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Immigration and Firm Innovation in Western-Europe: Understanding the Channels of Influence

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POLICY
BRIEF

Abstract

In most European countries, immigrants became more diversified by country of origin, gender and education levels. Especially the mobility of highly-skilled workers from various countries creates both challenges and opportunities from an economic perspective. This study focuses on the relationship between firm's innovation performance and intra-firm diversity. It introduces a structured analysis of the mechanisms of influence at different spatial scales, namely from country to firm level, based on the evidence provided by the economics research in Europe.



1. Migration patterns and policy changes in European countries: Self-selection versus government policy

The current demographic, ethnic and skill composition of migration is changing radically in most European countries. Migration patterns in Europe are now biased towards a younger, more highly educated, more “working age” and in several cases more feminized flows (Widmaier and Dumont, 2011). Fargues and McCormik (2013) shows the severity of aging within the EU working age population and concludes that in order for Europe to maintain employment at its 2010 level, millions of workers will need to join the labour market. For a fast aging Europe, it is important to use the current stock of skills efficiently, while ensuring the participation of newcomers in the labour market. Figure 1 shows that in Europe a substantial number of newly-arrived immigrants are placed in jobs below their education level. The over-qualification rate of foreign-born persons aged 25-54 in 2008 is almost twice that of natives. However, the current occupational regulations and mobility level is far from meeting the required figures.

Today, particularly the mobility of highly-skilled workers creates both challenges and opportunities. From central governments to regional authorities, from large R&D firms to small spin offs, there is a great competition to attract highly-skilled migrants, and to benefit from the circulation of international and diverse knowledge. The long-term impact of immigrant workers on the productivity of the local economies, and in particular innovations, should constitute the core interest. Innovation effects are important because innovations have immediate impacts on welfare. For example, Figure 2 depicts the positive correlation between share of foreign workers and innovation in Europe. It is shown that, on average, areas with a higher share of foreign-born

residents in Western Europe have a higher number of patent applications *per* inhabitant. Moreover immigration flows have continued to increase in the last decade and the number of EU-27 citizens arriving at a Member State other than their own country of citizenship increased by an average of 12 percent per year, in 2002–2008 (Eurostat, 2011). A progressive and determined migration policy may, then, help to channel skills where they are most needed. Clearly, these developments pressure governments to find solution to improve labour market integration of the existing foreign workers as well as better integrate the incoming ones. Accordingly, many countries in Europe have immigration policies that positively select global talent. The policy practices tailored in the more developed countries of Europe try to appeal to talented foreign workers for their economies. For example, Germany launched a German Green card, which is a significant policy change, to help liberalise recruitment (Kolb, 2014). The Netherlands introduced a ‘Search Year’ for the highly-skilled and for those with a certain level of financial resources in the ‘Search Year’. Moreover, there is also more inclination towards employing hybrid systems, - as a combination of point and employment based schemes – particularly as this relates to knowledge migrants and to ensure better matching (Papademetriou and Sumption, 2011).

2. Why do foreign workers and their diversity matter?

The main motivation behind favouring immigrants as a source of distinct knowledge is explained by Granovetter’s *the strength of weak ties hypothesis* (Granovetter, 2005). Our close friends move in the same circles that we do, so there are considerable information overlaps, while we receive more novel information from acquaintances. Moving in different circles from ours connects us, then, to a wider world. Creating new knowledge paths has to be a good



thing, as ideas and influence are enhanced when people with unique knowledge cluster in the same locality or firms. In other words, unique knowledge brings in originality and creativity.

From this perspective, the impact of the international mobility of foreign workers can be large and varies around various spatial scales. There are several channels where migrants can influence innovation. Generally, migrants themselves can be a source of innovation through their direct involvement in inventions. In addition, with their entrepreneurial skills they establish new networks, trade links and commercialize new ideas for innovations. Similarly, by increasing the size of the host economy they can also enforce efficiency, so as to be more innovative. Finally, the compositional aspects can make a difference for innovations given their unique knowledge, ideas and diversity.

There are also other arguments in the economics literature explaining why the contribution of immigrants to innovation is likely. For example, Borjas (1999) argues that migrants are greater risk-takers and more entrepreneurial, so there is a strong self-selection among migrant groups. Especially the highly-skilled migrants can rely on their human capital for this uncertain journey. Given the scale and complexity of today's migration, immigrants are clearly not a homogenous group of people, nor are possible economic impacts on the receiving countries homogenous. Migrants also have a strong tendency to cluster and follow their predecessors. This would emphasize the importance of country of origin, while over time the quality and composition of the cohorts coming from the same source countries may differ substantially.

Economists have long studied the labour market impact of global mobility, yet most studies have been limited to discussing welfare and earnings distribution and the displacement effects of immigration. The more recent theoretical and empirical literature produced a

substantial number of studies on the possible benefits and conflicts from foreign labour and labour diversity induced by international mobility (Hong and Page 2001; Berliant and Fujita 2012). Ozgen *et al.*, (2013a) provides a detailed discussion on the mechanisms of how foreign labour can influence the long-term productivity of a country, region or a firm (See Figure 3). This policy brief, however, only documents innovation impacts of international workforce, particularly at the firm level.

3. New directions in research on economics of innovation

Western economies have experienced a swing towards services from the industrial sector. Accordingly, new directions in research on the economics of innovation take a people-oriented standpoint rather than looking at the fixed capital assets of production (Grossman and Helpman 1994; Romer 1990; Romer 1993). Endogenous growth theories have long discussed the role of employees as a source of firm productivity in particular innovations, but the explicit incorporation of migrant characteristics into the economics of innovation research is fairly new.

Studies now examine the role of employee composition (e.g. demographics, skills, ethnic background, language) more thoroughly. Clearly culture is a strong identifier about how one thinks, produces, adopts, and spreads innovation. Consequently, innovation literature today recognizes immigrants, as idea workers, as an important component of innovation.

This shift is motivated by the concerns that the impact of immigration cannot be only confined to a wage distribution effect. Today, immigrants are very heterogeneous in terms of their ethnic background; skills, abilities and education, therefore, the expected impact should also be complex. Second, the recent availability of micro-level administrative and linked

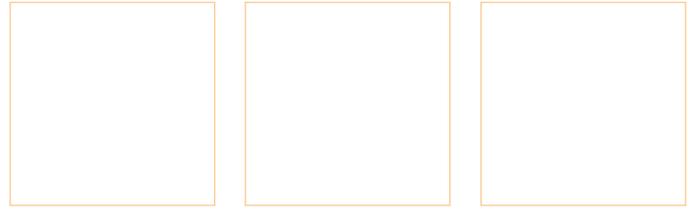


employee-employer data (LEED) makes it possible to explore different economic relations at varying spatial levels.

Measuring innovation

Innovation crosscuts through sectors, location, and markets. A product can be commercialized and sold at places other than where they are produced (Carlino and Kerr, 2014). Moreover, innovation occurs in many different sizes and shapes, in other words: categories, areas, and sectors. Underlying varieties can be as exhaustive as the drivers of innovation. Therefore, it is a challenge to disentangle the forces that create conducive environments to innovate, in addition to the factors that boost innovation.

Patent applications are by far the most commonly used proxy for measuring innovations. Many studies not only used patent applications as an outcome indicator for firm performance, but also made use of them to trace the knowledge spillovers among inventors by examining backward and forward linkages (in the form of references). Although an imperfect indicator to measure the innovative capacity of firms or individual employees, patent applications are found to be a fairly reliable source of information due to their formal and independent registration procedures. Many studies also rely on surveys where firms declare their innovative activity within a given time period. The Innovation Surveys are held every several years in many European countries and serve as a useful and comparative documentation of firms' innovations efforts, the problems they face, and the networks that provide information. These surveys allow researchers to study different types of innovation, namely product; process; organizational or marketing innovations. Finally, Total Factor Productivity is also used as an alternative and a broader measure of innovation. Venturini (2013) suggests, though, that TFP and patent applications measure different phases of innovation: patent applications



measure the inception phase; while TFP refers to more implementation.

4. Mechanisms of influence

The empirical literature provides evidence on several spatial levels as to the possible impact of immigrants on host economies. For example:

1. The foreign graduate and in particular foreign PhD students who obtained their degrees in the host country may facilitate the knowledge spillovers between home and host country, while simultaneously contributing to innovations in the host country.
2. Presence of diverse population and regional agglomeration externalities.
3. Diversity in team members may influence team performance.
4. Firm level studies
 - Firm output influenced by diversity of the regional or urban population.
 - Firm output influenced by employee diversity within the firm.

By proposing a modified index of diversity, Alesina *et al.* (2013) examines the impact of diversity on productivity across countries. They show that the diversity of the skilled workers is an important driver of economic performance. Most studies, however, focus on the impact of cultural diversity on narrower spatial scales. For example, Hunt and Gauthier-Loiselle 2010; Challeraj *et al.* 2008; Faggian and McCann 2009; Kerr 2009; Kerr and Lincoln 2008; Zucker and Darby 2007 focus on the effect of foreign entrepreneurs, students, and inventors on innovations. On the other hand, regional level studies examine the effect of migrant externalities from diverse regions on regional or firm level innovations and productivity (Ottaviano and Peri 2005; Sudekum *et al.* 2009; Niebuhr 2010; Ozgen *et al.* 2012; Bratti and Conti 2012; Bosetti *et al.* 2013). Alterna-



tively, Fassio *et al.* 2014, offer sector level analysis of foreign employees and patent applications in a cross-country comparative analysis of the UK, France and Germany. They present detailed distinctions across sectors and introduce the compositional aspects of workers in terms of nativity and age.¹ Finally, a limited but emerging number of firm-level studies deal with the contribution of foreign employees to firm knowledge acquisition and knowledge creation (Lee and Nathan 2010; McGuirk and Jordan 2012; Ostergaard *et al.* 2011; Ozgen *et al.* 2013a; Ozgen *et al.* 2013b; Ozgen *et al.* 2014; Parrotta *et al.* 2014).

An establishment is the smallest unit of production in which unique knowledge is produced. The knowledge that is produced within the firms is rival and not necessarily open to the public until the firm gains expected monopoly profits from it. Empirically, several lines of inquiry guide the research on migrant impacts on firm level innovation. Jensen (2014) provides a sound construction to assess this relationship. The prime interest is whether the employment of foreign workers in a firm has an effect on innovations. And if there is an effect, then what are the possible channels of influence? For example, is it the diverse knowledge sets and ideas the workers bring in the firms or it is simply workforce heterogeneity that spurs innovations? Moreover, it is also interesting whether this effect cuts across the economy or sectors, firm size classes and firms' orientation for markets make a difference in terms of the benefits that firms gain from employing foreign workers.

What did we learn from firm level innovation research?

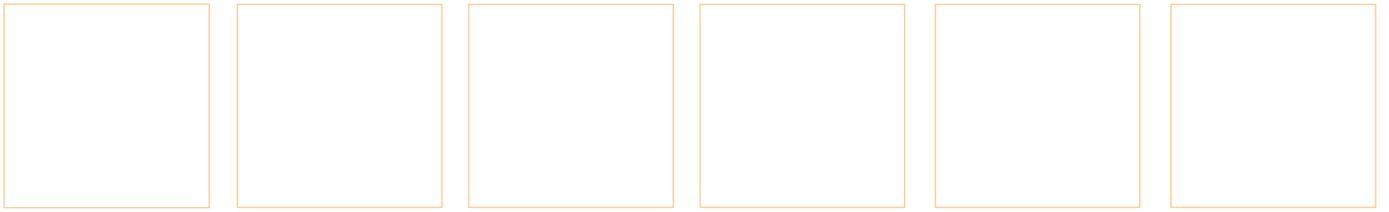
Research that focuses on the impacts of immigrants on innovation takes various avenues to explore this relationship. The firm level studies benefit from increasingly available linked employer-employee

1. See Venturini *et al.* (2012) for the country level demographic trends versus patent applications/TFP in an earlier version of this paper.

datasets since these datasets allows one to scrutinize the knowledge spillovers within firm, in addition to controlling for a firm's major external and internal resources help them to innovate. In these studies the main research question has been whether the firms, which have a more diverse composition of employees, are more innovative. Infra-firm mechanisms of influence are a challenge to address both methodologically and from the data availability point of view, while at the same time there are various instruments suggested in the literature to tackle these problems. The empirical evidence provides findings from the UK, Denmark, the Netherlands, Germany, and Ireland. Broadly speaking there are four major mechanisms that were repeatedly tested by the available studies. These are:

1. **Assimilation of the second generation:** Because second generation immigrants are expected to acquire the host country specific skills they do not, therefore, go through the integration period the newcomers do.
2. **Diversity as a highly-skilled sector phenomenon (sector-diversity complementarity):** The institutional setting creates a conducive environment to get positive spillovers from employee diversity. Typically large firms or certain sectors may devote more resources to facilitate diversity.
3. **Segregation at the workplace:** Clustering of immigrants who are country fellows in the same firms or sectors may lead to negative externalities in productivity. This sorting is typically evident in the low-skilled services sector.
4. **New forms of knowledge immigrants embody:** immigrants from different countries or occupational backgrounds embody and hence bring in distinct and unique knowledge sets to the firms.

While most studies concentrates on point four, namely diversity as a new form of knowledge, they also consider other points listed above. The diversity of employment is typically measured by a diversity



index². Some papers, in addition to using a diversity index, try to explore other forms of mechanisms that may boost or obstruct firm level innovations. One of the very first contributions was Ozgen *et al.* (2013a). This paper introduced workers' diversity and their demographic characteristics into a knowledge production function. The authors found that migrant diversity has a positive impact on product innovations, while the effect is quantitatively modest: a one standard deviation (0.3) increase in the diversity index raises the probability that the firm is an innovator by 3 to 4.5 percentage points (around the mean of 38 per cent). In this study, accounting for the share of second-generation immigrants in firm employment also assesses the assimilation impact of foreign workers. They show that second generation immigrant employees have a negative and significant impact on firm innovation while the negative impact largely disappears when the sectors employing the highest share of low-skilled employees in the Netherlands are excluded and endogeneity is accounted for. The study also highlights that once low-skilled employees are excluded from the sample of firms, the impact of diversity measures become stronger. Put in other terms, the cultural diversity of foreign workers seems to be beneficial for highly-skilled sectors rather than all sectors. Finally, it is found that the share of foreign workers has a significant and negative impact on innovations. This can be explained by the fact that in the Netherlands most foreign nationals are low skilled or are employed under their qualification level. Ozgen *et al.* 2014 provides similar results from a cross-country comparison of Germany with the Netherlands.

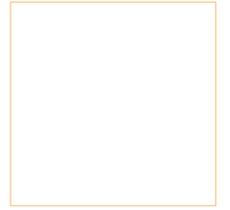
Ozgen *et al.* (2013b) extend the discussion to exploring the mechanisms in which foreign workers may potentially influence innovation within firms.

2. Fractionalization index $F_j = 1 - \sum_{i=1}^N s_{ij}^2$, in which s_{ij} is the share of the group i ($i=1, \dots, N$) in population (region, firm, etc.) j . This is by far the most commonly used index in the literature.

In a panel data setting, they concentrate on three major streams of knowledge spillovers. First, they utilize the Simpson index to measure the impact of overall employee composition. Second, they offer an index of exposure to own-kind that accounts for the cost of workplace segregation. (It is argued that the larger the value of the index the more segregated the workplace, hence the lower probability of innovation. The third mechanism tested is the richness of the knowledge sets brought by foreign employees. For this purpose a simple count of the unique countries of birth present in a firm is used as an indicator. When a firm is too diverse the so-called Babylon effect –high cost of communication and transaction– is likely.

Parotta *et al.* (2014) uses three different diversity indices based on demographics, occupations and ethnicity of the foreign employees in Danish firms, hence addressing mechanisms 2 and 4. The paper introduces three distinct mechanisms by which employee diversity may influence innovation. First, they disaggregate the employees by occupational groups in order to see whether cultural diversity impact is confined to and from a highly-skilled group of employees. Second, they try to address the cost of communication and cross-cultural dealing by excluding certain foreign groups, who are likely to speak Danish, belong to Germanic language group or have higher education level, from their estimations. Third, they construct two other indices of diversity, namely Shannon-Weaver entropy and richness indices, as sensitivity checks. Sensitivity analysis does not overturn the positive impact of ethnic diversity on patent applications.

In their paper based on cross-section data, Lee and Nathan (2010) make a distinction between the knowledge-based and non-knowledge based firm in analyzing the impact of foreign workers. They introduce ethnic ownership as a source of distinct knowledge inflow to 2300 firms in London and show that it



positively affects firms' efforts to create new working methods. The strength of the relationship changes over different innovation types.

Østergaard *et al.* (2011) focuses on the intra firm knowledge base of Danish firms through diversity of workers. They view age, gender and higher education diversity as a source of inducing new perspectives into firms in addition to ethnic diversity. Finally, there is a test of the optimal diversity of all diversity variables included in estimates. Their results suggest that educational diversity is an important mechanism that enhances firms' innovation while age diversity is detrimental for innovations, since it potentially leads to conflicts between people in different age categories.

Brunow and Stockinger (2013) take a similar line of approach for German establishments in dealing with mechanisms by which diversity can be influential for innovation. The paper explicitly considers the impact of employee diversity on the knowledge-intensive sectors that refer to the second mechanism, namely sector-diversity complementarity. Diversity among highly-skilled foreigners is found as a driver for strengthening absorptive capacity and skill complementarity in firms, hence it increases the probability of innovation.

Another study, from Ireland, focuses on the fourth mechanism, while it takes slightly different approach and looks into the effect of local labour market diversity on firm level innovation in Ireland.³ McGuirk and Jordan (2012) explore the effect of diversity in age, nationality and educational attainment on business innovation in four Irish counties. As Ozgen *et al.* (2013a), they also find a positive and significant effect of diversity, but at a different spatial scale, namely local labour markets level, on firms' product innovation. The study also considers jointly external

3. A similar study is conducted in New Zealand by Maré *et al.* (2013). They however do not explicitly use a diversity index. Their foreignness measure is migrant share by regions. Thus, for comparability of the papers discussed here, we exclude the studies using a different measure than fractionalization index.

labour market diversity and internal absorptive capacity. While the results point out a substitution effect between within-firm skilled workers and diversity of labour market, an additional analysis may be required to confirm how this mechanism works.

It is essential to note that the abovementioned studies provided ample evidence of how the cultural diversity of immigrant workers affect firm performance. Nevertheless, the studies had not explicitly taken unobserved firm effects into account. The limited availability of panel data of firms in addition to the little time variation of employee and sector structure had been downsides in accounting for unobserved heterogeneity from a fixed effects framework. A newly published study by Ozgen *et al.* (2015) estimates the cultural diversity in a knowledge production function framework with firm fixed effects, and provides comparative evidence on different estimation methodologies.

Conclusion

The increasing mobility and diversity of the workforce in many countries is a challenge to be addressed. Both demand-side and supply-side mechanisms of the economies stimulate this circulation. International mobility is, particularly for highly-skilled workers, becoming a necessity for better career prospects rather than a choice. The traditional immigrant destinations of northern European countries now need to compete with southern European countries like Italy and Spain in terms of the absolute numbers of foreign-born population (Eurostat, 2011). The continuous inflow of legal/illegal immigrants raises the question of how migration policies utilize existing immigrants belong to low-to-highly-skilled spectrum. The extent of the unused or latent supply of skills in the labour markets would require more integrated education and immigration policies based on the needs of host countries.

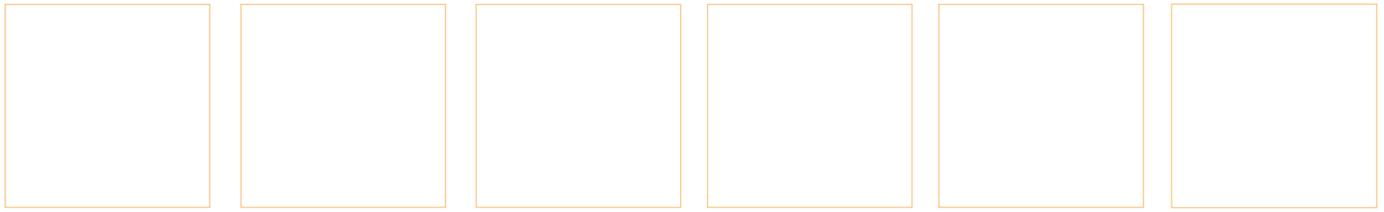


Consequently, international labour standards have become more significant than ever due to the challenges of globalization. Higher levels of unemployment obstruct the healthy integration of migrants into labour markets. Moreover, “The potential misuse of skills and qualifications of highly qualified migrants not finding jobs is amplified by the large number of highly qualified migrants working in jobs well below their educational qualification” (Eurostat, 2011, p.21). Because the foreign-born population tend to have a lower education level than natives, it is essential to allocate the skill surplus to relevant occupations where these skills are needed. These issues are relevant both at the regional level and firm level.

The limited literature so far focuses on the impact of cultural diversity on firm innovation through several mechanisms discussed above. A handful of studies show that the impact of diversity is relatively small and positive in many cases. Firms do benefit from traditional production inputs, while diversity of employment appears to be beneficial mostly in the highly-skilled sectors. These studies, in fact, show duality in the emphasis on the importance of diversity of employees at in workplaces despite the shortage of empirical evidence with regard to which channels to invest in or to improve. Further research should clearly be concentrated on complementarity/substitution effects on the basis of sectors and composition of immigrants. With the availability of new data resources particularly on the managerial practices and composition of the firm, disentangling these mechanisms further would enhance our understanding of the implications of diversity and help the creation of an evidence-based migration policy across Europe.

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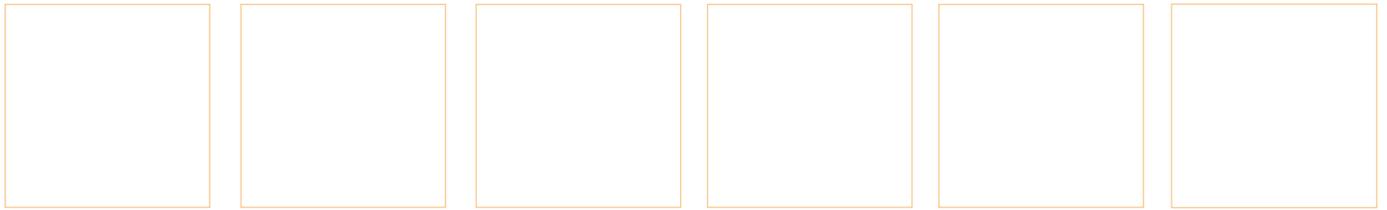
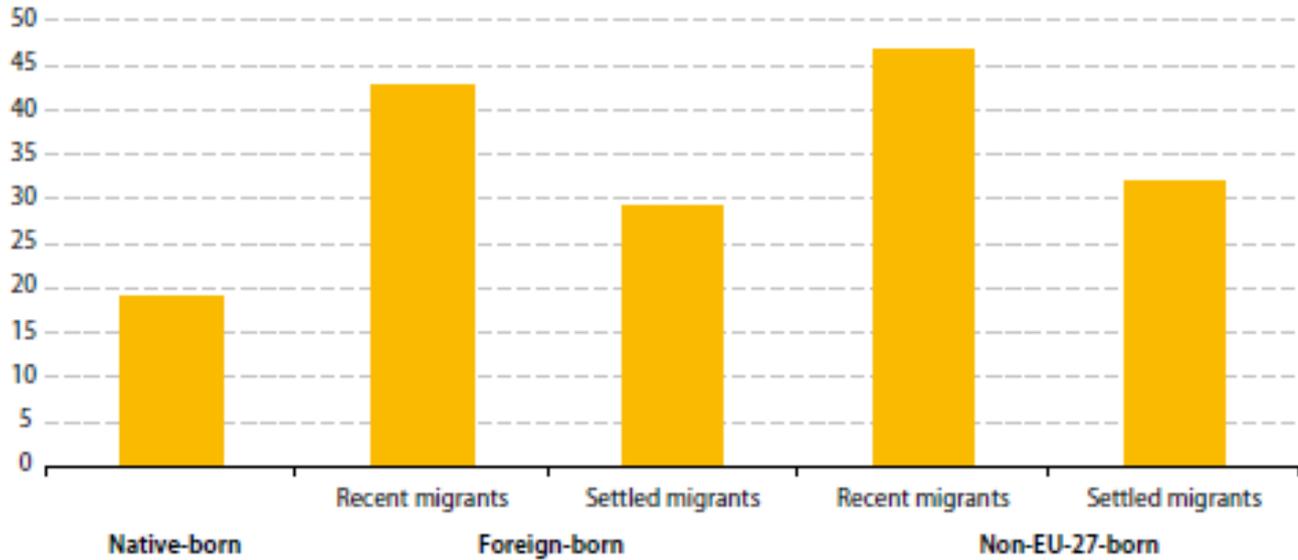
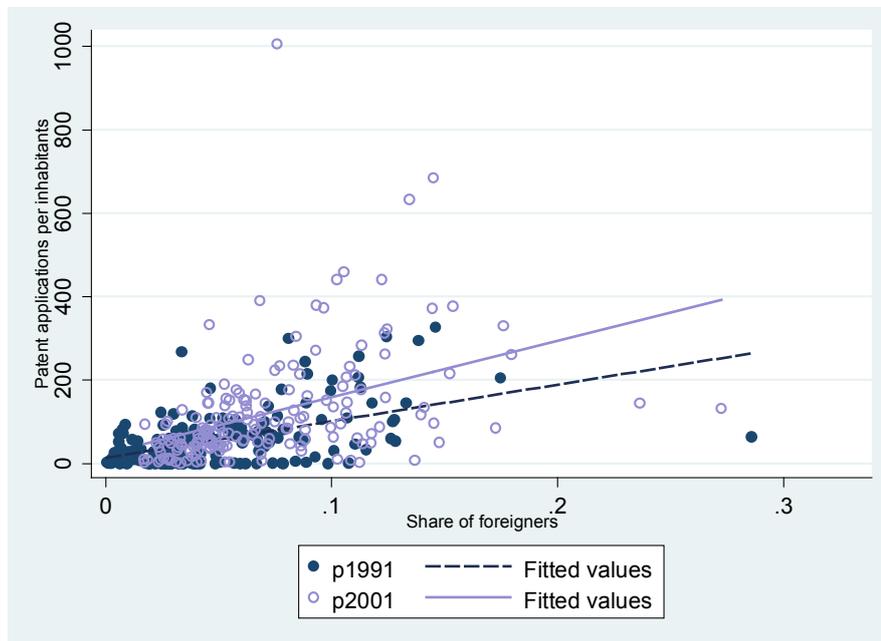


Figure 1: Over-qualification⁵ rate of persons aged 25–54 by groups of country of birth and duration of residence in the receiving country, 2008⁶



Source: Eurostat, 2011

Figure 2: Patent applications in Western Europe 1991-2001



Source: Ozgen et al. (2012), Author’s self-calculation based on Eurostat’s statistics.

5. “Over qualification rate is defined as the share of persons with tertiary education working in a low- or medium-skilled job among employed persons having achieved tertiary education” (Eurostat, 2011).
6. “Migrants who left the host country — returning to the country of origin or moving to another country — are not included in this analysis. These departures will include those who left because they could not find a job appropriate to their skills” (Eurostat, 2011).

Figure 3: The Impacts of Immigration on Innovation: a Classification of Channels of Influence

Positive Channels	Negative Channels
<i>Within Firm</i>	
<ul style="list-style-type: none"> • <i>Positive self-selection of immigrants: e.g., intelligence, creativity, willingness to take risks, entrepreneurship, “star” knowledge workers (e.g. trained in host country universities)</i> • <i>Youthfulness of immigrants: increased mobility, creativity, progressivity</i> • <i>Cultural diversity among immigrants: knowledge spillovers, new ideas and practices, trade facilitation (networks, trust, institutional knowledge)</i> • <i>Resilience of immigrants: enhances decision making</i> • <i>Immigrant supply enables firm expansion: reduces shortages/vacancies of key personnel</i> 	<ul style="list-style-type: none"> • <i>Fractionalization of employees: cultural and language differences and barriers, leading to communication problems, less trust, greater potential for conflict among staff, discrimination</i> • <i>Greater labour intensity of production: lower reservation wages of immigrant workers lead to lower wage costs and, hence, lower capital investment in the short run (substitution effect), possibly offset by firm expansion in the long-run (output effect)</i>
<i>Externalities</i>	
<ul style="list-style-type: none"> • <i>Cultural diversity as an amenity: increased availability of ethnic goods and services in the community</i> • <i>Population growth: agglomeration advantages, greater demand and gross fixed capital formation, with new technology embodied in new capital</i> • <i>Community cohesion: bridging-type social capital leads to cross-cultural cooperation</i> 	<ul style="list-style-type: none"> • <i>Sorting: Residential and labour mobility leads to greater spatial segregation: less cross-cultural relations and trade, lower spatial mobility and knowledge transfers</i> • <i>Polarization: Bonding-type social capital leads to between-group conflicts</i> • <i>Representation: Political fragmentation and instability</i>

Source: Ozgen et al., 2013a.

Migration Policy Centre

The Migration Policy Centre at the European University Institute, Florence, conducts advanced research on global migration to serve migration governance needs at European level, from developing, implementing and monitoring migration-related policies to assessing their impact on the wider economy and society. The Migration Policy Centre is co-financed by the European Union.

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