employment expectations, and a greater readiness to accept jobs below their skill level. Ruhs, Anderson and McNeil claim that in some industries, existing shortages and an evident overreliance on immigrant workers may have been caused by a low level of labour market regulation and low levels of vocational training (e.g. in the UK construction sector) or by low wages and poor working conditions (e.g. in social care in the UK).

A study by Kahanec et al. (2013) analyzes existing structural inefficiencies in labour markets characterized by labour and skill shortages and mismatches. The authors suggest that improved labour market flexibility could improve labour market adjustment, especially in sectors with low resident labour mobility. In this case, a foreign labour force could be an option to mitigate labour shortages. The authors further argue that migrants from the Eastern Partnership countries (Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine) in the EU provide suitable human capital and much-needed productive capacity, and even help to mobilize internal capacities. At the same time, their potential is not fully realized due to job/skill mismatches caused by barriers in access to the labour market.

In a study on labour shortages and immigration policy in Germany, Constant and Tien (2011) study the role of immigrants in mitigating demographic and labour shortage problems in Germany. The authors underscore the effect of outmigration and brain-drain in Germany, which has aggravated the problems of a shrinking labour force and a growing old age dependency ratio. The authors find that most immigrants in Germany are employed in low-skilled sectors, and that this has been the case even following the implementation of the migration policy reform in 2005 designed to attract high-skilled migrants.

A study on the labour market assimilation of immigrants in Spain by Fernández and Ortega (2008) finds that

immigration has been important for satisfying labour demand in many sectors, such as services and construction, where the native workforce could not meet the demand. In addition, immigration helps to reduce wage pressures. However, their analysis shows that Spain may find it challenging to retain these immigrant flows.

Doudeijns and Dumont (2003) emphasize that labour shortages mostly concern the high-skilled sector, while the unemployed and inactive native populations are mostly low-skilled. This, they argue, calls for an inflow of foreign labour force. The authors analyze existing approaches to estimating labour shortages in different countries: occupational-level projections, (e.g. the US Occupational Outlook Handbook), indicators of future labour market perspectives (Netherlands), quotas applied in Italy and Spain, regional labour market tightness indicators used in Australia and Canada, as well as selective immigration policies introduced in the 2000s (e.g. shortage occupation lists in the UK, the Green Card scheme in Canada, the H-1B visa in the US, and points-systems in Australia, Canada and New Zealand). They conclude that immigrants who have resided in their destination country for a longer time eventually leave the more insecure jobs and, consequently, new immigrant inflows are needed to fill the shortages in these sectors.

Doudeijns and Dumont (2003) also suggest that labour shortages may not necessarily be cyclical, since they may be caused by a variety of factors and sometimes may even be exacerbated by an economic boom. They present the example of a Green Card scheme introduced in Germany in order to attract high-skilled immigrants to the ICT sector, where significant shortages were perceived, and point out that very few immigrants arrived as a result of this scheme, indicating either an overestimation of the labour need by the employers, or that migrants made different destination choices.

2.6. Evidence on migrants' responsiveness to labour shortages

Empirical evidence on the responsiveness of migrants to labour or skill shortages is scant. A study on the US as well as a recent study on the European Union do, however, provide evidence that immigrants are equally or more responsive than the natives of their destination countries to shortages across sectors, occupations and regions.

Borjas (2001) studied the effects of immigration on the US labour market and found that new arrivals tend to settle in states that pay higher wages for the skills the migrants possess and, in this way, help to equalize economic opportunities across areas. Kahanec et al. (2013) investigate whether migration helps to alleviate labour shortages in the EU labour market by evaluating the correlation between changes in residual wage differences for different industry-skill groups and the decisions made concerning employment in these jobs by both foreign and native workers. In particular, their analysis measures migrants' responses to changes in residual wage premia, vis-à-vis the natives' response. The authors identify a significant correlation between changes in shortages and the relative supply of immigrant workers in a sector, concluding that immigrants effectively fill gaps in industries, countries and occupations, because they are more responsive to labour shortages than natives. The authors estimate the elasticity of supply of immigrants compared to natives with respect to wage premia to be 0.5. To illustrate, a 12-percentage-point positive increase in wages in a given industry-skill-country group would result in relative migrant supply in that group increasing by 1.3 percentage points. Controlling for unemployment rate and GDP per capita, the authors find that immigrant supply is more responsive to labour market circumstances than native worker supply (the immigrant workforce decreases with increased unemployment to a greater extent than the native working population). On the other hand, broader economic changes have equal effects on immigrant and native labour supply; GDP changes were shown not to affect the relative supply of immigrants and natives across countries significantly. Guzi et al. (2015) extend the study by Kahanec et al (2013) and look at immigrants' relative responsiveness to labour shortages across institutional and policy contexts in Europe.

IN-DEPTH STUDY

3. DO IMMIGRANTS GREASE THE WHEELS OF EUROPEAN ECONOMIES?

In this final section we adopt the methodology pioneered by Borjas (2001) and later used by Dustmann, Frattini and Preston (2012) in the context of the UK, and by Kahanec et al. (2013) and Guzi et al (2015) in the EU context, to test whether immigrants help to reduce supply and demand imbalances in European labour markets. In particular, we look at the relationship between labour shortage measurements concerning jobs in various countries and industry-skill groups, which we call cells, and migrants' and natives' decisions about their location across countries, industries and occupations. Our results show that migrants from outside the EU15 countries respond to labour shortages more than natives in the EU15 countries, and thus provide for more efficient allocation of labour in the EU15. We also show that these migrants' responsiveness depends on countries' economic and institutional contexts.

3.1. Empirical strategy and data

The empirical strategy underpinning our results rests on two key building blocks. First, skill shortages are measured separately for each year in the form of wage residuals W_{cell} across skill-industry-country groups[1] after controlling for differences in the gender, educational and work-experience composition of workers across cells (Guzi et al., 2015). The estimated wage indices represent the wage premium in the given industry-skill-country group with respect to the average value at the European level (the wage indices presented in Table 1 and 2 show wage differential in percentages between the average wage (adjusted for individual characteristics) in the cell and the mean wage for the given year). In the analysis we test whether migrants are more responsive to these differences than the native population.

Second, following Borjas (2001), for each year and skill-industry-country cell we define an index of relative immigrant and native worker supply

$$Z_{cell} = \frac{M_{cell}/M}{N_{cell}/N}$$

where M_{cell} is the number of immigrants belonging to the skill-industry-country cell and M is the total number of migrants in the EU as a whole in the same year. The ratio of N_{cell} and N measures the relative supply of natives in the particular cell. An index higher than 1 indicates a relative over-concentration of immigrants in the given skill-industry-country group. We use the European Union Labour Force Survey (EU-LFS) to calculate the share of immigrant (defined as foreign-born) and native populations across skill and industry cells in each country, and the European Union Statistics on Income and Living Conditions (EU-SILC) to measure labour shortages (unexplained wage residuals) across the cells. As the classification of occupations and industries is harmonized across the two data sources, we can combine the calculated variables into a longitudinal dataset. After eliminating cells which have an insufficient number of individual observations, the final dataset includes 381 skill-industry-country cells for the period 2004-2011.[2]

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[1] Specifically, we partition the labor force into skill-industry-country groups, called cells, defined by four skill levels based on the ISCO classification and nine industry groups based on the NACE classification (see Tables A1 and A2 in the Appendix), yielding 36 cells for each country and year.

[2] Cells with fewer than 50 observations in the EU-LFS and fewer than 20 observations in the EU-SILC are excluded from our sample. The dataset includes Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands,

We adopt the empirical model developed by Guzi et al. (2015), measuring the statistical relationship between labour shortages (measured by wage residuals) and the relative supply of immigrants and natives across skill-industry-country groups as follows:

$$\Delta Z_{cell} = \beta_1 \Delta W_{cell} + \beta_2 GDP\_growth + \beta_3 U + \delta_c + \delta_t + \varepsilon_{cell}, \qquad (1)$$

where Δ stands for difference between two consecutive years, δ_c and δ_t are country and year fixed effects, respectively, and ε_{cell} is the error term. To reflect the fact that workers' reactions to labour shortages may take some time, the wage index and other explanatory variables are lagged by one year. We include the unemployment rate and GDP growth to control for overall conditions in the countries' labour markets. The model is estimated using the Ordinarily Least Squares method, and observations are weighted by the total number of workers in the skill-industry-country group. The national unemployment rate and GDP annual growth figures are taken from the World Development Indicators (WDI) online database.[3]

Tables 1 and 2 show the distribution of immigrants Z and wage index W across industries and occupations, respectively. We observe that immigrant workers are primarily concentrated in construction, transportation and storage, and public administration. They are least concentrated in the education sector. According to the wage index, labour shortage increased the most between 2004 and 2011 in the following sectors: manufacturing, construction, and agriculture and fishing.

Table 1 - Distribution of immigrants and wage index across industry groups

Year	1	2	3	4	5	6	7	8	9
Relative supply of immigrants									
2004	1.01	1.87	0.83	1.46	0.92	0.59	0.87	1.30	0.71
2005	1.04	1.81	0.84	1.67	0.98	0.57	0.92	1.31	0.77
2006	1.07	1.85	0.89	1.77	0.94	0.56	1.01	1.34	0.88
2007	1.07	1.98	0.94	1.86	0.99	0.51	0.94	1.28	0.91
2008	1.08	1.89	0.98	1.69	1.02	0.53	0.91	1.38	0.80
2009	1.03	1.73	0.97	1.70	1.00	0.54	0.92	1.55	0.95
2010	1.01	1.67	0.97	1.63	1.01	0.53	0.99	1.69	0.96
2011	0.97	1.60	0.92	1.60	1.02	0.57	0.94	1.60	0.95
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: Statistics are provide for nine industry groups: 1 Manufacturing, 2 Construction, 3 Wholesale and trade, 4 Transportation and food, 5 Communication and financial, 6 Education, 7 Human health, 8 Public administration, 9 Agriculture and fishing.

We observe a steep skill gradient in the density of immigrants across occupational groups, with higher concentrations in less skilled occupations (Table 2). As expected, the wage premium is visibly higher in

more skilled occupations, which informs us that the labour shortage in occupations requiring highly skilled workers remains roughly stable. A decreasing wage index is observed in other occupation groups, which indicates an excess of labour putting downward pressure on wages. The wage index has been greatest in the low-skilled group over recent years. Tables 1 and 2 also show that there is substantial variation in *Z* and *W* across industries and occupations and over time, providing for identification of β_1.

Table 2 - Distribution of immigrants across occupations

Year	1	2	3	4
Relative supply of immigrants				
2004	0.66	0.98	1.14	3.32
2005	0.71	0.99	1.22	3.18
2006	0.70	1.06	1.27	3.42
2007	0.66	1.09	1.32	3.61
2008	0.63	1.11	1.36	3.64
2009	0.62	1.09	1.32	3.99
2010	0.64	1.06	1.28	4.27
2011	0.61	1.06	1.25	4.11
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: Statistics are provided for four occupation groups defined by skill level: 1 High, 2 Intermediate general, 3 Intermediate specific, 4 Low.

3.2. Immigrants' and natives' responsiveness to labour shortages across economic and institutional contexts

A key question we address in this report is whether and how immigrants' and natives' responsiveness to labour shortages depends on contextual economic and institutional variables. To study this question, we follow Guzi et al (2015) and amend our empirical model (1) with an indicator of contextual variables as follows:

$$\Delta Z_{cell} = \beta_1 \Delta W_{cell} + \beta_2 \Delta W_{cell} V + \beta_3 V + \beta_4 GDP\_growth + \beta_5 U + \delta_c + \delta_t + \varepsilon_{cell}, \quad (2)$$

where *V* stands for an indicator variable depicting the economic, institutional or policy context in the given country and year. For example, *V* can be assigned value 0 in years before and 1 in years during the Great Recession in a model evaluating the effects of the Great Recession. Adding this interaction term to the model changes the interpretation of all of the coefficients. If there were no interaction term, β_1 would be interpreted as the unique effect of labour shortage on migrants supply. But the interaction reflects the fact that the responsiveness of immigrants to labour shortages is different in different time periods, hence the effect of labour shortage on the responsiveness of immigrants is not limited to β_1, but also depends on the values of β_2 and *V*. The unique effect of labour shortage is represented by everything that is multiplied by

labour shortage in the model i.e. $\beta_1 + \beta_2 * V$. Similarly β_1 is now only interpreted as the unique effect of labour shortage on immigrants' responsiveness when *V = 0* (i.e. prior to the Great Recession).

3.3. Results

The results from the baseline model (1) are reported in Table 3. The labour shortage variable has a significant positive coefficient for the relative share of immigrants. The inclusion of GDP growth and unemployment rate slightly increases the effect, and importantly, the significance remains unchanged. These results indicate that immigrants to EU15 countries from outside the EU15 countries are more responsive to changing patterns of scarcity across European industries, occupations and countries than the native populations of those countries, and hence can be said to grease the wheels of European labour markets.

Table 3 - The relative responsiveness of immigrants to labour shortages (baseline)

	(1)		(2)	
Labor shortage	0.177	*	0.184	*
	(1.897)		(1.934)	
GDP growth (annual %)			0.014	**
			(2.555)	
Unemployment rate			-0.016	***
			(-3.081)	
R2	0.017		0.028	
N	2096		2096	

Source: Own calculations based on EU-SILC, EU-LFS, and WDI data.
Notes: The dependent variable is the supply of immigrants from non-EU15 countries relative to natives in the particular skill-industry-country cell expressed as first difference. The labour shortage for the same group is also expressed as first difference. All variables are lagged and models include year and country fixed effects. All regressions are weighted by the number of observations for the skill-industry-country group in year *t*. *t*-statistics in parenthesis, * p<0.1, ** p<0.05, *** p<0.01.

To investigate how economic conditions affect immigrants' and natives' responsiveness to labour shortages, we introduce the indicator variable *V* to our models. In the model evaluating the effect of GDP on immigrant's relative responsiveness to labour shortages, V equals 1 if a country belongs in the upper half when the countries are ordered by the average value of GDP per capita during the studied period, and zero otherwise. Likewise, in the model looking at the effects of unemployment V equals 1 for countries with an above median unemployment rate, and zero otherwise (mean unemployment rate is used to construct the indicator). The results, presented in Table 4, indicate that immigrants' relative responsiveness to labour shortages is positive across all contexts. The unique effect of labour shortage on migrant responsiveness in high-GDP and high-unemployment countries is expressed in the lower part of table. Both estimates are significant. The effect of labour shortage on migrant responsiveness in countries with above-median unemployment rates is particularly statistically significant at 0.342, which is double that found with the baseline model. This finding is remarkable, as it indicates that immigrants respond particularly fluidly to labour shortages in countries which need that response the most.

Table 4 - Relative supply of migrants and economic conditions

	GDP		UR	
	(1)		(2)	
LS	0.188		0.084	
	(1.132)		(0.638)	
LS * below median	ref.		ref.	
LS * above median	-0.007		0.258	
	(-0.037)		(1.314)	
Below median	ref.		ref.	
Above median	-0.089	**	0.106	***
	(-2.332)		(2.853)	
GDP growth (annual %)	0.014	**	0.012	**
	(2.519)		(2.059)	
Unemployment rate	-0.016	***	-0.016	***
	(-3.080)		(-3.078)	
LS in above median	0.18	*	0.342	**
	(1.674)		(2.44)	
r2	0.028		0.029	
N	2096		2096	

Source: Based on EU-SILC, EU-LFS, and WDI data.
Note: See note to Table 3. LS=Labour shortage. The interaction dummy (above median) is created based on the level of GDP per capita (in PPP constant prices) and unemployment rate over the studied period.

In Table 5 we look at how immigrant integration policies affect immigrants' responsiveness to labour shortages across skill-industry-country cells. To gauge integration policies we use the Migrant Integration Policy Index (MIPEX), which compares the level of integration policies across EU member states. This index is created based on a large range of 148 policy sub-indicators determined on the basis of expert surveys (Huddelston et al., 2011). The sub-indicators are summarized as an overall score in six fields: labour market access, family reunion, long-term residence, political participation, access to nationality, and anti-discrimination. MIPEX is used as a benchmark tool in several empirical studies (e.g. Nieto, Matano, and Ramos, 2013; Bisin et al., 2011). In our analysis we employ the most recent MIPEX data, collated in 2010.
We study the effect of the MIPEX measure of labour market access, which is the most relevant dimension of the MIPEX index to labour shortages. As above, we divide the countries into two groups, using the median labour market access score as the threshold for the indicator variable *V*. We find that immigrants are more responsive to labour shortages in countries with better MIPEX scores for labour market access than in countries with lower MIPEX scores in this area.

Table 5 - Immigrants' access to the labour market

	(1)	
LS	0.098	
	(0.525)	
LS * low integration	ref.	
LS * high integration	0.147	
	(0.681)	
Low integration	ref.	
High integration	0.095	***
	(3.105)	
Unemployment rate	-0.015	***
	(-3.041)	
LS in high integration	0.244	**
	(2.441)	
r2	0.028	
N	2096	

Source: Based on EU-SILC, EU-LFS, WDI data and MIPEX index.
Note: See note to Table 3. LS=Labour shortage. Countries are divided into two groups based on their 'labour market access' integration score measured by MIPEX 2010.

Our next step is to test the robustness of our findings with respect to welfare state contexts across Europe. Various welfare institutions may play a role in the integration of the immigrant workforce, and may affect the fluidity of immigrants across industries, occupations and countries. Esping-Andersen (1990) provides a useful typology of welfare states, partitioning European countries into four groups:
1. Conservative (corporatist) welfare states: Austria, Belgium, France, Germany, Luxembourg and the Netherlands.
2. Social democratic welfare states: Denmark, Finland and Sweden.
3. Mediterranean welfare states: Greece, Italy, Portugal and Spain.
4. Liberal welfare states: Ireland and the UK.

In Table 6 we examine the relationship between this welfare state typology and our labour shortage measure. We find that immigrants' responsiveness to labour shortages does not vary across welfare state types, retaining marginal statistical significance for the social democratic welfare state. Guzi et al (2015) find that although welfare typology only mildly affects immigrants' relative responsiveness, public welfare expenditure has a significant lock up effect on immigrants. Immigrants are only more responsive to labour market shortages in countries with below- median public welfare expenditure. This result is in line with the notion that higher welfare expenditures may increase immigrants' reservation wages, locking them into their current status as much as the native workers.

Table 6 - Relative supply of migrants and the role of the welfare state

	(1)	
LS	0.029	
	(0.160)	
LS * (AT,BE,FR, DE, LU, NL)	ref.	
LS * (DK,FI,SE)	0.158	
	(0.715)	
LS * (ES,IT,GR,PT)	0.214	
	(0.753)	
LS * (IE,UK)	-0.012	
	(-0.04)	
GDP growth (annual %)	0.018	***
	(3.197)	
Unemployment rate	-0.007	**
	(-2.015)	
LS in (DK,FI,SE)	0.187	*
	(1.64)	
LS in (ES,IT,GR,PT)	0.244	
	(1.076)	
LS in (IE, UK)	0.017	
	(0.067)	
r2	0.014	
N	2096	

Note: See note to Table 3. LS=Labour Shortage. Estimates for the welfare state indicators are not shown in this table.

4. CONCLUSIONS

Labour shortages signal imperfections and sluggish adjustment to changes in the labour market, resulting in economic costs of non-trivial magnitude. The literature proposes that migration is a vehicle for labour market adjustment, since migrants bring in useful skills and compensate labour shortages. A number of studies also warn that immigrants' potential is often not fully realized, due to mismatches between immigrants' skills and the jobs they actually take, which are typically below their (formal) skill levels. Migration may however also decrease incentives to train and acquire skills, and in receiving countries can lead to path-dependency and reliance on migrants.

This paper empirically tests whether immigrants help to reduce labour shortages in the European labour market. Proposed means of measuring labour shortages include the unemployment-to-vacancies ratio; wage premium increase; labour demand elasticity; employer-reported difficulties with filling vacancies; and normative, statistical and self-declared skill mismatches. Overreliance on the measurement of skill shortages as a criterion for migration policy may be misleading.

We find that migrants from outside the EU15 countries respond to labour shortages more than natives in EU15 countries, and thus provide for more efficient labour allocation in the EU15. We also show that the immigrants' responsiveness depends on the countries' economic and institutional contexts. In particular, we find that immigrants are especially responsive in countries with high unemployment rates, in economically more developed countries (with high GDP), and in countries that provide immigrants with good access their labour markets, and/or social democratic welfare systems. Guzi et al. (2015) show,

however, that higher welfare spending may lock immigrants into their existing positions and make them less fluid. We conclude that migrants generally grease the wheels of their receiving labour markets, but that this potential is not fully realized due to extant barriers to mobility.

REFERENCES

Andersen, R., & van de Werfhorst, H. G. (2010). Education and occupational status in 14 countries: The role of educational institutions and labour market coordination. *British Journal of Sociology*, *61*(2), 336–355.

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.

Arratibel, O., Heinz, F. F., Martin, R., Przybyla, M., Serafini, R., Zumer, T., & Rawdanowicz, L. (2007). Determinants of Growth in the Central and Eastern European EU Member States - A Production Function Approach. *ECB Occasional Paper*, (61).

Bauer, T. K., & Zimmermann, K. F. (1999). Assessment of Possible Migration Pressure and Its Labor Market Impact following EU Enlargement to Central and Eastern Europe. *IZA Research Report*, *3*.

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.

Bisin, A., Patacchini, E., Verdier, T., & Zenou, Y. (2011). Ethnic identity and labour market outcomes of immigrants in Europe. *Economic Policy*, *26*(65), 57–92.

Bonin, H., Eichhorst, W., Florman, C., Hansen, M. O., Skiöld, L., Stuhler, J., … Zimmermann, K. (2008). Geographic Mobility in the European Union: Optimising its Economic and Social Benefits. *IZA Research Report*, *19*.

Borjas, G. J. (1987). Self-Selection and the Earnings of Immigrants. *American Economic Review*, *77*(4), 531–53.

Borjas, G.J. (1999). "Immigration and welfare magnets", *Journal of Labor Economics*, 17 (4), 607-637.

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

Borjas, G. J. (2008). *Labor Economics* (4th ed.). Dublin: McGraw-Hill International/Irwing.

Boswell, C., Stiller, S., & Straubhaar, T. (2004). *Forecasting labour and skill shortages: how can projections better inform labour migration policies*. Hamburg: Office for Official Publications of the European Communities.

Byrne, D., & McGuinness, S. (2009). Mismatch in the graduate labour market among immigrants and second-generation ethnic minority groups. *ESRI Working Paper*, *316*.

Chiswick, B. R. (2000). Are Immigrants Favorably Self-Selected? An Economic Analysis. *IZA Discussion Paper*, *131*.

Cohen, M. (1995). *Labor Shortages as America approaches the twenty first century*. Ann Arbor: University of Michigan Press.

Constant, A., & Tien, B. (2011). Germany's Immigration Policy and Labour Shortages. *IZA Research Report*, *41*.

Czaika, M. (2012). Migration in times of uncertainty. On the role of economic prospects. *International Migration Institute Working Paper*, *52*.

De Giorgi, G., & Pellizzari, M. (2009). Welfare Migration in Europe. *Labor Economics*, *16*(4), 353–363.

Doudeijns, M., & Dumont, J. (2003). Immigration and labour shortages: evaluation of needs and limits of selection policies in the recruitment of foreign labour. In *Conference on the Economic and Social Aspects of Migration*. European Commission and the OECD.

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*. Cambridge: John Wiley & Sons.

Fernández, C., & Ortega, C. (2008). Labor market assimilation of immigrants in Spain: Employment at the expense of bad job-matches? *Spanish Economic Review*, *10*(2), 83–107.

Fertig, M., & Kahanec, M. (2013). Mobility in an Enlarging European Union: Projections of Potential Flows from EU's Eastern Neighbors and Croatia. *IZA Discussion Paper*, *7634*.

Foley, P., Watts, H., & Wilson, B. (1993). New technologies, skills shortages and training strategies. In P. Swann (Ed.), *New Technologies and the Firm: Innovation and Competition*. London: Routledge.

Fourage, D., & Ester, P. (2007). *Factors Determining International and Regional Migration in Europe*. Dublin.

Franke, W., & Sobel, I. (1970). *The Shortage of Skilled and Technical Workers*. Heath and Company.

Frelak, J., & Kazmierkiewicz, P. (2007). Labor Mobility: The Case of Poland. In J. Smith-Bozek (Ed.), *Labor Mobility in the European Union: New Member, New Challenges.* (pp. 60–79). Heidelberg: Center for European Policy Analysis.

Giulietti, C., Schluter, C., & Wahba, J. (2013). With a lot of help from my friends: Social networks and immigrants in the UK. *Population, Space and Place*, *19*(6), 657–670.

Guzi, M., Kahanec, M., & Kureková, L. (2015). How immigration grease is affected by policy: evidence from EU labor markets. *IZA Discussion Paper*, (forthcoming).

Haskel, J., & Martin, C. (1993). Do Skill Shortages Reduce Productivity? Theory and Evidence from the United Kingdom. *The Economic Journal*, *103*(417), 386–394.

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

Iglicka, K. (2005). *The impact of the EU enlargement on migratory movements in Poland* (No. 12/05). Warsaw: Center for International Relations.

Kahanec, M., Zaiceva, A., & Zimmermann, K. F. (2009). Lessons from Migration after EU Enlargement. *EU Labor Markets After PostEnlargement Migration*, *No. 4230*, 3–45.

Kahanec, M., & Zimmermann, K. F. (2010). Migration in an Enlarged EU: A Challenging Solution? In *Five Years of an Enlarged EU: A Positive Sum Game* (pp. 63–94).

Kahanec, M., Zimmermann, K. F., Kurecova, L., & Biavaschi, C. (2013). Labour Migration from EaP Countries to the EU – Assessment of Costs and Benefits and Proposals for Better Labour Market Matching. *IZA Research Report*, *56*.

Kim, K., & Cohen, J. E. (2010). Determinants of international migration flows to and from industrialized countries: A panel data approach beyond gravity. *International Migration Review*, *44*(4), 899–932.

Kriechel, B. (2013). „Replacement demand and personnel planning on the sectoral level: Challenges of an ageing workforce", Chapter 2 in Conference Procedings, Joint OECD- EUSAV Conference on the Impact of Ageing on Public Finances and Labour Markets in EU Regions, Bratislava.

Krieger, H., & Maître, B. (2006). Migration Trends in an Enlarging European Union. *Turkish Studies*, *7*(1), 45–66.

Kureková, L. (2011). From Job Search to Skill Search: Political Economy of Labor Migration in Central and Eastern Europe. mimeo.

Lassnigg, L. (2008). Improving the Quality of the Supply-Demand-Match in Vocational Education and Training by Anticipation and" Matching Policy". *European Journal of Vocational Training*, *44*(2).

Layard, R., Nickell, S., & Jackman, R. (2005). *Unemployment: macroeconomic performance and the labour market*. Oxford: Oxford University Press.

Liebig, T., & Sousa-Poza, A. (2004). Migration, self-selection and income inequality: An international analysis. *Kyklos*, *57*(1), 125–146.

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

Mansoor, A., & Quillin, B. (2007). *Migration and remittances: Eastern Europe and the former Soviet Union*. Washington, DC: World Bank.

Martin, P. (2012). A need for migrant labour? UK–US comparisons. In M. Ruhs & B. Anderson (Eds.), *Who needs migrant workers*. Oxford: Oxford University Press.

Martin, P., & Ruhs, M. (2011). Labor Shortages and U.S. Immigration Reform: Promises and Perils of an Independent Commission. *IMR*, *45*(1), 179–192.

Massey, D. S., Arango, J., Hugo, G., Kouaouci, A., Pellegrino, A., & Taylor, J. E. (1993). Theories of International Migration: A Review Migration and Appraisal. *Population and Development Review*, *19*(3), 431–466.

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

Nieto, S., Matano, A., & Ramos, R. (2013). Skill Mismatches in the EU: Immigrants vs. Natives. *IZA Discussion Papers*, *7701*.

Obadić, A. (2006). Theoretical and empirical framework of measuring mismatch on a labour market. In *Zbornik radova Ekonomskog fakulteta u Rijeci: časopis za ekonomsku teoriju i praksu* (Vol. 24).

Padoa-Schioppa, F. (1991). *Mismatch and labour mobility*. Cambridge: Cambridge University Press.

Pedersen, P. J., Pytlikova, M., & Smith, N. (2008). Selection and network effects-Migration flows into OECD countries 1990-2000. *European Economic Review*, *52*(7), 1160–1186.

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

Ruhs, M., Anderson, B., & McNeil, R. (2011). *Responding to employers: labour shortages and immigration policy*. *Policy Primer*. Migration Observatory.

Rutkowski, J. (2009). *Ukraine. Labor Demand Study*. World Bank.

Sattinger, M. (2012). Assignment Models and Quantitative Mismatches. mimeo.

Sjaastad, L. A. (1962). The Costs and Returns of Human Migration. *Journal of Political Economy*, *70*(S5), 80.

Streeck, W. (2012). Skills and politics: General and specific. In M. R. Busemeyer & C. Trampusch (Eds.), *The political economy of collective skill formation* (pp. 317–352). Oxford: Oxford University Press.

Striestka-Ilina, O. (2007). Skills shortages. In *Agora Thessaloniki XXVI - Building a European VET area*. Thessaloniki.

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.

Todaro, M. P., & Smith, S. C. (2006). *Economic Development*. Pearson Addison Wesley.

Trendle, B. (2008). *Skill and labour shortages - definition , cause and implications*. *Labour Market Research Unit* (pp. 0–34).

Veneri, C. M. (1999). Can Occupational Labor Shortages be Identified Using Available Data? *Monthly Labor Review*, (March), 15–21.

Van de Werfhorst, H. G. (2004). Systems of educational specialization and labor market outcomes in Norway, Australia, and the Netherlands. *Journal of Comparative Sociology*, *45*(5), 315–335.

Van de Werfhorst, H. G. (2011). Skills, positional good or social closure? The role of education across structural–institutional labour market settings. *Journal of Education and Work*, *24*(5), 521–548.

Zimmermann, K., Bonin, H., Fahr, R., & Hinte, H. (2007). *Immigration Policy and the Labor Market*. Berlin and Heidelberg: Springer.

APPENDIX

Table A1 - Skill categorization

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 - Industry categorization

Group	Nace
1	Manufacturing, mining and quarrying and other industry
2	Construction
3	Wholesale and retail trade
4	Transportation and storage, accommodation and food service
5	Information and communication, Financial and insurance activities
6	Education
7	Human health
8	Public administration, defence, and social work activities
9	Agriculture, forestry and fishing