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By **Cristina Cattaneo**, FEEM
Carlo V. Fiorio, University of Milano and Econpubblica
Giovanni Peri, University of California, Davis and NBER

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Summary

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JEL Classification: J61, O15

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Address for correspondence:

Cristina Cattaneo
Fondazione Eni Enrico Mattei
Corso Magenta 63
20123 Milano
Italy
Phone: +39 02 520345673
E-mail: cristina.cattaneo@feem.it

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Cristina Cattaneo (FEEM) Carlo V. Fiorio (University of Milano and Econpubblica)

Giovanni Peri (University of California, Davis and NBER) *

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Abstract

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*Cristina Cattaneo, Fondazione Eni Enrico Mattei-FEEM; Email: cristina.cattaneo@feem.it; Carlo V. Fiorio, Department of Economics, Management and Quantitative Methods, University of Milano; Email: carlo.fiorio@unimi.it. Giovanni Peri, Department of Economics, UC Davis, Email: gperi@ucdavis.edu. We thank two anonymous referee for helpful comments and the Fondazione Rodolfo Debenedetti for its support. Participants to the CReAM Immigration conference (London), MILLS Workshop (Milan) and the European Economic Association Meetings (Gothenburg) also provided useful suggestions. This paper was partly funded within the EC project "Sustainable Development in a Diverse World", VI Framework Program.

1 Introduction

There is a debate on the effect that immigrants have on the labor market opportunities of natives (Borjas 2003, Borjas et al 2008, Card 2001, 2009, Card and DiNardo 2000, Ottaviano and Peri 2012). As immigrants concentrate their labor supply in some occupations much more than in others, their effect on natives depends on how much these occupations compete with or, instead, complement native's jobs. The effect also depends on the response of natives to immigration, as they may change their occupation to take advantage of their specific skills, vis-a-vis immigrants (Peri and Sparber 2009, D'Amuri and Peri, forthcoming). The literature has so far mainly analyzed the aggregate effects of immigration, using the regional or national wages and employment of natives (or group of natives) as outcomes. Researchers have constructed average wages or employment rates for region/skill groups and they have estimated the impact of immigration on the average outcomes in the group, constructed using repeated cross-sections of individuals. Most of these studies find small wage and employment effects of immigration on natives both in Europe (Dustman et al 2013, D'Amuri et al 2010, Glitz 2012) and in the US (Ottaviano and Peri 2012, Card 2009). There are however some significant exceptions (Borjas 2003, 2006). A problem of this approach is that labor markets, are in continuous flux. People enter and exit, young people join and old people leave and these flows may be affected by immigration. This alters the composition of individuals over time in the market (cell), so that the wage effects of immigration identified at that level can be due to changes in wages of individuals or to changes in the composition of individuals in the analyzed cell. The aggregate analysis can mask differentiated effects of immigration on single individuals (e.g. the incumbents, the potential entrants and those who exit).

An alternative and less explored question is: how much does immigration affect the occupation and wage of a specific native person if one follows him/her over time after a significant inflow of immigrants? What happens to native workers over the following years, when immigrants take jobs in the same labor market as theirs? Is the evolution of their career affected by this? In this paper we introduce a genuine panel of individuals so that we can follow them over time and we test how an inflow of immigrants affects the labor market outcomes of native incumbents. By comparing similar workers, some of whom were exposed to large inflows of immigrants and others who were not, and by following them over time, we analyze how the competition and complementarity with immigrants affected their careers.

This way of analyzing the effects of immigrants has interesting implications. First, we can control for heterogeneity at the individual level, reducing the scope for omitted variable bias. Second, this method is closer to the idea of evaluating the gain/losses for incumbent native workers, when exposed to immigrant competition. Third, it moves the literature on labor market effects of immigration closer to the analysis of individual effects of aggregate shocks (e.g. globalization, technology). To the best of our knowledge, this is one of the first papers analyzing the effects of immigration on individual labor market outcomes following people over time.[1]

The data requirements to implement this type of analysis are larger than those implied by the repeated cross-section cell-based regressions. We need longitudinal panel data set for a representative sample of individuals of a given population. The data must include information on their demographic and labor market variables and on their location and it should refer to a country (or an economy) during a period in which it received a significant inflow of immigrants. At the same time we need an aggregate dataset to construct accurate measures of the local immigration flows for the receiving labor markets. The European Community Household Panel (ECHP) provides the representative longitudinal sample of natives for one of the largest economy in the world: the European Union. The ECHP is a European survey that was designed to provide a representative and cross-nationally consistent picture of households and individuals on a range of topics, including income, health, education, housing, demographics and employment characteristics. The survey, designed as a longitudinal panel, was conducted between 1994 and 2001, in eight successive waves in the EU-15 European countries, with a standardized methodology. The ECHP was designed to be representative for native households. Hence, while we use this survey to track the outcomes of natives, we compute the share of immigrant population by country, year and occupation group, by using, instead, the harmonized European Labour Force Survey (ELFS). This is a larger database and it is representative of the whole population in EU countries. It is, however, a repeated cross section.

We consider individual outcomes and labor-market immigration shocks so that the reverse causality issues are reduced. However, the inflow of immigrants in country/occupation cells may be correlated with unobserved economic and labor market shocks, that may affect native careers, causing an omitted variable

[1] A recent working paper by Kerr and Kerr (2013) looks at STEM workers (science, technology, engineering and math) transitions from firms that experience a large increase in foreign skilled workers in the US. Similarly the working paper by Foged and Peri (2013) analyzes individual transitions of workers in Denmark.

bias. In order to estimate the casual impact of immigrants on individual outcomes, we use an instrumental variable approach. The method is a variation on the so called "enclave" instrument first used by Altonji and Card 1991 (followed by Card 2001, Peri and Sparber 2009 and Lewis 2011) and now broadly used in this literature. We construct the imputed inflow of immigrants allocating the aggregate flows by country of origin between 1991 and 2001 in proportion of the 1991 immigrant distribution across countries and occupations. We then use these imputed flows as instrument for actual flow of immigrants. Such instrument uses historical location of immigrants and aggregate immigration shocks to predict country-occupation specific immigration. We will discuss further the advantages and the caveats for this approach in terms of identification.

The paper has three main findings. First an inflow of immigrants generates a higher probability that a worker moves to a higher occupational level within the next year. The effect is statistically and economically significant. We find this result by first grouping occupations in four levels (or "tiers"), that are ranked in terms of wage, education and social status, from lower to higher: "Elementary", "Clerical and Craft", "Technical and Associate" and "Professional and Manager". Hence, we estimate that an increase of immigrants by one percentage point of employment in the occupation-cell increases by 0.5 percentage points the probability for a native worker to move to a higher ranked tier. As the average probability of an annual upgrade to an higher occupational tier for a native worker is 8.8 percentage points, increasing the immigrants share in a cell by 4 percentage points of employment (its standard deviation in the sample) would increase the probability of upward mobility from the average to 10.8 percentage points. This is a 23% increase over the average. Second, we find that in response to immigration there is no change in the probability that a worker joins unemployment in any of the following three years. Third, we also find some evidence that immigration increases wages of natives, with some lags (one to two years). The immediate upgrade in response to immigration and the delayed wage gain is compatible with an effect of moving natives towards a better career path, still requiring some time to accumulate specific human capital in the new occupation. Results also suggest that natives move away from self-employment in response to immigration, probably because immigrants themselves are more likely to be self-employed. All these effects indicate a dynamic response of natives, along the occupational dimension, which in the long run may benefit natives. At the very least, the occupational upgrade protects native individuals, on average, from the potential competition

effect of immigrants, which could be detrimental if they stay in the original job.

Overall it looks like immigrants speed up the transition of natives to higher ranked occupations, which are complementary to lower ranked occupations. They do not push them out of the labor market and do not hurt their wage income. The rest of the paper is organized as follows. Section 2 frames the contribution of this paper within the existing literature. In Section 3 we present the empirical framework of analysis. Section 4 presents the dataset and the main variables and section 5 describes our main results. Section 6 extends the analysis and performs robustness checks and section 7 concludes the paper.

2 Literature Review

There is a large literature analyzing the effect of immigration on labor market outcome of natives. Studies such as Borjas 2003, Card 2009, Ottaviano and Peri 2012, Dustmann et al. (2013) tackle the issue by defining a production function that determines the productive interactions between the immigrant labor and the native labor. In that framework, the variation to the marginal productivity of native labor caused by immigration is captured by changes in aggregate wages. In presence of rigidities or upward sloped labor supply, it would also cause changes in aggregate employment. Most of the studies use annual (short-run) or decade (long-run) variation in immigrant population (or employment) to identify the effects on average native wages or aggregate employment. The data used in those studies are "pseudo-panels". They are constructed using repeated cross sections of individuals (obtained from Census or Labor force survey) organized in "cells" such as regions, skill or region/skill groups and then followed over time. Even papers specifically analyzing the dynamic effect of immigration on natives identify the effects following "cells", rather than individuals, over time. For example, Cohen-Goldner and Paserman (2011) distinguish between the short-run and medium-run effects of immigrants on wages and employment, taking into account possible labor market adjustments induced by immigration. In that paper, however, arrival cohorts, rather than individuals are followed over time. Peri and Sparber (2009) and D'Amuri and Peri (forthcoming) focus on the "dynamic response" of natives, by analyzing whether natives move to more complex jobs as a consequence of immigration. Again, these papers do not follow individuals over time but they use skill cells as units of observation.

The immigration literature has not, to the best of our knowledge, used individual panel data to measure

the effects on natives. Individual panel data allow us to follow individuals during and after immigrants move into their country/occupation and analyze what is the impact on their labor-market outcomes, over one or more years. Peri and Sparber (2011) analyze the substitutability of highly educated natives and foreigners by tracking natives' occupations in two points in time. They then assess how an inflow of immigrant workers with graduate degree affects the occupation of highly educated natives. In their paper, however, only yearly changes in occupation are recorded and no medium run effects are considered.

The use of individual panel data to track the medium and long-run transition has been confined to the analysis of other types of shocks. For instance Von Wachter et al. (2007), Neal (1995) and Stevens (1997) (among others) analyzed the impact of mass layoffs on employment and wages of individuals who were subject to those shocks, by following them. Oreopulos et al. (2012) analyzed the medium and long-run effect of a recession at the beginning of one's career. Bartel and Sicherman (1998) studied the effect of technological change on employee training. Zoghi and Pabilonia (2007) analyzed the effect of the introduction of computers on individual wages. Dunne et al. (2004), using establishment-level data, assessed the effect of computer investment on the dispersion of wages and productivity. All these papers consider aggregate shocks and track their effects on individual panel data. While this is common in the labor literature, it is rarely done when analyzing the long-run impact of immigration.

The present paper brings individual panel data and a strategy similar to the one used to identify effects of recession, layoffs and technological change, to the study of the impact of immigration on native workers' labor market outcomes. This is particularly important if natives respond to immigration by changing their specialization (as suggested in Peri and Sparber 2009) or by investing in firms' specific skills (as suggested by the wage dynamics in Cohen-Goldman and Pasermann, 2011) or by undertaking other changes. These responses, in fact, may take some time to manifest.

3 Empirical Framework and Implementation

Let us begin by presenting the empirical framework that we adopt in our analysis. We also discuss in this section important issues related to the identification strategy, and to the construction of the instruments.

3.1 Basic Specification

Our basic specification relates the presence of immigrants working in the same occupation-country-year cell of natives to several outcomes of native individuals. In particular we define $f_{j,c,t}$ as the number of foreign born workers in occupation j and country c and year t relative to total workers in that cell. Denoting $y_{i,t}$ a specific outcome for individual i at time t, we estimate the following specification:

$$y_{i,t} = \phi_i + \phi_t + \phi_{l,c} + \delta X_{i,t} + \beta f_{j,c,t} + \varepsilon_{i,t} \tag{1}$$

In specification (1) the outcome y will be, alternatively, a variable measuring the relative occupational level of individual i**,** a dummy for unemployment status, the logarithm of income or a dummy for self-employment status. The term ϕ_i captures a set of individual fixed effects fully controlling for the individual heterogeneity in the sample, ϕ_t is a set of year effects, which controls for common time effects, $\phi_{l,c}$ is a set of occupational-level (l) by country (c) fixed effects, which captures country-specific heterogeneity in relative demand.[2] The term $X_{i,t}$ includes time-varying individual controls, namely dummies for education, marital status, industry and tenure dummies. The coefficient of interest is β, which captures the correlation between the number of immigrants, measured as the share of employment in the occupation-country-year cell, $f_{j,c,t}$, and individual i's outcome.

We also estimate a more demanding specification, in which we include all the possible pair-wise interactions between country c, year t and occupational-level l as follows:

$$y_{i,t} = \phi_i + \phi_t + \phi_{l,c} + \phi_{c,t} + \phi_{l,t} + \delta X_{i,t} + \beta f_{j,c,t} + \varepsilon_{it} \tag{2}$$

These fixed effects capture country-specific financial and macroeconomic shocks, occupation-level demand shocks and the potential heterogeneity of demand and immigration across country and occupation levels. Their inclusion brings the identification based on this approach,close to that of national-level studies (such as Borjas 2003, Ottaviano and Peri 2012). In those studies, once the authors have controlled for fixed effects,

[2]Notice that the fixed effects absorb the occupational-level (or occupational-tier) variation including the four occupational levels described below. We interacted those effects with country and year effects. We do not include specific occupation fixed effects and their interactions, as that specification would be too demanding for our data.

the remaining variation of immigrants in a cell is assumed to be driven by supply shocks and OLS estimation is applied. We instead worry about potential lingering country-occupation specific demand shocks and we devise an instrument (described below) based on a shift-share approach, at the European level.

Given the longitudinal structure of our dataset we also estimate a specification that includes lags of the immigrant share, to see whether some effects of immigration on native workers occur with a lag:

$$y_{i,t} = \phi_i + \phi_t + \phi_{l,c} + \phi_{c,t} + \phi_{j,t} + \delta X_{i,t} + \sum_{r=0}^{R} \beta_r f_{j,c,t-r} + \varepsilon_{it} \tag{3}$$

The first outcome that we consider is an indicator of occupational level. Our data has a definition of occupations that can be organized (as we illustrate in the next section) into four tiers (or levels) with a clear ranking. These tiers, in fact, are associated with different levels of wage, average education, use of cognitive and complex skills. Ranking those tiers with respect to any of those variables would provide the same ordering. Our occupational outcome variable is a standardized index that takes the value of 0 if at time t the individual i works in the initial occupational level (i.e. the occupation the individual was employed when he/she entered the sample) while it takes a value of +1 if he/she works in a higher tier one, or -1 if he/she works in a lower ranked one. The outcome, therefore, is an "index of occupational level" relative to the entry level. Based on this variable, we also created a "higher occupational level" index and a "lower occupational level" index, which isolate upward and downward mobility, respectively.

The second outcome that we consider is the unemployment status. The outcome variable is a dummy equal to 1 if individual i is unemployed at time t and 0 if he/she is not. The third is the logarithmic income for individual i at time t, distinguishing between yearly wage-salary earnings and yearly self-employment income. We also include as additional outcome an indicator that records entrepreneurial activity. In particular it is computed as a dummy equal to 1 if an employed person receives only wage and salary and no self-employment income and 0 otherwise.

3.2 Identification and Instrumental variable

The goal of the empirical analysis is identifying and estimating consistently the parameter β in equations (1) to (3), so that it can be interpreted as the causal effect of immigration on individual outcomes. Our

immigration shocks are measured at the country by occupation group and we control for each pair-wise interaction of country, year and occupational-level dummies. Labor market outcomes could differ in different countries, due to differences in institutions, sector of specialization and other structural features. Hence, we control for country-occupation level fixed effects in all specifications ($\phi_{l,c}$). In the most demanding specifications, changes in technology, such as adoption of computers, the progress of information technology, the change in the relative demand across skills are controlled for by the inclusion of the occupation-level by year fixed effects ($\phi_{l,t}$). Country-specific shocks driven by political, financial or institutional evolutions are also controlled for by the inclusion of the country by year fixed effects ($\phi_{c,t}$). Finally, in all specifications, the heterogeneity of native individuals is controlled for using individual fixed effects (ϕ_i).

While these effects absorb a large array of demand shocks and have been considered as sufficient controls to identify a causal effect in national-level analysis (Borjas 2003, Ottaviano and Peri 2012), there can still be omitted variables at the country-occupation-year level that cause estimation bias. Specific labor markets, defined as occupation-country cells, might be experiencing expansion or contraction of their labor demand in a certain year for specific reasons related to the interaction of technological change and specific country conditions. Those shocks could affect the inflow of immigrants, as well as individual outcomes for native workers, generating a spurious correlation. Hence we adopt an instrumental variable strategy. We use the fact that, using national Censuses in 1991, we can observe the distribution of immigrants from nine different areas of origin to European countries and occupational groups.[3] From the Censuses 1991 we can calculate the total number of foreign-born from area of origin N in Europe, F^N_{1991}.We then impute the share of European immigrants of nationality N, who are in country c and occupation j, $sh^N_{j,c,1991}$, as the product of the country c share of European immigrants of area of origin N, $\frac{F^N_{c,1991}}{F^N_{1991}}$, and the occupation j share of European immigrants of area of origin N, $\frac{F^N_{j,1991}}{F^N_{1991}}$, both measured in year 1991. So we obtain: $sh^N_{jc1991} = \frac{F^N_{c,1991}}{F^N_{1991}} \times \frac{F^N_{j,1991}}{F^N_{1991}}$.[4] Such initial imputation reduces the risk of endogeneity of immigrant distribution to cell-specific economic conditions for two reasons. First it uses variables measured in year 1991, while the analysis is relative to

[3] The areas of origin that we construct are; Central and South America, Eastern Europe, Middle East Central Asia, North Africa, North America, Oceania-Pacific, Other Africa, South and Eastern Asia, Western Europe.

[4] An alternative instrument was developed using the distribution of nationality N across occupations in the EU minus the destination country in the formula. Hence $sh^N_{jc1991} := \frac{F^N_{c,1991}}{F^N_{1991}} \times \frac{F^N_{j,-c,1991}}{F^N_{-c,1991}}$. This might be motivated by the fact that in Europe in some cases, country-of-origin can be tightly linked to country-of destination (e.g., Algerians in France), which might argue against the validity of the instrument in this context.The empirical results for this instrument (available upon request) are similar to those presented in the text.

the period 1995-2001. Second it assumes independence between the country and occupational distribution of immigrants, preventing country-occupation specific factors in1991 to affect it. We then use the OECD data on net migrant flows by area of origin into Europe (ΔF_t^N) to obtain the total number of foreign born from each area in each year. In particular, the number of foreign-born of area of origin N in Europe in year t is constructed as $\widehat{F}_t^N = F_{1991}^N + \sum_{s=1992...t} \Delta F_s^N$. Then we allocate the total immigrants from each area of origin to country-occupation cells according to their shares $sh_{j,c,1991}^N$. The "imputed" number of immigrants of area of origin N in occupation j and country c in year t will therefore be: $\widehat{F}_{j,c,t}^N = \widehat{F}_t^N \times sh_{j,c,1991}^N$. The total imputed number of foreign-born in that country-occupation cell is obtained by summing across areas of origin so that $\widehat{F}_{j,c,t} = \sum_N \widehat{F}_{j,c,t}^N$. We then divide this imputed immigrant population in occupation j and country c by the total employment in that cell to obtain $\widehat{f}_{j,c,t} = \left(\widehat{F}_{j,c,t}/Empl_{j,c,t}\right)$. We use $\widehat{f}_{j,c,t}$ as instrument for $f_{j,c,t}$, the employment share of foreign-born in occupation j, country c and period t.

The assumption behind this instrument is that the distribution of immigrants of specific nationality across countries or occupations in 1991 is the result of historical settlements and past historical events. This initial distribution, combined with networks of information and individual preferences for their own kind, implies that new immigrants are more likely to move to the same country-occupations in which previous immigrants of the same nationality operated. Hence, in periods of large aggregate immigrants inflows, that vary by country of origin independently of labor market shocks, cells receive different inflows of immigrants due to their initial different composition. The country-occupation specific changes in demand after 1991 do not affect at all the instrument. Moreover the rich set of fixed effects captures a large part of demand shocks. Hence, the variation of the instrument, after controlling for the fixed effects, can be thought as proxying for a supply-driven change in immigrants. It should, therefore, be correlated with the share of foreign-born, but not with the region-sector specific demand shocks. Let us emphasize again that our approach combines the fixed effects controls used in the "national-level" approach, with the imputed immigration instrumental variable used in the area approach.

4 Data and summary statistics

The main dataset used is the European Community Household Panel (ECHP), a survey that involves annual interviewing of a representative panel of households and individuals in each of EU-15 countries. The total duration of the ECHP was 8 years, running from 1994 to 2001. In the first wave, a sample of around 60,500 nationally representative households - including approximately 130,000 adults aged 16 years and over - were interviewed in the EU-12 Member States. Austria, Finland and Sweden (who joined the European Union in 1995) joined the ECHP project in 1995, 1996 and 1997, respectively. Two major areas covered in considerable detail in the ECHP are the economic activity and personal income of the individuals interviewed. Information on other topics such as health, education, housing, demographics and employment characteristic was also provided.

The important feature of ECHP is its longitudinal panel structure. Within each country, the original sample of households and persons is followed over time at annual intervals. Persons who move or otherwise form or join new households are followed at their new location, provided they move within the same country. In this manner, the sample reflects demographic changes in the population and continues to remain representative of the population over time, except for losses due to sample attrition. Households formed purely of new immigrants into the population are not included (European Commission, 1996). Hence the survey is only representative of natives. Although attrition is a typical problem with panel surveys and ECHP is no exception, its sample dynamic compares well with other similar panels (Peracchi, 2002).

In order to measure the presence of foreign-born as share of the population, we use the harmonized European Labour Force Survey (ELFS), which groups together country specific surveys at the European level (see Eurostat, 2009). We use only data ranging from 1995 to 2001 since, before 1995, data on place of birth are absent in most countries. We use ELFS to construct yearly measures of foreign born shares by occupation and country. The ELFS is an aggregation of repeated cross-sections, built with standard sampling techniques to make them representative of the national labor force, allowing us to capture inflows and outflows of migrants by country and years. The sample size of ELFS is 5 to 10 times larger than the ECHP, depending on the year and country considered, allowing for a more reliable estimate of migrant shares by occupation. Using ELFS we are left with 11 out of EU-15 countries (namely Austria, Belgium, Denmark,

Finland, France, Greece, Ireland, the Netherlands, Spain, Portugal, and the UK) as for the others there is no information allowing us to distinguish between native and foreign born individuals.[5]

In both data sets we selected only observations relative to working age individuals (15-65) and we base our estimation on the sample of native workers in ECHP. Their occupations are coded according to the 1988 International Standard Classification of Occupations (ISCO) produced by the International Labour Office (ILO 1990). The ISCO classification is the result of detailed investigation of national coding of occupations in the European countries and organizes them into standard groups (Elias and McKnight, 2001). We group the ISCO-88 occupations into four occupational level or "tiers". Table 1 provides the correspondence between the 4 occupation tiers and the ISCO occupations at 1-digit. The first tier ("Elementary") includes occupations that use skills associated with a basic general education, usually acquired by the completion of compulsory education. Examples of occupations in the first tier include postal workers, hotel porters, cleaners, and catering assistants. The second tier ("Clerical and Craft") covers a large group of occupations, all of which require basic knowledge as for the first tier, but also a worker-related training or work experience. Occupations classified at this level include machine operation, driving, caring occupations, retailing, and clerical and secretarial occupations. The third tier ("Technical and Associate") applies to occupations that normally require a body of knowledge associated with a period of post-secondary education but not necessarily up to a college degree level. A number of technical occupations fall into this category, as do a variety of trades occupations and proprietors of small businesses. In the latter case, educational qualifications at sub-degree level or a lengthy period of vocational training may not be a necessary prerequisite for competent performance of tasks, but a significant period of work experience is typical. The fourth tier ("Managers and Professionals") relates to what are often termed professional occupations and managerial positions in corporate enterprises or national/local government such as legislators, senior officials and managers. Occupations at this level typically require a tertiary degree or equivalent period of relevant work experience.

Table 2 shows the distribution of native workers across the four tiers. As we notice from columns 1-2, overall about 8% of individual-year observations fall in the first occupation tier, 56% in the second tier, 14% in the third and 22% in the fourth (top) tier occupations. This table also shows frequencies (columns 3-4)

[5]It should be noticed that ECHP, besides being unable to provide a representative sample of the foreign population in the EU, lacks information on respondents' country of birth in for 4 out of 15 countries, namely Germany, the Netherlands, Greece and Luxembourg.

of tiers in terms of individuals rather than individual-years, showing that 14% of individuals ever worked in the first tier, 67% in the second, 21% in the third and 29% in the fourth, for a grand total of 77,410 individual-tier observations. Considering that we have about 59,000 individuals in our sample, this table suggests that mobility across occupational tiers is substantial as one quarter of the European individuals in the period considered has held occupations in at least 2 different tiers.

The grouping of the occupations into the four hierarchical levels is quite reasonable. The aggregate data, in fact, show that moving from tier 1 to 4, we find an increasing percentage of native workers with tertiary education. The levels of wage and salary earnings also increase and so does income from self-employment. In addition a higher score in complex skills as well as a lower score in manual skills is associated with higher tiers (see Table A1 in the Appendix to see these descriptive statistics).[6]

The full sample of native workers comprises over 260,000 individual-year observations. Table A2 provides a summary statistics of the main outcome variables, for the full and the 2SLS sample. The latter is restricted to countries for which an instrument can be constructed.[7] The average of the occupational level index in the full sample is 3%, which suggest that the upgrades are more likely than downgrades. In fact, about 10% of individual-year observations record an occupation upgrade, and about 7% a downgrade. The percentages computed for the 2SLS sample are almost the same. A better idea of the inter-tier mobility is given by the matrix A.3 in the Appendix. That table shows that the more likely transition within one-year is from Tier 1 to 2: Every year, 19% of individual in Tier 1 transitions to Tier 2. Also common is transiting from Tier 3 to 4 (7.3% per year). The most common downward transition is from Tier 3 to 2 (8.6% of those in Tier 2 experience it within a year). The other transitions are not larger than 5% per year. Overall, however, transitions between two adjacent tiers occur to 5-10% of individuals in the sample. Looking at worker-year observations (Table A2), the average unemployment rates is around 7% and the other averages for the outcome variables are very similar considering the full or the 2SLS samples.

Our main explanatory variable is the share of foreigners employed in country c and time t in occupation

[6] The intensity of skills of the different tiers are computed using D'Amuri and Peri (forthcoming) calculation based on the O*NET data, from the US Department of Labor. Complex scores are computed as the average of scores in communication, complex and mental skills. Non-complex, manual scores are the average of scores in manual and routine skills. The higher scores in complex tasks for tier 4 occupations imply that workers in this group are the most likely to use intensively complex skills compared to the rest of the workers.

[7] The sample in the 2SLS estimations does not include all the 11 countries available because the 1991 census data, used to compute the instrument, were available only for six, namely France, UK, Greece, Spain, Portugal and Austria.

j. We define as foreign born those workers who were born in a country different from the one where they are currently resident. Although in some countries further information regarding the country of origin is provided, it is not consistently defined across the years and countries considered. Figure 1 shows the average share (1995-2001) of foreign born workers in employment by country (left panel) and by the ISCO occupation categories (right panel). The first shows that EU countries widely differed in their share of foreign workers. Averaging the whole period, in France about 10% of the working population was foreign-born, and in Belgium that percentage was over 9, while in Finland it was less than 2% of the population. Breaking down the foreign born population of workers by ISCO codes, one also notices that foreign-born workers are a relatively large share (roughly 8%) of workers in elementary occupation occupations but they also constitute a large share (about 6-7%) of those employed in occupations requiring high qualifications (such as professional, legislators, senior officials and managers).

5 Main Empirical Results

In this section we present the results of the empirical analysis. As the main explanatory variable, $f_{j,c,t}$, varies at the occupation-country-year level and as individuals are followed over time, we use a two-way cluster to compute the standard errors. To account for possible correlation within individual over time, one needs to cluster at the individual level. To account for the correlation within the same occupation-country-year, one would cluster at that level. Hence the two-way cluster should account for correlation within each group and across them, so that the standard errors are not artificially reduced by within group correlation. The reported regressions, from specification of equation (1), include progressively more demanding fixed effects. All specifications include all individual controls ($X_{i.t}$) and, beginning with column (4), include all the possible two-way fixed effects (between time, occupational-level and country). The only coefficients shown in the estimation tables are those on the main explanatory variable, $f_{j,c,t}$.

Tables 3 and the other tables up to Table 10 have the same following structure. The first column presents estimates for the basic specification (1) estimated using OLS and using the full sample of 11 countries. In the second column we restrict the sample to the set of 6 countries for which we can construct the instrument (driven by the availability of 1991 census micro-data). The third column estimates the same

specification using 2SLS and the fourth adds the full set of two-way interaction dummies ($\phi_{l,c}, \phi_{l,t}$ and $\phi_{c,t}$). In specification (5) we include one lag, in 6 we include two lags while in specification (7) we include three lags of the immigrant share (explanatory variable) as in equation (3) with $R = 3$.

5.1 Immigrants and Native job mobility

In Table 3 we report the estimates of the coefficient of the immigrant share of employment ($f_{j,c,t}$) when the dependent variable is the occupational level index described above. The outcome $y_{i,t}$ for occupational level is coded with a discrete variable that is standardized to 0 at the beginning of the individual working spell covered in our panel. It takes a value of $+1$ or -1 if the worker experiences a level upgrade or a downgrade, respectively, relative to the initial occupational level. If the individual did not change tier or went back to the original one, the variable takes a value of 0.

The 2SLS results are robust and consistent across specifications. They show that the effect of immigration on occupation level is positive and significant at time t for all specifications. First, let us notice that the OLS estimates are not very different when using the full sample of 11 countries or the restricted one of 6 countries. The comparison of the first two columns, in fact, shows that the estimates are very close, suggesting that no large bias is introduced by the smaller sample.

The 2SLS estimates of column (3), however, are significantly larger than the OLS ones. This direction of the bias suggests that immigrants in Europe might have moved, endogenously, to occupations or countries that were not experiencing fast upward career mobility for natives. For instance, one may think of a positive demand shock for a particular set of occupations in a particular country. This increase in demand would tend to draw immigrants into that market as well as to keep native-born workers from moving out of it, although the increase in supply would tend to push workers out. These types of endogenous inflows would bias the estimate toward zero. Our instrument is, by construction, uncorrelated with these types of demand shocks, and hence it allows to disentangle the supply push margin only.[8] Finally, also measurement error in the ELFS, corrected by the census-based instrument, could contribute to explain the downward OLS bias.

Focussing on the most conservative specification, in column (4), the 2SLS estimated effect of immigrants on occupational level is large and significant. Using the coefficient of 1.25, an increase of immigrants by

[8] We thank an anonymous referee for suggesting this example to explain the direction of the bias of the OLS estimates.

one percentage point of employment in a cell, increased the average measure of occupational level by 0.012 points. This implies that it made an occupational level upgrade 1.2 percentage points more likely, or an occupational downgrade 1.2 percentage points less likely for a native.

The non-significant coefficients on the lagged variables in column 5, 6 and 7 indicate that the response of native occupational level to an increase in immigrant competition is prompt and it unfolds already within one year. This dynamic response is consistent with the possibility that some individuals, those relatively more mobile, are responsive and they take advantage of the pressure produced by immigration relatively quickly as immigrants move into the market. These individuals may be the younger ones and those with shorter tenure.

It is useful to re-code the occupational level variable, separating between upward and downward events. In this way we are able to detect whether immigrants are genuinely providing a "push" to native careers or if they are simply preventing them to fall lower in the occupational levels. To do this we define a "higher occupational level" dummy that is equal to 1 if an individual moves in an occupation level higher than that of his/her first entry in the sample and 0 otherwise. Similarly we define a "lower occupational level" dummy that is coded 1 if an individual moves to an occupation in a lower tier than the initial one and 0 otherwise. Table 4 presents results on the dummy "higher occupational level". The estimated coefficients are consistently positive and significant. Considering the most demanding 2SLS estimates, the coefficient of the share of immigrants at time t is 0.5. If we control for past values of the share of immigrants, the coefficients increase to 0.7 and 1 (column 5-7). These estimates suggest that an increase in the share of immigrants by 1 percentage point of cell employment raises the average likelihood of occupational upgrading by about 1 percentage point. This confirms a significant effect (about 11% of the average probability of upgrading in a period, which is 8.8 percentage points) of immigrants on native occupational improvements. The coefficients of the lagged variables remain not statistically significant, confirming a responsive reaction of natives. It is important to notice that it may take some time for the productive consequences of this upgrade to be realized. Wages, as we will see below, respond with a lag. This likely takes place because a change in occupation, although upwards, entails an immediate loss of specific human capital. Nevertheless, the relatively high occupational mobility of natives, especially during their early career, may provide opportunities to respond quickly to

competition via upgrading opportunities. Hence, by taking jobs at the lower tiers of the occupational distribution, immigrants provide a push and complementarity benefits to faster career upgrades of natives. Over time this affords a wage increase or at least protects natives from wage competition. On average, native workers seem to take advantage from that, by having higher probability of upward mobility within the considered period (1995-2001).

Table 5 shows results for the dummy "lower occupational level". The coefficients suggest a negative and sometimes significant effect of the share of immigrants at time t on the likelihood of moving to a lower level. The statistical significance of the effect is reduced when more lags in the share of immigrants are introduced. In particular, the point estimate of this effect is only around -0.5 when we include two lags in the share of immigrants. Focussing on the coefficient of column 4, the estimate suggests that immigration equal to 1 percentage point of cell employment reduces the average likelihood of moving to a lower occupational level by about 0.7%. We can therefore summarize that an inflow of immigrants in an occupation-country cell encourages natives to escape competition by significantly increasing the chances of moving to a higher level but also reducing, somewhat, the chances of moving to a lower one.

The last columns (specification 8) of Tables 3, 4 and 5 show another interesting feature of the impact of immigrants on occupational mobility of natives. In those specifications we include also the share of immigrants in the next higher occupational tier as control. While increased competition of immigrants within an occupation is escaped by upward mobility, the presence of immigrants in the upper occupational tier could discourage mobility. Natives could encounter competition even after upgrading. In line with this intuition, the share of immigrants in the next higher occupation level has a negative effect on the probability of moving to a higher occupational tier (Table 3 and 4). The effect, however, is smaller than the positive push due to immigrants in the current level. This may be due to the fact that fewer immigrants are in the intermediate than in the lower tiers, or to the fact that competition in the narrowly defined initial occupation is more relevant than the competition in the broadly defined and more skill intensive next tier. Competition in upper tier might also have an effect on the probability of moving to a lower occupational tier, possibly because moving to a lower tier could be a way to escape competition at the same and at the upper tier. In fact, the regression in column 8 of Table 5 shows that there is no evidence that the probability of moving to

a lower occupational level is significantly affected by the share of immigrants in the upper tier.

The imputed immigrant share by cell, constructed as described in section 3.2, turns out to be a strong instrument for the endogenous variable in all the specifications used. The F-statistics of the excluded instrument, reported in the last row of the Tables, are always well above 10.

These results imply that immigration promotes a response of natives in terms of occupational career. By filling occupations at the "manual and routine" end of the occupational spectrum, many immigrants generate opportunities (and increase demand) for jobs in higher occupational tiers, that can be filled by natives. Native workers appear to take advantage of these opportunities. These dynamics were known, for aggregate economies, from previous studies (such as Peri and Sparber 2009, D'Amuri and Peri, forthcoming). Our dataset, however, by considering individual data, shows that individual workers are pushed, on average, to climb more rapidly the ladder of occupational opportunities when immigration is larger. Natives are more likely to advance and less likely to drop in their progression from simpler and less paid jobs to more complex and better paid jobs. By following individual native workers, we know that the higher concentration of natives in higher-ranked occupations, in response to immigration, is not only the result of compositional changes (new hires or selective retirement) but of existing native individuals moving more rapidly to higher ranked occupations.

5.2 Immigrants and native unemployment

The second outcome that we consider is the unemployment status of native individual i at time t. While the mobility towards higher occupational tiers is potentially a positive outcome for natives, it may imply, in the short and medium run, higher risk of unemployment as it displaces workers from their initial job. A modified version of the "crowding-out" hypothesis (that argues that immigrants decrease the job opportunities for natives) implies that immigrants push natives to move to other occupations, but generate periods of costly unemployment. The fact that natives have to change job to take advantage of the opportunities created by immigrants may leave them unemployed, or out of the labor force for a while.

To test this possibility we consider as outcome $y_{i,t}$ a dummy equal to 1 if native individual i is unemployed at time t and 0 if he/she is not. As already discussed in the Section 4, we consider only individuals aged

15-65. We then exclude those in education or training, retired or doing community or military service. Table 6 shows the estimates of the coefficient β in such regressions. The table has the same structure as the previous ones, showing different columns with estimates from increasingly demanding specifications. The results are similar across specifications and they show no significant effect of immigration on the probability of being unemployed. The point estimates of the share of immigrants at time t in the specifications with no lags for the immigrant share are not statistically significant. Also, in the specifications that include the lagged values of the share of immigrants, the coefficients are mostly non-significant. If anything, a negative effect of immigration on unemployment emerges in column (6) and (7) for the 2-year lag. An increased share of immigrants does not change the natives' likelihood of experiencing unemployment and, with a two-year lag, it may reduce it slightly. This may be because workers become more likely to be in higher occupational tiers in which unemployment rate is lower. Taken together, these results imply that immigration has no significant impact (or possibly a negative impact after 2 years) on the probability that a native worker becomes unemployed. This effect is consistent with the hypothesis that immigrants generate complementary working opportunities for natives in higher occupational tiers. They may even induce stronger job-creation by firms, stimulating upgrading and employment of natives (as shown, for instance in Chassamboulli and Palivos, 2012). We do not find support to the idea of crowding-out.

5.3 Effects on income and self-employment

Our panel data contain also information on the yearly wage income of an individual and on the yearly income from self-employment. Using these variables we explore two further potential outcomes. First, we analyze the impact of immigrants on yearly wage income of individual natives. On the one hand, the occupational upgrade identified before should contribute positively to wages. On the other, especially in the short run, the loss of specific human capital may offset the positive wage effect of occupational upgrading. Moreover, immigrant competition may decrease the occupational wages at low level of the occupation ranking, so that climbing up simply offsets the potential decreases. Whether immigration, in the short run, is associated to a positive wage effect on natives is an empirical question.

Table 7 shows that the estimated effect of the foreign born share on average wages and salaries of natives is

positive but not significant at time t for all 2SLS specifications. However, the more demanding specifications, with the inclusion of the lagged share of immigrants (columns 5-7), suggest that a significant (but not too large) positive effect on natives wage and salary earnings occurs with 1-2 year lags. The point estimates of the effect of immigrants at time $t-1$ range between 0.7 and 1. Therefore, an increase of immigrants at time $t-1$ by one percentage point of cell employment would increase the average wage and salary earnings by 0.7 to 1 percentage point. The most significant effect is found with one year lag. These results suggest that occupational upgrade may imply a delayed wage increase. Natives are pushed to a more remunerative occupation but, due to an initial loss of specific human capital, the actual wage gain is only shown later.

We then focus on self-employment income. Self-employment income is a significant component of labor income in many countries. As immigrants usually have a larger self-employment rate than natives, they could have an effect on the employment status of natives**.** Figure A1 plots the probability of receiving any self-employment income for immigrants with respect to natives. Over the period considered such probability increased sharply. This generated a significant increase in the supply of self-employed immigrants. The response of natives to this change in supply of immigrants can be ambiguous. On the one hand, the presence of immigrants may increase the opportunity of natives to start a business, hiring immigrants in manual tasks at moderate cost. On the other, the competition of immigrants as entrepreneurs can crowd-out (pushing towards paid employment) native entrepreneurs. While there are some studies analyzing immigrants as self-employed (e.g. Fairlie 2010), there is very little research on whether more immigration encourages natives to become entrepreneurs. An exception is Fairlie and Meyer (2003), that finds a crowding out effect of immigrant entrepreneurs on native ones.

In Table 8 we analyze the effect of immigration on the (logarithm of) self-employment income of natives and in Table 9 we test whether immigration affects their likelihood of receiving no self-employment income. The outcome variable in Table 9 takes value equal to one if an employed person receives only wage and salary and no self-employment income and 0 if one receives either some or only self-employment income.

The analysis of these two outcomes provide a sense of the effect on native entrepreneurial activity overall (self-employment income) and on the extensive margin (probability of self-employment). The empirical findings are as follows. First, the likelihood of native workers to receive self-employment income decreases

with increased share of foreign-born (Table 9). An increase of foreign born by one percentage point of cell employment would imply by up to 1.1 percentage point increase in the probability of not having any self-employment income. Second, immigration does not produce any significant effect on the average level of self-employment income (Table 8).[9] The point estimates, consistently with the result on the extensive margin, are always negative, though not statistically significant. This implies a decrease in propensity to do self-employment activities. Hence, there is some evidence that immigration decreases the probability of self-employment activities by natives and that some crowding-out effects of immigrants on natives occur, in this area, consistently with what was found by Fairlie and Meyer (2003).

6 Extension and Checks

6.1 Different definitions of Occupational Mobility

One key element of our finding is the increased occupational mobility of natives in response to immigration. In order to verify that the specific occupational "tier" structure imposed is not responsible for the findings of larger occupational mobility, in this section we compute occupational change without any occupational level. In particular, we analyze whether immigration affects the probability of natives moving between any of the nine ISCO occupational groups. We construct a binary outcome variable, that we call occupation mobility. The variable takes the value of 0 for each individual when he/she joins the sample. It equals 1 if individual i works in a different occupation than the initial one, while it remains 0 otherwise. This outcome variable does not allow to test for the "direction" of the occupation change but it is a check that immigration affects the propensity of native individuals to change occupation, independently of the tier-structure imposed. Clearly, in the sample there are more occupation changes than the sum of upgrades and downgrades: some occupation changes are not coded as either upgrades or downgrades as they occur between occupations of the same tier. While the sample average probability of occupational change is 22% per year, the sum of average upgrades and downgrades is around 16% (see Table A2 in the Appendix). Table 10 presents the empirical findings using occupational change as dependent variable. The point estimate is positive and statistically significant in all

[9] Given the large share of zero self-employment income, one should correct for selection bias. However, as we found no statistically significant effect of the share of immigrants on the log of self-employment income, we refrained to estimate the same model correcting for selection bias.

2SLS estimations. The 2SLS coefficients of the share of immigrants at time t are about 3, when no lags in the share of immigrants are added (columns 3 and 4), implying a significant increase in mobility in response to higher immigration. The point estimates on occupational mobility are even larger for the 2SLS specifications that include more lags (columns 5 and 6). These large effects on occupational change suggest that the "net" upgrading effect estimated in Table 4 can be simply the tip of a more pervasive effect on individual "gross" mobility. Besides the net average upgrading effect, there may also be an increase in "horizontal" mobility of natives (specialization). Overall, immigrants increase the mobility of natives across occupations, which, together with specialization according to comparative advantages, is the key mechanism for the gains from immigration. The results of the previous and of the present section indicate that immigration makes the labor market more dynamic.

6.2 Heterogeneity by initial skill, age, gender

There is large heterogeneity in the labor market outcomes of workers which is associated to their age, gender and skills. These differences can make one group more vulnerable and responsive than others to the inflow of migrants. In Table 11 we take into account this heterogeneity and we split the sample of workers according to three criteria. First, we distinguish workers in terms of their occupational tiers at the entry in the sample. As we have found a positive effect of the share of immigrants at time t on occupational level we would like to check whether this is confirmed also looking at the sub-sample of workers starting by lower and upper tiers. Native workers in Tier 1 and 2 may be subject to more intense competition from immigrants in manual jobs, whereas natives in Tier 3 may have stronger upward mobility opportunities, linked to their higher skills, better ability to learn and stronger wage incentives to upgrade (as wage distributions are more "stretched" at the top). Second, we assess whether the ability to respond to immigration via an occupational upgrade is mainly an opportunity for young workers, defined as individuals younger than 40 years of age at the beginning of our sample. Third, we also test whether results are robust to the exclusion of individuals aged less than 25. This group could include workers, who are also enrolled in higher education and that may experience large upgrades after the completion of their tertiary education. Finally, we distinguish between male and female workers. A larger share of immigrants is male in Europe, so one could expect a larger

pressure on that gender to upgrade occupation. However, some house-service occupation typical of migrants can substitute women's household work. All these models are estimated by 2SLS using the specification (2), with the complete set of fixed effects, which corresponds to specification of column (4) in Tables 3-10. We do not include the lagged values of immigrant share (which generally did not have a significant coefficient in previous regressions).

The empirical findings presented in Table 11 show the estimated effect of immigrants on occupational level (top rows), unemployment status (middle rows) and log earnings (bottom rows). First, columns 1 and 2 show that workers both in lower and upper tiers are significantly more likely to experience occupational upgrading as a consequence of immigrant competition. The coefficient is much larger for workers starting at high tiers, suggesting more responsiveness of intermediate occupations to immigration waves. These results are consistent with the hypothesis that large inflows of immigrants increase the demand for managerial occupations and natives have a particular advantage in those. In columns 3, 4 and 5 we present results for the group of young workers (less than 40), older workers (40 or more) and those not-in-education age (25 or more). Occupational mobility induced by immigrant influx affects in similar ways all age groups, with a slightly larger point estimate for natives below 40 than above 40. Columns 6 and 7 present the results for the male and female sub-samples, respectively. Although both subgroups show significantly positive estimated coefficients for occupation level, that of the female sub-sample is larger. Immigrants may be substitutes for manual house-services typically employing females (e.g. house cleaning, baby-sitting, elderly care) and this allows native female to be employed in more professional roles and enjoy more dynamic careers (e.g. Cortes and Tessada, 2011).

The impact on unemployment status, shown in the middle section of the Table 11, suggests that the probability of unemployment of natives is not an outcome affected by immigration for any of the groups considered. In fact, for individuals beginning at Tier 1 or 2, a larger inflow of immigrants in their markets decreases the probability of unemployment. Be it because of the immigrant-native complementarity or because firms increase jobs creation when immigration is large, we do not observe evidence in the EU of immigrant crowding out natives. Similarly, the contemporaneous effects of immigrants on wages is negligible for all groups. Remember that in Table 7 we found some lagged positive effects of immigration on wages but

no contemporaneous effects.

7 Conclusions

In this paper we have analyzed the impact of immigration on several native outcomes. The novelty of the approach is that we use data that allow us to follow native individuals in a panel and analyze the response in their working careers after they have been exposed to labor market competition from immigrants. Our main focus is to analyze whether the exposure to immigrant competition accelerates or slows the career of native workers. Using the presence of immigrants from different nationalities in 1991 in country-occupation cells in Europe and their inflow during the period 1995-2001, we compare natives exposed to large or small waves of immigrant competition and we use this variation to identify the effects on their career.

We find that immigrant competition increases the probability of upward mobility of natives within the observed period. Also, interestingly, we find that such a faster mobility did not take place at the cost of higher probability of unemployment. The dynamic effects of immigration, in fact, did not imply that natives were crowded out, but instead, that working opportunities were created in higher occupation levels. If anything, the lagged impact of immigrants on unemployment was negative. Possibly, foreigners, by taking jobs complementary to those of natives, induce stronger job-creation by firms. The upward mobility seems stronger among females, and among natives starting at intermediate occupational levels (rather than from very low levels). Native individuals are also more likely to leave self-employment in response to immigrant competition and, in general, immigration increases substantially occupational mobility of natives.

The novelty of our findings is that we are following a representative panel of European workers, controlling for their observed and unobserved (time-invariant) characteristics. Hence, differently from the previous literature, issues of selection, unobserved heterogeneity and attrition of native workers do not bias our results. We are isolating the causal impact of immigrants on native individuals, exposed to competition from immigrants. The impact of an immigration shock on native careers is a new dimension of the analysis of labor market effects of immigrants and may have very important long-run implications for the gains from immigration.

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Table 1: The skill content of occupations

Occupation tiers	ISCO Occupation-1 digit
First: "Elementary occupations"	9. Elementary occupations
Second: "Clerical and Craft occupations"	4. Clerks; 5. Service workers and shop and market sales workers; 6. Skilled agricultural and fishery workers; 7. Craft and related trades workers; 8. Plant and machine operators and assemblers
Third: "Technical and Associate professionals"	3. Technicians and associate professionals
Fourth: "Professional and Manager"	1. Legislators, senior officials and managers; 2. Professionals

Table 2: Distribution of native workers in the four occupation tiers (%). Average 1995-2001

Occupation tiers	All natives			
	By individual-years		By individuals	
	Freq.	%	Freq.	%
	(1)	(2)	(3)	(4)
First	21,701	8.26	8,384	14.24
Second	146,173	55.64	39,197	66.58
Third	36,292	13.81	12,518	21.26
Fourth	58,545	22.28	17,311	29.41
Total	**262,711**	**100.00**	**77,410**	**131.50**
			(No. of individuals = 58,868)	

Source: authors calculation based on ECHP data.

Note: Columns (1) and (2) report statistics by individual-years, summing up to the total sample size. Columns (3) and (4) report frequencies and shares of individual who have ever been of each tier. The total frequency is higher that the number of individuals suggesting that some individuals have been employed in different tiers over the period considered.

Table 3: Immigration and native occupational level

Specification:	(1) OLS Full sample	(2) OLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS	(7) 2SLS	(8) 2SLS
Share of immigrants at time *t*	0.3394*** [0.0619]	0.2866*** [0.0657]	1.2501*** [0.2335]	1.2494*** [0.2270]	1.3974*** [0.2846]	1.4623*** [0.3372]	1.6860*** [0.4319]	1.5342*** [0.2236]
Share of immigrants at time *t-1*					-0.0842 [0.2152]	0.0229 [0.1571]	-0.0918 [0.1902]	
Share of immigrants at time *t-2*						-0.0475 [0.1375]	-0.1075 [0.1478]	
Share of immigrants at time *t-3*							-0.1358 [0.1648]	
Share of immigrants in next higher tier level at time *t*								-0.3675*** [0.0606]
Fixed effects	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year
Interaction effects	Country*Occ. Lev.	Country*Occ. Lev	Country*Occ. Lev	Country*Occ. Lev, Country*Year, Occ. Lev*Year	Country*Occ. Lev, Country*Year, Occ. Lev*Year	Country*Occ. Lev, Country*Year, Occ. Lev*Year	Country*Occ. Lev, Country*Year, Occ. Lev*Year	Country*Occ. Lev, Country*Year, Occ. Lev*Year
N. obs.	262,711	183,068	183,068	183,068	130,407	94,553	65,705	165,189
F-test 1st stage	.	.	115.4	133.6	137.8	72.21	33.98	128.10

Note: Each column reports the estimate from a different regression where the dependent variable is defined as equal 0 if the individual is at the same tier level as when he first entered the sample, 1 if he is at a higher tier and -1 if he is at a lower tier. The coefficient reported in columns (1) to (8) is the coefficient on the share of foreign-born at time t and (from column 5 to 7) at earlier periods. Column (8) reports also the coefficient on the share of immigrants in the next higher tier level at time t. The first column uses the whole sample of 11 countries, the remaining columns use data from the subsample where instrumental variables are available. All regressions are performed at the individual level and include controls for education, marital status, tenure and industry as well as individual and year fixed effects. In brackets we report the standard error using two-way clustering at the individual and at the year-country-occupation levels. *,**,*** indicate significance at the 10, 5 and 1% level, respectively.

Table 4: Immigration and "higher occupational level" of natives

Specification:	(1) OLS Full sample	(2) OLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS	(7) 2SLS	(8) 2SLS
Share of immigrants at time *t*	0.3626***	0.4065**	0.3825	0.5050*	0.6910**	0.9829***	1.0335**	0.8891***
	[0.1353]	[0.1606]	[0.3112]	[0.2923]	[0.3459]	[0.3700]	[0.4764]	[0.2824]
Share of immigrants at time *t-1*					-0.3510	-0.1694	-0.2734	
					[0.4765]	[0.3271]	[0.2631]	
Share of immigrants at time *t-2*						0.0643	-0.0182	
						[0.3338]	[0.3040]	
Share of immigrants at time *t-3*							0.0555	
							[0.2999]	
Share of immigrants in next higher tier level at time *t*								-0.2767***
								[0.0842]
Fixed effects	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year
Interaction effects	Country*Occ.Lev.	Country*Occ.Lev	Country*Occ.Lev	Country*Occ. Lev, Country*Year, Occ. Lev*Year	Country*Occ. Lev, Country*Year, Occ. Lev*Year	Country*Occ. Lev, Country*Year, Occ. Lev*Year	Country*Occ. Lev, Country*Year, Occ. Lev*Year	Country*Occ. Lev, Country*Year, Occ. Lev*Year
N. obs.	262,711	183,068	183,068	183,068	130,407	94,553	65,705	165,189
F-test 1st stage	.	.	115.4	133.6	137.8	72.21	33.98	128.1

Note: Each column reports the estimate from a different regression where the dependent variable is defined as equal 0 if the individual is at the same or at a lower tier level than when he first entered the sample and 1 if he is at a higher tier. The coefficient reported in columns (1) to (8) is the coefficient of interest at time t and (from column 5 to 7) at earlier periods. Column (8) reports also the coefficient on the share of immigrants in the next higher tier level at time t. The first column uses data of the whole sample, the remaining columns use only data of the subsample where instrumental variables are available. All regressions are performed at the individual level and include controls for education, marital status, tenure and industry as well as individual and year fixed effects. In brackets we report the standard error clustered at the individual and at the year-country-occupation levels. *,**,*** indicate significance at the 10, 5 and 1% level, respectively.

Table 5: Immigration and "lower occupational level" of natives

Specification:	(1) OLS Full sample	(2) OLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS	(7) 2SLS	(8) 2SLS
Share of immigrants at time *t*	0.0231 [0.1329]	0.1199 [0.1518]	-0.8676*** [0.3177]	-0.7444*** [0.2873]	-0.7064** [0.3353]	-0.4794 [0.3704]	-0.6525 [0.4291]	-0.6451** [0.2798]
Share of immigrants at time *t-1*					-0.2668 [0.4546]	-0.1924 [0.3092]	-0.1816 [0.2655]	
Share of immigrants at time *t-2*						0.1118 [0.3227]	0.0892 [0.2849]	
Share of immigrants at time *t-3*							0.1913 [0.2916]	
Share of immigrants in next higher tier level at time *t*								0.0908 [0.0806]
Fixed effects	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year
Interaction effects	Country*Occ.Lev.	Country*Occ.Lev	Country*Occ.Lev	Country*Occ. Lev, Country*Year, Occ. Lev*Year	Country*Occ. Lev, Country*Year, Occ. Lev*Year	Country*Occ. Lev, Country*Year, Occ. Lev*Year	Country*Occ. Lev, Country*Year, Occ. Lev*Year	Country*Occ. Lev, Country*Year, Occ. Lev*Year
N. obs.	262,711	183,068	183,068	183,068	130,407	94,553	65,705	165,189
F-test 1st stage	.	.	115.4	133.6	137.8	72.21	33.98	128.1

Note: Each column reports the estimate from a different regression where the dependent variable is defined as equal 0 if the individual is at the same or at a higher tier level than when he first entered the sample and 1 if he is at a lower tier. The coefficient reported in columns (1) to (8) is the coefficient of interest at time t and (from column 5 to 7) at earlier periods. Column (8) reports also the coefficient on the share of immigrants in the next higher tier level at time t. The first column uses data of the whole sample, the remaining columns use only data of the subsample where instrumental variables are available. All regressions are performed at the individual level and include controls for education, marital status, tenure and industry as well as individual and year fixed effects. In brackets we report the standard error clustered at the individual and at the year-country-occupation levels. *,**,*** indicate significance at the 10, 5 and 1% level, respectively.

Table 6: Immigration and native unemployment

Specification:	(1) OLS Full sample	(2) OLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS	(7) 2SLS
Unemployment Status at time *t*	-0.0993	-0.1200	0.2042	-0.1353	-0.1153	-0.2208	0.0147
	[0.0749]	[0.0905]	[0.1646]	[0.1122]	[0.1434]	[0.1901]	[0.2361]
Unemployment Status at time *t-1*					-0.0443	0.0089	0.0827
					[0.2804]	[0.3064]	[0.3103]
Unemployment Status at time *t-2*						-0.3874***	-0.4643***
						[0.1339]	[0.1663]
Unemployment Status at time *t-3*							-0.0070
							[0.1576]
Fixed effects	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year
Interaction effects	Country*Occ.Lev.	Country*Occ.Lev.	Country*Occ.Lev.	Country*Occ.Lev., Country*Year, Occ.Lev.*Year	Country*Occ.Lev., Country*Year, Occ.Lev.*Year	Country*Occ.Lev., Country*Year, Occ.Lev.*Year	Country*Occ.Lev., Country*Year, Occ.Lev.*Year
N. obs.	321,934	218,629	218,629	218,629	168,206	129,850	96,000
F-test 1st stage	.	.	137.6	158.0	183.0	119.1	52.57

Note: Each column reports the estimate from a different regression where the dependent variable is defined as 1 if the individual is unemployed and 0 if regularly working. The coefficient reported in columns (1) to (7) is the coefficient of interest at time t and (from column 5) at earlier periods. The first column uses data of the whole sample, the remaining columns use only data of the subsample where instrumental variables are available. All regressions are performed at the individual level and include controls for education, marital status as well as individual and year fixed effects. In brackets we report the standard error clustered at the individual and at the year-country-occupational levels. *,**,*** indicate significance at the 10, 5 and 1% level, respectively.

Table 7: Immigration and native wage and salary earnings

Specification:	(1) OLS Full sample	(2) OLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS	(7) 2SLS
Log Wage income at time *t*	0.4945**	0.5501*	0.5101	0.3363	0.2185	0.3322	0.6381
	[0.2312]	[0.2845]	[0.6963]	[0.4172]	[0.3675]	[0.4227]	[0.6156]
Log Wage income at time *t-1*					0.7594*	0.7295*	0.9603**
					[0.4272]	[0.3936]	[0.4343]
Log Wage income at time *t-2*						0.4458	0.5690
						[0.3572]	[0.3885]
Log Wage income at time *t-3*							-0.4517
							[0.4292]
Fixed effects	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year
Interaction effects	Country*Occ.Lev.	Country*Occ.Lev.	Country*Occ.Lev.	Country*Occ.Lev., Country*Year, Occ.Lev.*Year	Country*Occ.Lev., Country*Year, Occ.Lev.*Year	Country*Occ.Lev., Country*Year, Occ.Lev.*Year	Country*Occ.Lev., Country*Year, Occ.Lev.*Year
N. obs.	213,287	141,996	141,996	141,996	103,413	74,700	51,700
F-test 1st stage	.	.	104.7	119.0	122.9	69.33	32.20

Note: Each column reports the estimate from a different regression where the dependent variable is defined as the log of net wage and salary earnings. The coefficient reported in columns (1) to (7) is the coefficient of interest at time t and (from column 5) at earlier periods. The first column uses data of the whole sample, the remaining columns use only data of the subsample where instrumental variables are available. All regressions are performed at the individual level and include controls for education, marital status, tenure and industry as well as individual and year fixed effects. In brackets we report the standard error clustered at the individual and at the year-country-occupational levels. *,**,*** indicate significance at the 10, 5 and 1% level, respectively.

Table 8: Immigration and native self-employment income

Specification:	(1) OLS Full sample	(2) OLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS	(7) 2SLS
Log Self-empl. income at time *t*	-0.0577 [0.6390]	0.1237 [0.7185]	-1.3622 [2.5238]	-1.1288 [2.3136]	-3.0032 [2.6175]	-1.9620 [3.3111]	-2.1609 [3.9169]
Log Self-empl. income at time *t-1*					-1.3383 [2.2132]	-0.1307 [2.1487]	0.5663 [2.6247]
Log Self-empl. income at time *t-2*						0.9689 [2.6620]	-0.5351 [2.4543]
Log Self-empl. income at time *t-3*							0.2094 [2.5947]
Fixed effects	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year
Interaction effects	Country*Occ.Lev.	Country*Occ.Lev.	Country*Occ.Lev.	Country*Occ.Lev., Country*Year, Occ.Lev.*Year	Country*Occ.Lev., Country*Year, Occ.Lev.*Year	Country*Occ.Lev., Country*Year, Occ.Lev.*Year	Country*Occ.Lev., Country*Year, Occ.Lev.*Year
N. obs.	37,407	28,864	28,864	28,864	22,018	16,514	11,806
F-test 1st stage	.	.	88.12	120.1	36.52	15.66	9.046

Note: Each column reports the estimate from a different regression where the dependent variable is defined as the log of net self-employment income. The coefficient reported in columns (1) to (7) is the coefficient of interest at time t and (from column 5) at earlier periods. The first column uses data of the whole sample, the remaining columns use only data of the subsample where instrumental variables are available. All regressions are performed at the individual level and include controls for education, marital status, tenure and industry as well as individual and year fixed effects. In brackets we report the standard error clustered at the individual and at the year-country-occupational level levels. *,**,*** indicate significance at the 10, 5 and 1% level, respectively.

Table 9: Immigration and native probability of receiving no self-employment income

Specification:	(1) OLS Full sample	(2) OLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS	(7) 2SLS
Wage income only at time *t*	0.3984*** [0.0875]	0.4599*** [0.1042]	0.9252*** [0.2587]	1.1092*** [0.2516]	0.8026*** [0.2272]	0.8244*** [0.2650]	0.8929** [0.3508]
Wage income only at time *t-1*					0.1990 [0.2344]	0.3729* [0.2184]	0.5937** [0.2715]
Wage income only at time *t-2*						-0.0427 [0.1837]	0.1140 [0.1926]
Wage income only at time *t-3*							-0.2863 [0.2165]
Fixed effects	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year
Interaction effects	Country*Occ.Lev.	Country*Occ.Lev.	Country*Occ.Lev.	Country*Occ.Lev., Country*Year, Occ.Lev.*Year	Country*Occ.Lev., Country*Year, Occ.Lev.*Year	Country*Occ.Lev., Country*Year, Occ.Lev.*Year	Country*Occ.Lev., Country*Year, Occ.Lev.*Year
N. obs.	262,711	183,068	183,068	183,068	130,407	94,553	65,705
F-test 1st stage	.	.	115.4	133.6	137.8	72.21	33.98

Note: Each column reports the estimate from a different regression where the dependent variable is defined as 1 if an employed person receives only wage and salary and no self-employment income and 0 otherwise. The coefficient reported in columns (1) to (7) is the coefficient of interest at time t and (from column 5) at earlier periods. The first column uses data of the whole sample, the remaining columns use only data of the subsample where instrumental variables are available. All regressions are performed at the individual level and include controls for education, marital status, tenure and industry as well as individual and year fixed effects. In brackets we report the standard error clustered at the individual and at the year-country-occupational levels. *,**,*** indicate significance at the 10, 5 and 1% level, respectively.

Table 10: Immigration and native probability of occupation change

Specification:	(1) OLS Full sample	(2) OLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS	(7) 2SLS
Share of immigrants at time *t*	0.3116 [0.3830]	0.3067 [0.4267]	2.8094* [1.7000]	2.9892* [1.6129]	4.0573** [1.6619]	5.3726*** [1.4844]	5.8593*** [1.8764]
Share of immigrants at time *t-1*					-1.4420 [1.1495]	-0.8597 [0.8197]	-0.8971 [0.6523]
Share of immigrants at time *t-2*						-0.3065 [0.8005]	-0.5168 [0.7060]
Share of immigrants at time *t-3*							0.2315 [0.7170]
Share of immigrants in next higher tier level at time *t*							
Fixed effects	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year	Individual, Year
Interaction effects	Country*Occ.Lev.	Country*Occ.Lev.	Country*Occ.Lev.	Country*Occ.Lev., Country*Year, Occ.Lev.*Year	Country*Occ.Lev., Country*Year, Occ.Lev.*Year	Country*Occ.Lev., Country*Year, Occ.Lev.*Year	Country*Occ.Lev., Country*Year, Occ.Lev.*Year
N. obs.	262,711	183,068	183,068	183,068	130,407	94,553	65,705
F-test 1st stage	.	.	115.4	133.6	137.8	72.21	33.98

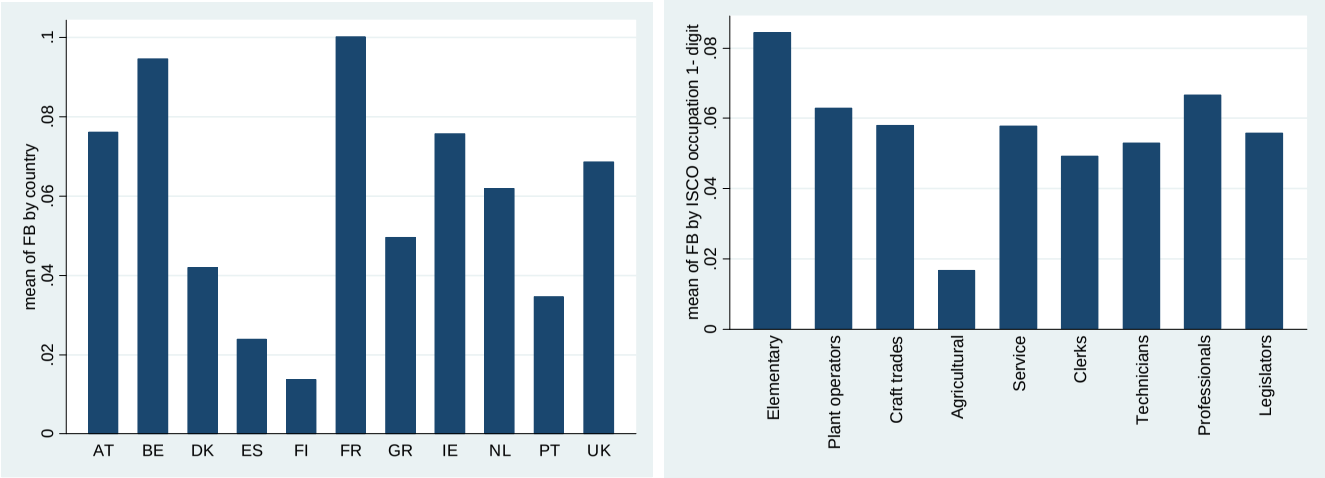
Note: Each column reports the estimate from a different regression where the dependent variable is defined as 1 if the individual changed occupation towards one with an ISCO code which is different with respect to the one he/she had when he entered the sample and 0 otherwise. The coefficient reported in columns (1) to (7) is the coefficient of interest at time t and (from column 5) at earlier periods. The first column uses data of the whole sample, the remaining columns use only data of the subsample where instrumental variables are available. All regressions are performed at the individual level and include controls for education, marital status, tenure and industry as well as individual and year fixed effects. In brackets we report the standard error clustered at the individual and at the year-country-occupational levels. *,**,*** indicate significance at the 10, 5 and 1% level, respectively.

Table 11: Immigration and native occupation level, unemployment and earnings: by skill, age and gender

Subsamples	(1) Tier: 1 or 2	(2) Tier: 3 or 4	(3) Age < 40	(4) Age >= 40	(5) Age >= 25	(6) Male	(7) Female
				Occupaiton Level			
Share of immigrants at time t	0.2342** [0.1006]	3.3689*** [0.6375]	1.2728*** [0.2378]	1.1342*** [0.3097]	1.3036*** [0.2486]	0.8255*** [0.2017]	2.1799*** [0.3787]
Observations	128,291	54,777	115,277	67,791	147,172	110,358	72,710
First st. F-stat	105.3	182.8	114.7	159.0	150.4	123.6	116.6
				Unemployment status			
Share of immigrants at time t	-0.2261* [0.1280]	0.2549 [0.1689]	-0.1994 [0.1480]	0.0492 [0.1270]	0.0302 [0.1107]	-0.1781 [0.1291]	-0.0082 [0.2086]
Observations	156,340	62,289	139,882	78,747	170,899	125,796	92,833
First st. F-stat	132.1	193.3	133.6	193.9	178.5	147	140.5
				Log wage earnings			
Share of immigrants at time t	0.4177 [0.4731]	-0.5469 [0.8059]	0.7159 [0.5463]	-0.3305 [0.5353]	-0.2052 [0.3855]	0.4658 [0.4515]	-0.1528 [0.9576]
Observations	99,489	42,507	92,990	49,006	113,570	83,611	58,385
First st. F-stat	95.90	152.9	103.7	136.4	130.9	119.9	80.51

Note: Each column reports the 2SLS estimate from different regressions of an outcome variable (from top to bottom, respectively, Occupation level, Unemployment status and Log wage earnings) over the contemporaneous share of immigrants. Columns differs by the subsample selected, which is by tier (either the first two or the last two), by gender, by age at entry in the sample. All regressions are performed at the individual level and include controls for education, marital status, tenure and industry as well as individual and year fixed effects. All columns report the estimate for the specification with all interaction dummies (Country*Occupational Level, Country*Year, Occupational level*Year). In brackets we report the standard error clustered at the individual and at the year-country-Occupation level. *,**,*** indicate significance at the 10, 5 and 1% level, respectively.

Figure 1: Share (%) of foreign born workers over total population by ISCO 1-digit. Average 1995-2001

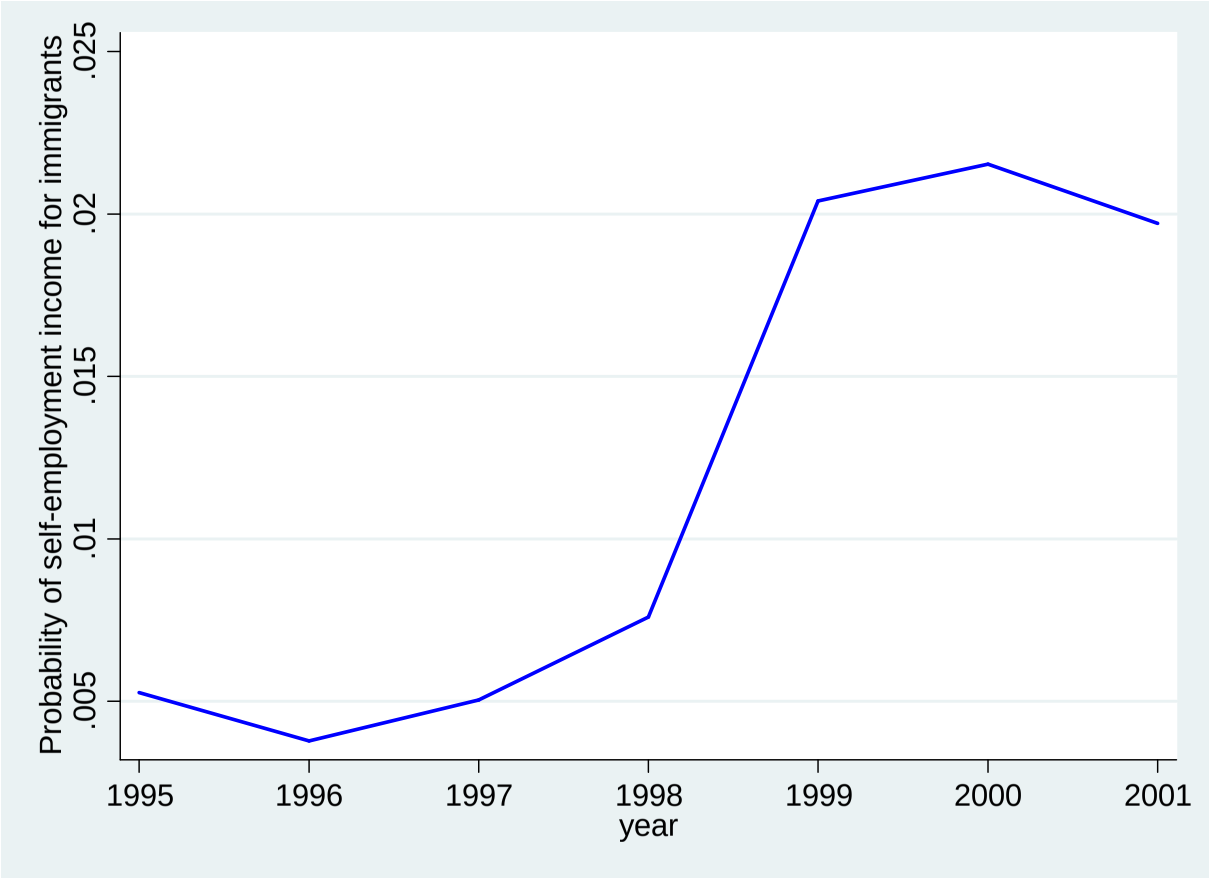


Source: authors' calculations based on ELFS.

Note: ISCO occupation 1-digit codes are grouped in four Tiers as follows: (Elementary Occupations)= **Elementary**; (Plant and machine operators and assemblers, Craft and related trades workers, Skilled agricultural and fishery workers, Service workers and shop and market sales workers, Clerks)= **Clerical and Craft**; (Technicians and associate professionals)= **Technical and associate**; (Professionals, Legislators, senior officials and managers)= **Professionals and managers**.

Appendix

Figure A1: Probability of receiving any self-employment income for immigrants with respect to natives



Note: This line plots the pointwise estimates of the simple correlations between the probability of receiving any self-employment income and foreign-born dummies: $y_{it} = \varphi_i + \varphi_t + \varphi_{f,t} + \varepsilon_{i,t}$, where y_{it} is coded one if individual *i* receives any self-employment income and zero otherwise, $\varphi_{f,t}$ is the interaction between a foreign born dummy and year fixed effects, φ_i and φ_t are individual and year fixed effects, respectively. Estimates are obtained by OLS over the full sample of natives and immigrants and errors are clustered at the individual level.

Table A1: summary statistics of native workers, by Occupation levels. Average 1995-2001

Occupation Levels	Tertiary education (%)	Wage and salary earnings	Self-employment income	O*NET score in complex skills	O*NET score in manual skills	O*NET complex/manual score
	(1)	(2)	(3)	(4)	(5)	(6)
First	6.32	2,471.68	3,657.39	34.50	64.25	0.54
Second	14.24	4,074.49	3,113.88	42.45	60.00	0.71
Third	45.36	5,835.55	4,569.13	69.22	43.67	1.59
Fourth	66.55	9,864.26	6,330.36	77.53	40.50	1.91

Source: authors calculation based on ECHP data and O*NET data. Column (1) provides the percentage of native workers with tertiary education. Monetary values in ECU until 1998, in Euro from 1999 onwards. The scores in column (4) are the average scores in complex, mental and communication skills. A score equals to 78 in complex skills for Tier 4 implies that 78 percent of all workers use complex skills less intensively than workers in Tier 4. The scores in column (5) are the average scores in manual and routine skills. Statistics weighted using individual weights.

Table A2: Summary statistics of the main variables for natives only. Individual-year observations, average 1995-2001.

Variable	Obs	Mean	Std. Dev.
		Full sample	
Occupation Lavel	262,711	0.0274	0.4091
Higher occupation	262,711	0.0977	0.2970
Lower Occupation	262,711	0.0704	0.2558
Occupation Mobility	262,711	0.2311	0.4215
Unemployment status	321,934	0.0484	0.2146
log-wage income	213,287	9.3161	0.8660
log self-employment income	37,407	8.7656	1.3752
No self-employment income	262,711	0.7899	0.4074
Share of immigrant at time *t*	262,711	0.0558	0.0370
		2SLS sample	
Occupation Lavel	183,068	0.0193	0.3952
Higher occupation	183,068	0.0879	0.2832
Lower Occupation	183,068	0.0686	0.2528
Occupation Mobility	183,068	0.2196	0.4140
Unemployment status	218,629	0.0546	0.2273
log-wage income	141,996	9.1761	0.8635
log self-employment income	28,864	8.6989	1.3130
No self-employment income	183,068	0.7617	0.4260
Share of immigrant at time t	183,068	0.0566	0.0397

Source: authors calculation based on ECHP data. Monetary values in ECU until 1998, in Euro from 1999 onwards.

Table A3: One-year mobility of native workers across the four Occupation Levels (%). Average 1995-2001

Tier at time *t - 1*		Tier at time *t*				
		First	Second	Third	Fourth	All
	First	78.52	19.03	1.36	1.09	100
	Second	2.59	92.41	2.65	2.35	100
	Third	0.60	8.61	83.50	7.29	100
	Fourth	0.34	5.30	4.29	90.07	100
	All	8.71	55.81	14.47	21.01	100

Source: authors calculation based on ECHP data.

Table A4: Share of foreign workers (%), by Occupation Level and country. Selected years.

year	Occupation Level	AT	BE	DK	ES	FI	FR	IE	GR	NL	PT	UK
1995	First	19.06	12.34	3.85	1.98		17.47		10.89	9.07	1.03	5.56
1998	First	21.98	14.02	6.26	3.08	2.17	18.00	5.65	23.88	11.87	3.10	6.98
2001	First	22.53	13.48	7.48	5.64	2.02	18.23	6.94	22.32	9.55	4.71	7.02
1995	Second	6.48	8.06	2.39	1.67		9.79		3.29	6.18	1.01	5.42
1998	Second	7.53	8.96	3.97	1.88	1.41	9.45	6.75	4.90	7.11	3.19	6.25
2001	Second	8.23	10.84	4.01	2.62	1.78	9.81	7.47	5.67	6.38	3.81	6.32
1995	Third	5.74	7.77	2.43	2.44		7.01		3.88	4.68	1.40	5.66
1998	Third	5.69	8.16	3.41	2.37	1.39	6.92	9.68	2.16	5.25	6.98	6.71
2001	Third	5.89	7.44	4.13	2.73	1.42	6.88	9.39	2.82	5.47	5.46	8.56
1995	Fourth	5.33	9.24	4.85	2.66		10.95		3.12	4.68	1.79	8.38
1998	Fourth	7.07	11.13	6.12	2.96	1.24	11.50	8.21	2.78	5.33	6.36	9.09
2001	Fourth	6.82	11.01	5.35	3.28	2.15	11.42	9.56	2.55	5.11	6.94	9.97

Source: authors calculation based on ELFS data.

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