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Abstract

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Keywords: Free movement of persons, labor market effects of immigration, unemployment, shift-share instrument, occupational specialization

JEL-Classification: F22, J21, J61.

I Introduction

Do immigrants crowd out resident employees or do they fill gaps in the resident workforce, thus raising the productivity and job chances of the latter? This question is of great policy relevance and is often controversially debated. Our paper adds to the empirical literature on this topic by examining the effects of immigration in Switzerland in the period of introducing free movement of workers with the European Union (EU). The principle is the cornerstone of the migration policy of the EU (Bertola et al., 2015) and allows EU citizens to move freely within the territory of member states for the purpose of employment. Opposition against the principle grew stronger in many European countries in recent years. Populist right wing parties that demand to restrict the free movement of workers have gained voter shares in several European countries (Bertola et al., 2015). In fact, the principle figured prominently in the debate about Brexit. In Switzerland, the controversy culminated in the acceptance of a referendum demanding the reintroduction of quotas on the number of immigrants per year. Against this background, a better understanding of the potential costs and benefits of free movement of workers is central for European policy makers that try to weigh the economic benefits of the principle against its potential negative side effects.

Switzerland introduced the principle of free movement of workers after reaching an agreement with the EU and EFTA member states in 1999. The agreement led to the gradual but eventually complete abolition of all prior legal restrictions on hiring and employing immigrants and cross-border workers in the country. In the process of the introduction, Switzerland abolished a bureaucratic admission process that had been in place before, extended the durations

of different residency permits, and abandoned prior quotas on immigration.[1] In the period following the reform, the country experienced a surge in immigration, as Figure 1 illustrates. After a decade with low immigration rates, the country's share of foreign born in the total population increased from 23.1 percent to 28.3 percent between 2003 and 2013, mainly due to immigration from neighboring EU countries.

We study the consequences of this immigration wave on the resident workforce. To this end, we relate the number of newly arrived immigrants into labor market cells defined by occupational categories (e.g. "managers" and "professionals") and experience to the labor market outcomes of residents in these skill cells. Because of the small scale of Switzerland, we follow Friedberg (2001) and Borjas (2003) and define these cells at the national level rather than at the level of local labor markets.[2] In contrast to these prior studies, we address the concern that skill groups in high demand by employers may attract more immigrants. This could give rise to a coincidence of good labor market prospects both for residents and for newly arrived immigrants in skill groups in which we observe high immigrant inflows, which one might mistake for evidence of complementarity between immigrants and residents.

To address the potential endogeneity of immigration, we devise a shift-share instrumental variable (IV) akin to the one extensively applied in the empirical literature on immigration. The instrument translates changes in the total number of immigrants from a specific country of origin—the *shifts*—into skill-group specific labor supply shocks using shares which are arguably unrelated to the labor market situation of different skill groups in Switzerland. We

[1] See online appendix section A, Beerli and Peri (2015), and Ruffner and Siegenthaler (2016) for more extensive discussions on the changes brought about by this reform.

[2] See Peri (2016) and Dustmann et al. (2016) for recent overviews on the literature on the labor market effects of immigration.

propose two methods to construct these shares. The first method builds the shares using data on the occupation-age distribution of immigrants by source country in Switzerland 12 and more years before our sample period. The second method relies on the distribution of the labor force across occupation-age groups in the source countries of immigrants. It mainly exploits differences in the occupational specialization and the age distribution of the labor force in immigrants' countries of origin.[3]

Our paper contributes to the literature on the labor market effects of the recent immigration wave to Switzerland.[4] The existing studies suggest that the substantial immigrant inflow had only limited effects on average wages and employment of residents. Estimates on its distributional effects vary, with some studies finding slight negative effects on wages and employment of high-skilled workers (Favre et al., 2013; Gerfin and Kaiser, 2010; Müller et al., 2013). Others, however, find positive effects for this group despite the fact that a large fraction of the immigrants was highly skilled (Beerli and Peri, 2015).[5] We add three elements to this literature. First, our empirical approach based on national skill cells complements the existing empirical studies that mostly rely on the comparison of immigrant inflows and residents' outcomes across regional labor markets (e.g., Beerli and Peri, 2015; Favre et al., 2013). Second, our main analysis is based on administrative data sets that provide complete

[3] A small number of other studies also exploit source country information to construct shift-share instruments for immigration (Friedberg, 2001; Peri, 2011; Del Carpio et al., 2015).

[4] There are also studies that have looked at the effects of the immigration wave on residents beyond the Swiss labor market. In particular, Basten and Koch (2015) exploit a traditional shift-share instrument with geographic allocation of immigrants to investigate the effects of immigration on house prices, and of house prices on mortgage demand. They do find that immigration can affect house prices, but find evidence of a two-way correlation between house prices and mortgage volumes.

[5] 48% of all immigrants between June 2002 and May 2008 had a tertiary education. This share increased to over 50% in the period after that. The share of tertiary educated immigrants clearly exceeded the corresponding share in same-aged cohorts of the resident population. More details on the recent immigration wave to Switzerland and on the gradual introduction of free movements of persons with the EU/EFTA states can be found in Section A of the online appendix.

counts on registered unemployment and immigration in Switzerland. Previous papers mainly relied on survey data. Finally, our paper is the first to shed light on one central mechanism that may explain the limited evidence for displacement of residents: occupational mobility. In an influential study, Peri and Sparber (2009) show that an increased presence of low-skilled immigrants caused native workers in the US to move more rapidly towards communication-intensive and more complex types of jobs. They argue that this is because immigrants provide the incentives and the complementary manual factors such that natives specialize in better-paid jobs, exploiting their comparative advantage. Effects of immigration on occupational mobility and task specialization have by now been documented for high-skilled workers, too (Peri and Sparber, 2011b; Borjas and Doran, 2015), and in several other countries (Cattaneo et al., 2015; D'Amuri and Peri, 2014; Foged and Peri, 2016; Peri and Sparber, 2011b). We study the extent to which occupational specialization—through reducing the competition between immigrants and natives in national skill groups—can help to explain the limited evidence for displacement effects of immigration in the Swiss case.[6]

Our results suggest that Switzerland's native workforce did not loose and may even have benefited from (free-movement) immigration since 2002. We find evidence that an increase in the number of newly arrived foreign employees *reduced* registered unemployment. There is no measurable average effect on wages and employment of residents. Moreover, we show that the employment of foreign workers caused natives to redirect their job changes. These job changes were on average beneficial for natives: they occurred into higher skilled and better paid jobs, and into jobs with more managerial tasks. We show that residents' occupational

[6]Following the working paper version of this paper, Beerli and Peri (2015) further extended the knowledge on the effects of immigration on occupational mobility in Switzerland.

upgrading reduced their unemployment by improving job opportunities for those staying in the skill group. Importantly, however, these effects were concentrated among young residents. We find no effect on the upward mobility of older residents. The absence of this effect may be one reason why the immigrant inflow seems to have reduced wages of older resident workers.

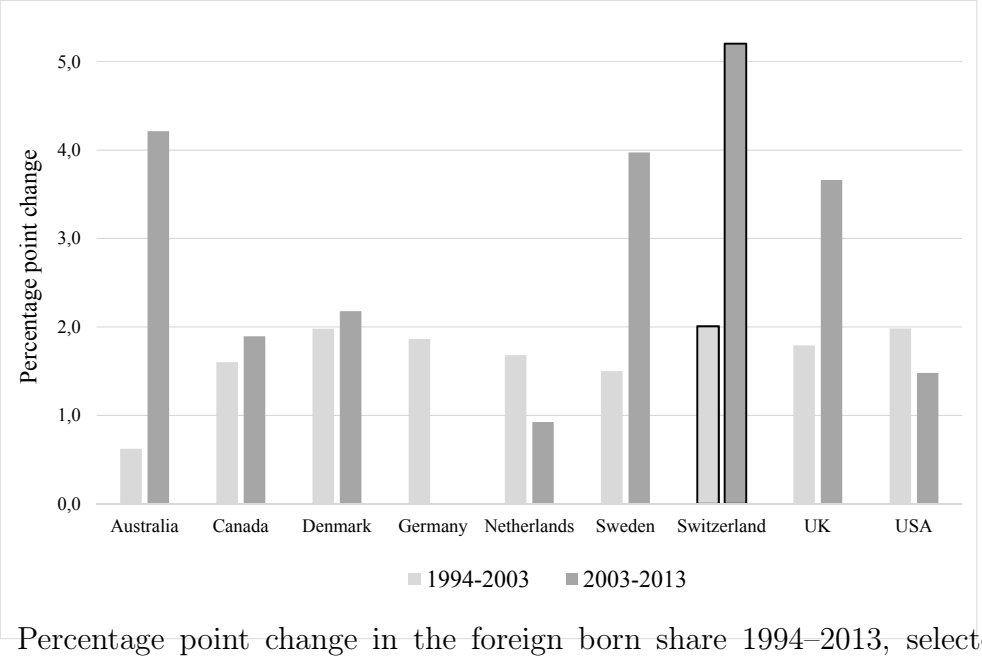


Figure 1: Percentage point change in the foreign born share 1994–2013, selected OECD countries

II Methodology

Regression model

To study the labor markets effects of immigration, we define labor market cells in terms of broad occupational groups and age groups at the national level. The age grouping accounts for

the fact that workers with differences in work experience are imperfect substitutes (Borjas, 2003). We use 9 (in Section IV.4 4) age groups and split occupations into the 9 major groups of the International Standard Classification of Occupations 1988 (ISCO-88), yielding a total of 81 (36) skill groups.[7] The main alternative to our approach would be to partition national labor markets into different regional labor markets and relate immigration into these labor markets to residents' labor market outcomes. Following Card (2001), the endogeneity of immigration in this "area approach" is addressed by applying a "shift-share" instrumental variable that exploits that immigrants tend to move to regions where many fellow compatriots already live, independently of the current labor market situation.

We think that defining skill cells on the national level has two important advantages over the area approach in our setting. First, Switzerland is a small-scale economy. Commuting times between neighboring major cities hardly exceed one hour. Consequently, residents could respond to larger immigrant inflows into specific local labor markets by moving to another local labor market. In the presence of such native outflows, the effects of immigration may dissipate across local labor markets and may thus not be detectable with an area approach (Friedberg, 2001; Borjas, 2003). Second, firms in certain Swiss regions have historically relied on immigrants from certain source countries. For instance, many Italian immigrants settled in the Italian-speaking part of the country. It is thus possible that new immigrant inflows from a specific country of origin into specific regions are driven by persistent unobserved components in labor demand. This questions the validity of the shift-share IV based on

[7]The nine age categories are 15–24 years, 25–29 years, 30–34 years, 35–39 years, 40–44 years, 45–49 years, 50–54 years, 55–60 years and 60 and above. ISCO major group 0 ("Armed Forces") is quantitatively irrelevant in our application and hence not used.

historical immigrant concentrations, as current labor demand shocks may be correlated with past settlement patterns.

However, the national skill-cell approach has also two potential disadvantages. First, it may be sensitive to how workers are partitioned into skill groups (Peri, 2016). We thus present results using alternatively broadly defined skill cells. Second, the approach is more likely than other approaches to identify a *relative* effect of immigration—of one age group versus another within occupational groups and of one occupational group versus another—rather than the total effect of immigration on a particular native skill group (Dustmann et al., 2016). The latter incorporates possible complementarities across skill cells and between labor and capital. Our results should thus be interpreted as mainly revealing the *distributional* effects of immigration between skill groups.

We estimate the following first-differenced regression model based on data for national occupation-age groups:

$$\Delta ln(O_{it}) = \alpha + \beta ln(I_{it}) + \gamma X_{it} + \tau T_t + \Delta \epsilon_{it} \tag{1}$$

In this equation, $\Delta ln(O_{it})$ represents the log change in the outcome of interest in skill group i and year t. We consider three main outcome variables: (i), the log change in the stock of resident unemployed between January t and January $t+1$, $\Delta ln(U_{it})$; (ii) the log change in the number of resident employees, $\Delta ln(E_{it})$; (iii) and the change in the log wage of resident employees, $\Delta ln(w_{it})$. $ln(I_{it})$ is the central independent variable in the regressions and indicates the number of newly hired foreign employees in skill group i during year t. $ln(I_{it})$ rises

if a labor market cell experiences an influx of foreign employees in the course of year t within a given skill group. A positive β would indicate displacement effects of immigration when the outcome is unemployment. We do not first-difference the variable of interest because it is measured in terms of gross inflows, which is already implicitly first-differenced.

Two comments on I_{it} are important. First, our immigration variable is not the population of immigrants coming to Switzerland, but just employed persons. We consider both, the inflow of foreign employees taking permanent residence and the number of new cross-border workers.[8] Cross-border workers are employed in Switzerland but live in neighboring countries, i.e. they commute to Switzerland at least once a week to work. They are quantitatively important in Switzerland. In 2011, they made up 5.2% of the total labor force, increasing from 3.8% in 2002. Second, we measure immigration in terms of gross inflows. While this is not without precedents in the literature (see, for instance Card, 2001), most studies in the literature consider net immigration. We focus on gross immigration because our register data do not reliably measure outmigration out of skill cells. Our estimates thus identify the effects of *newly arrived* employed immigrants on residents. In a robustness test, we show that the results are very similar if we use net rather than gross inflows.

The remaining ingredients of our baseline estimations are a small number of control variables X_{it}, only included in some regressions, and a full set of occupation-year and age-year fixed

[8]The ZEMIS does not provide sufficient information to assign unemployed and non-employed immigrants to the occupational groups. However, we believe that this data limitation is not an important shortcoming of our study. First, data from the SLFS show that there are essentially no newly arriving immigrants to Switzerland that are unemployed. The reason is that the high living costs in Switzerland are hard to bear for unemployed foreigners. Second, most immigrants migrating to Switzerland in the last decade came for work reasons. Half of all immigrants held a job when immigrating to Switzerland. Moreover, all new cross-border workers have, per definition, a job in the country. Finally, it is the fear that the immigration of employees crowds out resident workers which is at the heart of the political debate in Switzerland.

effects, subsumed in the regressor T_t. These fixed effects account, for instance, for unobserved occupation-specific trends, changes in technology affecting skill demand, and other unobserved factors that differentially affected the 9 age or occupation groups. The fixed effects also help to control for potential pre-existing cell-specific trends shared by the outcome variable and the immigration variable, for example due to growth of the underlying population. Since we run our estimations in first differences, we account for time-invariant factors affecting the level of the outcome variable.

Two shift-share instruments for national skill cells

The above regression might suffer from endogeneity if differences in gross immigrant inflows across skill cells or within skill cells over time are driven by unobserved demand or productivity shocks that also affect residents' labor market outcomes. We try to limit these concerns by exploiting only that part of the variation in gross immigrant inflows that can be predicted by two related shift-share instruments. In our case, the shift-share IV distributes changes in the *total* number of immigrants from a specific country of origin j in year t (the *shifts*), denoted by $\bar{I_{jt}} = \sum_i I_{ijt}$, across skill cells using source country specific and time-invariant *shares* π_{ij}:

$$\hat{I}_{ijt}^{basic} = \pi_{ij}\bar{I_{jt}} \tag{2}$$

These country-specific predictions are then aggregated over all source countries j of immigrants. The log of this variable is our "basic" shift-share instrument $ln(\hat{\bar{I}}_{it}^{basic}) = ln(\sum_j \hat{I}_{ijt}^{basic})$

used to instrument $ln(I_{it})$.

The main challenge in applying a shift-share methodology is to find plausibly exogenous country-specific shares π_{ij}. The shares should be unrelated to confounding unobserved shocks driving migration to Switzerland. On the other hand, they should predict the occupation-age distribution of immigrants from each source country. We propose two different methods to construct them. In the first approach, we exploit that the occupation-age distribution of immigration from a specific country of origin tends to be similar over time, among others because of network effects and because the skill composition of the workforce of a country remains similar (Patel and Vella, 2013). We thus use data from the Swiss population census of 1990 to compute *historical* shares for 153 different countries of origin of immigrants to Switzerland. Arguably, the distribution of immigrants of a specific nationality across occupation-age cells in 1990 should be unrelated to occupation-age specific shocks in Switzerland posterior to 2002.

Our second method to construct the shares uses the distribution of the labor force across occupation-age groups *in immigrants' countries of origins* prior to the estimation period. We estimate these shares using the Labor Force Surveys (LFS) of Eurostat, averaging three consecutive years to increase precision (1998–2000). The predictive power of these shares comes mainly from cross-country differences in the occupational specialization and the demographical structure in immigrants' source countries. Again, we think that the skill distribution of the labor force in the source country is unrelated to skill specific shocks in Switzerland.

What about the shifts? They, too, should be exogenous with respect to the labor market situation of skill groups in Switzerland, i.e. they should not be driven by demand for a

specific skill group in the destination country. Rather, they are determined by the conditions in the sending country and possibly by aggregate conditions in Switzerland. We control for unobserved aggregate shocks in Switzerland with the time fixed effects in the regressions. In fact, due to the occupation-year and age-year fixed effects and the first-differencing of the regression model, the IV is only identified if gross immigration from a specific source country increases *relative* to other source countries. Such *changes in the composition* of source countries are arguably caused by the situation in the country of origin, as immigrants from both source countries face the same skill group-specific situation in the receiving country (i.e. Switzerland). To make sure that the demand for specific skills in Switzerland has no effect on total immigration from specific source countries, we refine the instrument slightly and subtract the own cell's contribution (I_{1jt}) from the total number of immigrants from country j ($\bar{I_{jt}}$), following a suggestion by Wozniak and Murray (2012):

$$\hat{I}_{ijt} = \pi_{ij}(\bar{I_{jt}} - I_{ijt}) \tag{3}$$

A final potential concern with our shift-share instruments is the endogeneity of migration policies. The IV estimates could be biased if unobserved trends or shocks to specific occupation-age group lead to policy changes that in turn increase immigration from certain countries of origin. The central policy change that occurred in the sample period—large enough to affect the country composition of immigration to Switzerland—is the introduction of free movement of persons. While there are several reasons that it is unlikely that this immigration reform is a cause for concern[9], we tested whether our results change if we do not exploit the variation

[9]First, the country's motives to opt for the reform lie outside the labor market. In fact, the migration

that the reform created. This does not appear to be the case.[10]

III Data

Our data on gross immigration into Switzerland stem from the central migration information system (*Zentrales Migrationsinformationssystem*, ZEMIS). ZEMIS is a continuous census of the foreign resident and nonresident population in Switzerland. It provides a complete count of the number of *immigrating foreign employees* into our skill groups for any given year since 2002. It contains their personal characteristics such as their nationality, sex, age, residency permit, and their occupation.

This data set has two clear advantages relative to those used in many other studies in the literature. First, ZEMIS provides a complete count of immigrants to Switzerland. The cell-specific numbers of newly arrived foreign employees are thus not subject to measurement error that could attenuate estimates of the effects of immigration (Aydemir and Borjas, 2011). Second, our estimates do not suffer from the problem that immigrants may "downgrade" and compete with natives in another labor market than the one to which they had been

reform was not even an aim of the Swiss government owing to the anticipated political opposition against it. Rather, it was a concession to the EU. Moreover, it took 3.5 years—substantially longer than initially planned—until the agreement on the free movement of persons was put into place. It is very unlikely that the labor market situation in our sample period influenced Switzerland's behavior in the negotiations with the EU that took place in the mid-1990s. In fact, we consider the increase in immigration from EU countries caused by the policy change—the share of EU-27/EFTA citizens in total gross immigration increased from below 45–50% before 2002 to more than 70% in 2012—as a very valuable source of exogenous variation in our shift-share instruments.

[10]To do this, we aggregated the country-specific predictions ($\hat{I}_{ijt}$) of the two shift-share instruments only over all EU-15 countries. The EU-15 countries were not *differentially* affected by changes in migration policies in the period under examination. We then instrumented total immigration to Switzerland using the shift-share IVs for these EU-15 countries. Thanks to the year fixed effects, such a regression only exploits variation in immigration rates that occurs *within* these 15 countries. Hence, this instrument set does not exploit variation created by the introduction of free movement of persons. Doing this yields essentially the same results as the instruments in the preferred case.

assigned based on observed qualifications (Dustmann et al., 2016). The reason is that we can correctly assign immigrants to skill groups as the assignment is determined by the actual job immigrants found in Switzerland.

Our data on resident unemployment stem from the Swiss unemployment register (AMSTAT). The database is a complete count of all unemployed persons registered at regional unemployment agencies in Switzerland in any month since 2004. We assign resident unemployed to occupational cells according to their last job. Since the data are only available since 2004, the sample period in the estimations using unemployment is January 2004 to January 2012.

We construct skill group specific employment of resident workers using the Swiss Labor Force Survey (SLFS). The SLFS is a representative household survey conducted by the Federal Statistical Office (FSO) of Switzerland since 1991, covering, depending on the year, between 0.5 and 1.2% of Switzerland's labor force. It is a rotating panel, surveying households for 5 consecutive years. After elimination of the non-employed, retirees, persons aged below 15, and persons belonging to the nonresident population, we are left with between 18,500 and 35,200 observations per wave that we use to compute total cell-specific employment of residents. We define a person as "native" (or "resident") if she or he declares having lived in Switzerland for at least 3 years, regardless of nationality.

Data on cell-specific earnings of residents are from the Social Protection and Labor Market Survey (SESAM). This data set is composed of a linkage of data from the SLFS with information gathered from different social security registers. Among others, SESAM provides monthly earnings in the main job according to register data from the old age insurance (AHV). We use information from the SLFS to construct a full-time equivalent monthly wage.

Since contributing to the old age insurance scheme is mandatory for all wage components in Switzerland, our wage measure is a very broad measure of remuneration of employees.[11] When studying outcomes derived from the SLFS and SESAM data, the estimations span the period 2002–2011.

We use two further data sources to construct the shift-share instruments. First, we use data from the Swiss population census in 1990 to construct country-specific historical distributions of foreign resident employees across skill groups. Second, we predict the age- and occupation-specific labor force size in immigrants' countries of origin using Eurostat's Labor Force Surveys (LFS). Table 1 provides summary statistics of the most important variables used in our empirical analysis.

IV Results

Figure 2 presents two scatter plots that convey two important results of this paper. The subplot on the left shows the reduced-form relationship between the log change in the number of registered unemployed in Switzerland from January in year t to January in $t+1$, on the vertical axis, versus the *predicted* gross inflow of foreign employees from January 1 to December 31. The sample covered is January 2004 to January 2012, and the instrument is constructed using the historical (census) shares. The plot indicates no or even a slightly negative correlation between predicted immigration and registered unemployment of resident workers. The right subplot of Figure 2 shows the growth in employment of resident employees

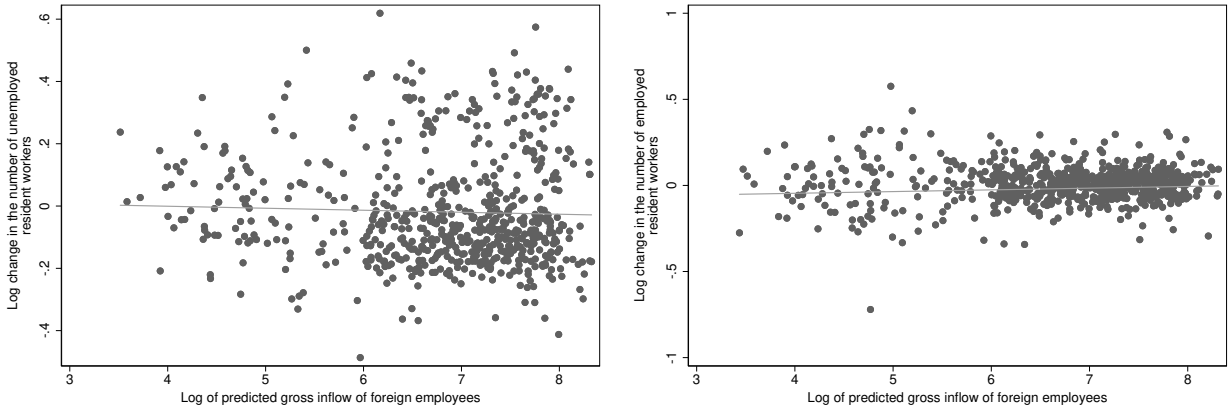
[11] Following Ottaviano and Peri (2012), we exclude earnings of self-employed since they are subject to substantial reporting errors. We also drop observations for which we observe monthly full-time equivalent wages below 2000 Swiss francs, since such wages are implausibly low.

Table 1: Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Unemployed (U_{it})	1611.62	1394.37	0	7969	729
$\Delta ln(U_{it})$	-0.02	0.18	-0.49	0.62	648
Employed residents (E_{it})	48901.88	30459.94	2969.85	139312.44	729
$\Delta ln(E_{it})$	0.01	0.11	-0.72	0.58	729
Residents' log monthly FTE wage (w_{it})	8.72	0.27	8.14	9.39	648
$\Delta ln(w_{it})$	0.01	0.08	-0.41	0.58	648
Immigrating employees (I_{it})	1284.53	1422.79	4	6728	729
$ln(I_{it})$	6.36	1.5	1.39	8.81	729
Shift-share IV (*Census 1990*, ln)	6.76	1.03	3.44	8.33	729
Shift-share IV EU-27 (*Labor Force*, ln)	6.85	0.71	4.56	8.09	729
Cell-specific tenure of immigrants (in years)	8.99	5.59	0.58	24.23	729

Notes: The table shows unweighted averages across skill cells. Unemployed (U_{it}) measures the number of unemployed registered at regional unemployment agencies in January of a given year. The data is available from January 2004 to January 2012. Skill group specific employment of resident workers is constructed using the Swiss Labor Force Survey (SLFS). It covers the 2002–2011 period and refers to the second quarter of a year. Data on cell-specific earnings of residents are average cell-specific monthly log full-time equivalent earnings from the Social Protection and Labor Market Survey (SESAM) in the second quarter of year t. The data covers 2002–2011. The variable "immigrating employees (I_{it})" reflects gross immigration into each skill cell in t as derived from ZEMIS and covers the 2002–2011 period. It is the sum of foreign employees taking permanent residence in Switzerland and the number of new cross-border workers.

between 2002 and 2011 against predicted immigration. The correlation between the two variables is close to zero. Thus, the plots provide no evidence of systematic displacement of natives due to immigration of foreign workers.



(a) Unemployment (b) Employment

Figure 2: Predicted immigration and change in unemployment and employment of residents

Registered unemployment

In Table 2, we examine the relationship between changes in native unemployment and gross immigration of employees more systematically. In all estimations, we weight observations according to the size of the skill group.[12] All standard errors are robust to clustering on the level of the skill group i.

The results of the WLS regressions in the first column of Table 2 are somewhat surprising: the coefficient on the number of immigrating employees is statistically significant and negative, i.e. native unemployment *declines* in cells with the largest gross immigration of foreign workers. This result suggests that natives are crowded in rather than crowded out by newly arrived immigrants. The two following columns show that this holds if we include occupation-year and age-year fixed effects (column 2 of Table 2) or cell-specific trends (column 3). The inclusion of these trends may be relevant, as occupational change may cause trends in the size of specific skill groups that may produce spurious correlations between unemployment and gross immigration.

These WLS estimates might be biased because immigrants may self-select into booming skill cells. The remaining columns of Table 2 address this concern. In these regressions gross immigrant inflows are instrumented using the two shift-share instruments proposed.[13] In columns 4 and 5 of the table, we employ the country of origin shares. In this case, we only

[12] We use the average labor force size from 2002 to 2011 as weight of the respective cell. The results are qualitatively similar if we do not weight observations. See section B.3 in the online appendix.

[13] If we estimate regressions that include occupation- and age-year effects, the number of regressors exceeds the number of clusters. The consequence is that the covariance matrix of moment conditions is not of full rank, and the cluster-robust covariance estimator is not well defined. By the Frisch-Waugh-Lovell Theorem, an admissible solution to the problem is to "partial out" the fixed effects and the constant from the regression prior to estimating the remaining coefficients. This is what we do.

instrument gross immigrant inflows from the EU-27 countries. The EU-28 are the set of countries for which we can built the labor force shares. 92% of all immigrants and cross-border workers in our sample period come from EU member countries. Columns 6 and 7 show the results if we combine both instruments, i.e. additionally use the historical shares from the 1990 population census. The first-stage estimations associated to these regressions are shown in the bottom panel of Table 2. We observe that the instruments are sufficiently strong, as indicated by the small standard errors in columns 4 and 5 and the high Kleibergen and Paap (2006) rk F-statistics of a test of joint significance of the two instruments in columns 6 and 7 shown at the bottom of the table. The p-values of the Hansen J-statistic suggest that the overidentifying restrictions are valid. Finally, as shown in Section E of the online appendix, the two instruments combined appear to be reasonably externally valid, as they predict gross immigration both for low- and high-skilled occupations as well as young and old workers.

The IV and 2SLS estimations in columns 4–7 of Table 2 confirm the results from the WLS estimations. The estimated negative effect of immigration on unemployment tends to be even larger compared to the WLS estimates. Our preferred specification is the estimation in column 6 accounting for occupation-year and age-year effects and using both instruments simultaneously. In these regressions, the coefficients are identified only from variation in changes in unemployment and predicted immigrant inflows *within* each occupational and age group. Consequently, the instruments exploit variation in the age structure of the immigrant stock in Switzerland in 1990 or in the labor force of immigrants' countries of origin within the same occupational group. The point estimate suggests that a 10% increase in gross immigration of foreign employees reduces the number of resident unemployed by 0.31%.

Considering that I_{it} amounted to 100,000 persons on average, this suggests that immigration reduced the stock of resident unemployed by 3,100 persons. This effect is economically relevant. It implies that immigration reduced registered unemployed in Switzerland by more than 2%.

Employment and wages

Table 3 presents the results when the outcomes of our regression model are the change in the log number of resident employees, $\Delta ln(E_{it})$ (columns 1–4), and the log change in mean monthly nominal full-time equivalent earnings, $\Delta ln(w_{it})$ (columns 5–8). The estimations cover the period from 2002 to 2011. The estimations in the first four columns indicate that the newly arrived immigrants had no impact on the number of employed residents. This holds both for the WLS and for the IV/2SLS estimations. The results of equivalent estimations pertaining to wages lead to similar conclusions. In the preferred IV/2SLS specifications, the estimated effects are statistically insignificantly different from and close to zero. Overall, these results appear to rule out substantial displacement or negative wage effects of the immigrant inflow. However, they are also quite imprecisely estimated.[14] The imprecision may partly explain the potential conflict between the zero results on wages and employment with the results for unemployment.

Do the average effects on resident labor market outcomes, established in Tables 2 and 3, mask that there are winners and losers among the resident population? This question is

[14]This imprecision probably has two sources. First, employment and average wages are sample estimates calculated from household surveys and thus subject to sampling error. Second, there is a minor timing difference between the dependent and independent variable. Due to data constraints, we regress the change in the outcome from the second quarter in year $t-1$ to the second quarter in year t on the inflow of foreign employees during year $t-1$.

Table 2: Effect of immigration on unemployment of residents

VARIABLES	(1) WLS	(2) WLS	(3) FE	(4) IV EU-27	(5) IV EU-27	(6) 2SLS Total	(7) 2SLS Total
Panel A: Unemployment							
$ln(I_{it})$	-0.012***	-0.022***	-0.023			-0.031***	-0.030***
	(0.002)	(0.007)	(0.025)			(0.008)	(0.008)
$ln(I_{it}^{EU-27})$				-0.010***	-0.016		
				(0.002)	(0.017)		
Job tenure immigrants							0.294
							(0.455)
Job tenure immigrants sq.							-1.194
							(1.479)
Panel B: First stage							
Shift-share IV EU-27				1.654***	0.413***		0.048
(*Labor Force*, ln)				(0.168)	(0.145)		(0.061)
Shift-share IV						0.682***	0.665***
(*Census 1990*, ln)						(0.071)	(0.089)
Observations	648	648	648	648	648	648	648
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Occupation-year effects	No	Yes	Yes	No	Yes	Yes	Yes
Age-year effects	No	Yes	Yes	No	Yes	Yes	Yes
Cell-specific trends	No	No	Yes	No	No	No	No
Weights	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RMSE				0.0780	0.0407	0.0408	0.0407
F stat first stage						47.21	45.64
p-value Hansen J stat						0.324	0.327

Cluster-robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Panel A shows WLS, FE, and IV/2SLS regressions of our baseline regression model. The dependent variable is the log change in registered unemployment from January t to January $t+1$. The estimation period is 2004–2011. The variable "$ln(I_{it})$" reflects the log of gross immigration into each skill cell in t as derived from ZEMIS. Panel B shows the first stage regressions associated to the 2SLS estimations. The instrument in columns 4 and 5 is predicted immigration based on the occupation-age distribution in the country of origin ("Shift-share IV EU-27"). The instruments in columns 6 and 7 are predicted immigration based on the historical (Census) shares and based on the occupation-age distribution in the country of origin. All standard errors are clustered on the level of the skill cell. Weights are the average total labor force size over the entire sample period.

Table 3: Effect of immigration on employment and wages of residents

VARIABLES	(1) Employ-ment FE Total	(2) Employ-ment IV EU-27	(3) Employ-ment 2SLS Total	(4) Employ-ment 2SLS Total	(5) Wages FE Total	(6) Wages IV EU-27	(7) Wages 2SLS Total	(8) Wages 2SLS Total
$ln(I_{it-1})$	-0.014		-0.002	-0.007	-0.109**		0.003	-0.001
	(0.022)		(0.009)	(0.010)	(0.046)		(0.004)	(0.006)
$ln(I_{it-1}^{EU-27})$		-0.009				-0.009		
		(0.014)				(0.011)		
Job tenure immigrants				-1.333**				-0.834
				(0.616)				(0.516)
Job tenure immigrants sq.				3.926**				3.740*
				(1.810)				(2.136)
Observations	729	729	729	729	648	648	648	648
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Occupation-year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age-year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cell-specific trends	Yes	No	No	No	Yes	No	No	No
Weights	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RMSE	0.0771	0.0707	0.0707	0.0705	0.0524	0.0488	0.0490	0.0487
F stat first stage			43.37	44.67			42.79	43.27
p-value Hansen J stat			0.449	0.371			0.179	0.255

Cluster-robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: The table shows FE and IV/2SLS regressions of our baseline regression model. The dependent variable in columns 1–4 is the log change in employment of residents from the second quarter in $t-1$ to the second quarter in t, $\Delta ln(E_{it})$. The dependent variable in columns 5–8 is the log change in FTE monthly wages of residents from the second quarter in $t-1$ to the second quarter in t, $\Delta ln(w_{it})$. The estimation period is 2002–2011. The variable "$ln(I_{it-1})$" reflects the log of gross immigration into each skill cell in $t-1$ as derived from ZEMIS. The instrument in columns 3 and 6 is predicted immigration based on the occupation-age distribution in the country of origin ("Shift-share IV EU-27"). The instruments in columns 4, 5, 7, and 8 are predicted immigration based on the historical (Census) shares and based on the occupation-age distribution in the country of origin. All standard errors are clustered on the level of the skill cell. The weight is the average total labor force size over the entire sample period.

analyzed in section C of the online appendix. The analysis yields three important results. First, the effects of new immigrant workers on wages and unemployment are similar for Swiss nationals and resident foreign workers. Second, the outcome-improving effect of immigration on unemployment of natives appears to be concentrated (i) in the first part of our sample period (2004–2007) and (ii) among low-skilled residents. Third, *younger* natives appear to have benefited more from the immigration wave than older natives. In fact, the arrival of new immigrants did not reduce unemployment of old residents. Moreover, it appears to have led to statistically significant reductions in their wages.

Our results are consistent with previous empirical studies analyzing the labor market effects of the recent immigration wave to Switzerland. In particular, Favre et al. (2013) also find no general negative employment and wage effects of net immigration on resident workers. Beerli and Peri (2015) focus on the liberalizations in the working status of cross-border workers which affected regions close to the border more strongly than regions further away. Their results also suggest positive (outcome-improving) effects on residents. They find evidence that net immigration of cross-border workers increased hours worked and employment of low-skilled residents, while high-skilled residents experienced an increase in wages.

Robustness checks

One potential concern with the estimates presented so far is related to the fact that they are based on gross rather than net immigration. Gross inflows could be misleading if they reflect a large turnover of foreign workers in the skill cell with no increase in the stock of foreign born over time. Moreover, our estimates could be biased if *changes* in the cell-specific

job turnover were systematically related to changes in gross immigration and changes in the outcome variables. To test whether these concerns are relevant, we add the mean job tenure of immigrant workers in the cells (expressed in 1/100 years) and the square of this variable as control variables to the preferred regression. The coefficients of interest remain virtually unchanged if we do this (cf. column 7 of Table 2, and columns 4 and 8 of Table 3).

Another implication of the use of gross rather than net inflows is that we measure the effects of recently arrived immigrants on residents' outcomes, rather than the effect of changes in the stock of immigrants as a whole (Peri and Sparber, 2011a). In our application, however, the results do not appear to depend much on this difference. Using data from the SLFS, we construct net immigrant inflows in each cell per year and relate them to our measure of gross immigrant inflows. Doing this establishes a reasonably strong correspondence between the two. Therefore, estimations using net immigration lead to qualitatively and quantitatively similar results as those using gross inflows: they also suggest that immigration lowered unemployment but had no impact on employment and wages of residents (see online appendix B.1 for details).

We conducted several other robustness checks, reported in the online appendix. Most importantly, we show that the results are similar if we use a broader definition of skill groups, if we do not weight observations by cell size, and we show that outliers do not drive our results. Finally, we show that the negative effect of immigration on unemployment is not driven by discouraged resident workers leaving the labor market.

Occupational mobility

The previous results suggest that the immigration of new foreign workers reduced resident unemployment and had no negative impact on residents' wages. This finding is hard to explain with a simple neoclassical model of labor supply and demand. In this section, we shed light on one possible mechanism that can explain why immigration reduces unemployment of residents. This mechanism is occupational specialization. Several previous papers suggest that immigration can allow residents to grow professionally and enable them to change to other (potentially better-paid) jobs, thus escaping the increased competition from immigrants (Borjas and Doran, 2015; Cattaneo et al., 2015; D'Amuri and Peri, 2014; Foged and Peri, 2016; Peri and Sparber, 2009, 2011b). Such effects of immigration on occupational specialization and job upgrading would attenuate negative wage effects and could explain positive unemployment effects of immigration.

We examine the impact of immigration on occupational mobility exploiting the panel nature of the SLFS. To this end, we first approximate the number of native workers changing jobs between the second quarters in years t and $t+1$, $Jobchange_{it}$.[15] Because of the limited number of observed moves, we reduce the number of skill cells by reducing the number of age groups to 4 (15–29, 30–39, 40–49, and 50+ years). In the estimations, we normalize $Jobchange_{it}$ by the past labor force size of each cell LF_{it-1}. We then regress the normalized variable on the similarly normalized number of immigrating foreign workers entering the cell

[15]To construct this variable as encompassing as possible, we look for individuals which (i) either state directly that they changed job when asked about this in the survey, or which (ii) show a reduction in job tenure from one survey to the next, or (iii) for which we observe a change in the ISCO code on the first digit level of the classification.

in year t (i.e. I_{it}/LF_{it-1}).[16]

The result of this regression is shown in column 1 of Table 4. We use our preferred specification and instrument actual immigration using both shift-share instruments. The estimation suggests that immigration does not cause resident workers to change job more often. However, this estimation hides an important fact: gross immigration into each skill group changes the *direction* of job switches. To show this, we differentiate between occupational moves within ISCO major group—and hence within our predefined skill groups—and across ISCO major group—which are moves out of our predefined skill groups. Columns 2 and 3 of Table 4 suggest that the arrival of new immigrants increases the likelihood of job changes across ISCO major group while it decreases the likelihood of changing jobs within ISCO major group.

To gain more insights into the driving force behind the positive impact of immigration on the movements across broad occupational category, we separate changes that occur to an ISCO major group with an equal or lower required ISCO skill level from changes that occur to an ISCO major group with a higher skill level. In our data, changing to next highest ISCO skill group is on average associated with a wage increase of 18.1%.[17] The relationships between our normalized instrument based on the historical shares and these movements are visualized in Figure 3. The left subfigure shows that there is no or even a slight negative relationship

[16]Such a specification was proposed by Card (2001) and deals with the problem that we observe zero job switchers in some skill groups in certain years. These observations would be discarded in a log specification as the log of zero is undefined. Simulations in Peri and Sparber (2011a) suggest that this specification performs as well as the "true" first-differenced specification we used so far.

[17]The ISCO major groups are grouped into four skill levels. ISCO major group 2 (professionals) requires skill level 4, major group 3 (technicians and associate professionals) skill level 3, major groups 4 to 8 require skill level 2, and occupations in major group 9 (elementary occupations) only require elementary skills (level 1). We add major group 1 (legislators, senior officials, and managers) to the highest skill category. In our sample, mean log FTE monthly earnings are 8.49 in skill group 1, 8.59 in skill group 2, 8.84 in skill group 3, and 9.03 in skill group 4.

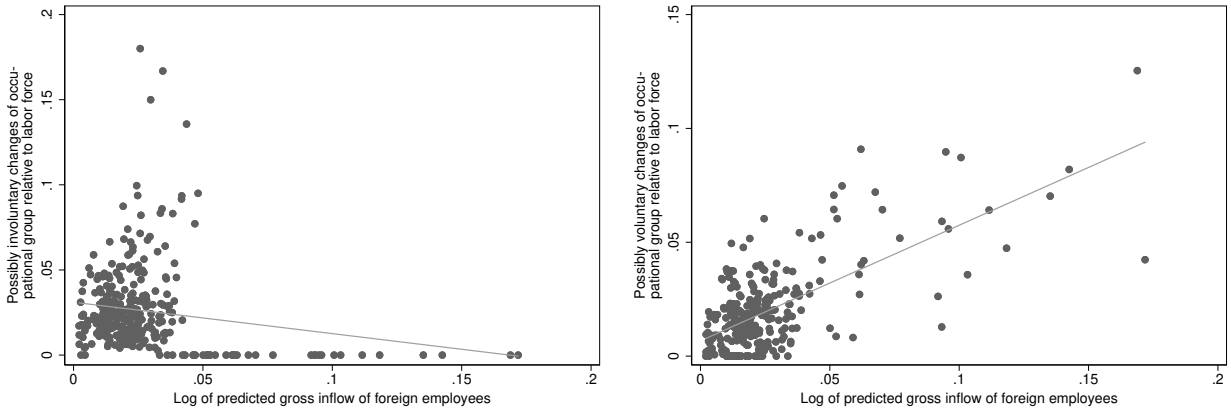
Table 4: Effect of immigration on occupational mobility

VARIABLES	(1) 2SLS Occ. change	(2) 2SLS Occ. change across cells	(3) 2SLS Occ. change within cells	(4) 2SLS Lower skilled ISCO group	(5) 2SLS Higher skilled ISCO group
I_{it}/LF_{it-1}	-0.021	0.108***	-0.129***	-0.077***	0.185***
	(0.039)	(0.026)	(0.033)	(0.026)	(0.029)
Job tenure immigrants	0.419	0.642***	-0.223	0.508*	0.134
	(0.415)	(0.246)	(0.274)	(0.298)	(0.141)
Job tenure immigrants sq.	-0.027	-1.442*	1.416*	-1.222	-0.220
	(1.188)	(0.756)	(0.855)	(0.833)	(0.429)
Observations	324	324	324	324	324
Occupation-year effects	Yes	Yes	Yes	Yes	Yes
Age-year effects	Yes	Yes	Yes	Yes	Yes
Weights	Yes	Yes	Yes	Yes	Yes
RMSE	0.0119	0.00927	0.00732	0.00715	0.00587
F stat first stage	65.74	65.74	65.74	65.74	65.74
p-value Hansen J stat	0.566	0.222	0.0434	0.767	0.167

Cluster-robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: The table shows the results of 2SLS regressions. The dependent variables are the normalized counts of resident job changers between the second quarter in t to the second quarter in $t+1$ ($Jobflows_{it}/LF_{it-1}$), counting only those job changes referred to in the column header (see main text for more information). The estimation period is 2002–2010. The instruments are predicted immigration based on the historical (Census) shares and based on the occupation-age distribution in the country of origin. All standard errors are clustered on the level of the skill cell. Weights are the average total labor force size over the entire sample period.

between predicted gross immigration and the share of natives changing to an ISCO major group with an equal or a lower skill requirement. On the other hand, there is a clear positive relationship between immigration and the share of natives changing to an ISCO major group with a higher skill requirement. The 2SLS regressions in columns 4 and 5 of Table 4 confirm that both correlations are indeed causal. Since we apply the shift-share instruments, we can rule out reverse causality, i.e. that professional advancements of natives cause immigrant inflows.



(a) Equal or lower skilled occupational group (b) Higher skilled occupational group

Figure 3: Predicted immigration and share of residents' moving across ISCO major groups

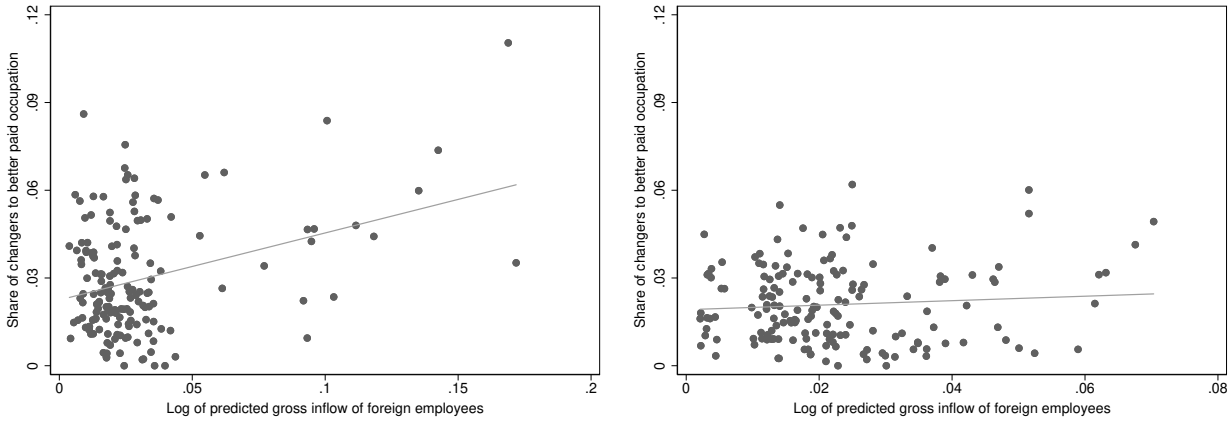
In Table 5, we focus on the effect of immigration on occupational upgrading of resident workers for all job changers, not just those that change across ISCO major groups. In the table, we work with three different definitions of job upgrading: changing to a position with more supervisory tasks[18], with more subordinates[19], and changing to a better-paid occupation[20]. The table provides clear evidence that the arrival of new immigrants helps residents to take over more managerial functions and to change to higher-paid positions. Similar findings are presented by Beerli and Peri (2015). Using a different identification strategy and another data set, they show that native workers became more likely to fill top managerial positions and move to higher paid occupations after the liberalization of the Swiss labor market.

[18]The variable is based on information provided in the SLFS on the managerial content of the job of the interviewed person. The survey distinguishes between employees/self-employed that have no or some "supervisory" tasks in their job. A change from no to some supervisory function is considered a move towards more managerial tasks.

[19]In the SLFS, workers are asked about the number of people that are taking orders from them (directly or indirectly). Using this information, we count the number of job changes that are associated with an increase in the number of subordinates.

[20]An occupation is defined on the fourth level of the ISCO classification. We assign average wage levels to each of these ISCO 4-digit occupations based on the FTE monthly wage in the (pre-sample) period 1999–2002.

There is one important qualification to these findings, however. The beneficial effects are concentrated among native workers below age 40, as shown by columns 2, 4, and 6 of Table 5. Older workers, on the other hand, do not appear to benefit. Figure 4 illustrates this result by showing the reduced-form relationship between predicted immigration and the share of residents that to move to a better-paid occupation. We observe a positive relationship for young workers but no connection for older workers. The limited evidence that old workers can escape the increased competition by moving up the occupational ladder could explain why older resident workers experience negative wage effects due to the arrival of immigrants.



(a) Workers aged 15–39 (b) Workers aged 40–65

Figure 4: Predicted immigration and share of resident job changers switching to better-paid occupation, by age of residents

One implication of the findings of this section is that immigrants cause "outflows" of our pre-defined labor market cells based on ISCO major groups. Previous studies using occupation-experience cells (such as Friedberg, 2001) argue explicitly or implicitly that native outflows are a less prevalent concern when using occupation cells because it is harder to change occupation than the own regional labor market as a response to large immigrant inflows. The presence of outflows out of the ISCO groups raises the question whether occupational

Table 5: Effect of immigration on upward mobility of natives

VARIABLES	(1) 2SLS Upgrading more managerial tasks	(2) 2SLS Upgrading more managerial tasks Aged 15–39	(3) 2SLS Upgrading more subordinates	(4) 2SLS Upgrading more subordinates Aged 15–39	(5) 2SLS Upgrading higher wage	(6) 2SLS Upgrading higher wage Aged 15–39
I_{it}/LF_{it-1}	0.068***	0.102***	0.066*	0.152*	0.164***	0.532***
	(0.025)	(0.038)	(0.036)	(0.088)	(0.055)	(0.099)
Job tenure immigrants	0.096	0.765**	0.282	0.652***	0.776**	0.960
	(0.167)	(0.300)	(0.179)	(0.249)	(0.360)	(1.072)
Job tenure immigrants sq.	-0.149	-3.855*	-0.833	-4.013**	-2.835**	-2.509
	(0.624)	(2.234)	(0.689)	(1.836)	(1.393)	(9.191)
Observations	324	162	324	162	324	162
Occupation-year effects	Yes	Yes	Yes	Yes	Yes	Yes
Age-year effects	Yes	Yes	Yes	Yes	Yes	Yes
Weights	Yes	Yes	Yes	Yes	Yes	Yes
RMSE	0.00319	0.00305	0.00393	0.00406	0.00656	0.00653
F stat first stage	23.37	26.36	23.37	26.36	23.37	26.36
p-value Hansen J stat	0.658	0.106	0.117	0.271	0.239	0.313

Cluster-robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: The table shows the results of 2SLS regressions. The dependent variable in columns 1 and 2 is the number residents changing to a position with more supervisory tasks, normalized by the total size of the labor force in each cell LF_{it-1}. The dependent variable in columns 3 and 4 is the normalized number residents changing to a position with more subordinates. The dependent variable in columns 5 and 6 is the normalized number residents changing to a better-paid position. See main text for more information on these outcomes. The estimation period is 2002–2010 in all cases. The instruments are predicted immigration based on the historical (Census) shares and based on the occupation-age distribution in the country of origin. Columns 2, 4, and 6 are restricted to workers aged 15–39. All standard errors are clustered on the level of the skill cell. Weights are the average total labor force size over the entire sample period.

(upward) mobility affects our previous estimates. This question is analyzed in Table 6. We present two different estimates of β from our preferred 2SLS specification: one if we estimate the model used so far, and another if we control for the share of natives changing the ISCO major group throughout year t.

The first column of Table 6 shows that the estimated effect of gross immigration on employment becomes positive and statistically significant if native outflows are held constant. A regression that does not account for the number of persons leaving the cells appears to

understate the beneficial impact of immigration on employment of residents within the skill cell. Given our evidence, the likely explanation for this result is that some residents change to a higher skill group due to the immigrant inflow. The effects of immigration becomes more beneficial once we account for this effect. Consistent with this, native outflows reduce employment in the cells, as is shown by the significant negative coefficient of native outflows itself. Similarly, the point estimate of β in the unemployment regression is less negative than in our baseline estimate and turns statistically insignificant if native outflows are held constant (column 2 of Table 6). This suggests that native outflows partly explain the negative effect of immigration on unemployment. The last columns shows that the wage estimate remains unchanged if we control for native outflows. Overall, the table indicates that an important part of the outcome-improving effect of immigration on residents' labor market outcomes arises because resident workers grow professionally due to immigration. This reduces the number of residents in the skill group and thus improves job opportunities of natives staying there.

V Conclusion

This paper develops a methodology which allows identifying the causal effects of immigration on the labor market outcomes of residents for national skill cells—a methodology which is broadly applicable beyond specific political events in the country of origin or policy changes in the destination country. Using this methodology, we examine the effects of the recent large-scale inflow of foreign workers on the labor market situation of resident workers in

Table 6: Accounting for occupational mobility and the estimated parameters of interest

	(1) **Employment**	(2) **Unemployment**	(3) **Wages**
β: Standard	-0.004	-0.026***	-0.007
	(0.011)	(0.01)	(0.008)
β: Accounting for native outflows	0.032**	-0.017	-0.00
	(0.016)	(0.007)	(0.009)
Coefficient on outflows	-0.051***	-0.002	-0.008
	(0.016)	(0.008)	(0.006)

Notes: The table shows the results of 2SLS regressions using our preferred regression model including occupation- and age-year effects. The dependent variable in column 1 is the log change in employment of residents from the second quarter in $t-1$ to the second quarter in t. The dependent variable in column 2 is the log change in registered unemployment from January t to January $t+1$. The dependent variable in column 3 is the log change in FTE monthly wages of residents from the second quarter in $t-1$ to the second quarter in t. The first row shows results from our standard regression, restricted to a sample of 36 skill groups (4 age groups, 9 ISCO major groups). The remaining rows show the same estimation controlling for the number of residents leaving the ISCO major group. The "coefficient on outflows" shows the estimate for this variable.

Switzerland.

We find that unemployment of residents has been reduced because of immigration of foreign employees, while average employment, wages and labor force participation have not been negatively affected. These results suggest that most resident workers did not loose and may even have benefited from free movement immigration from EU/EFTA states. An explanation for these favorable outcomes is that the arrival of new immigrants caused natives to redirect their job changes: rather than switching within occupational group, younger residents switched to another occupational groups. These job changes occurred mainly into higher skilled jobs, into better-paid jobs, and into jobs with more managerial tasks. The job upgrading appears to have helped residents to escape the increased competition caused by immigration.

A more general explanation of our findings is that Switzerland opened up the labor market to labor migrants in a setting in which resident labor was a scarce factor. In 2001, the year

before our sample starts, the country's unemployment rate was only 2.5% and the labor force participation rate of the population aged 15–64 was 81.2%—the second highest value among all OECD countries. In such a situation in which the labor market is absorptive, the effects of immigration are likely to be less detrimental to resident workers. Most advanced economies suffer from skill shortages in some sectors or will suffer from skill shortages in the future due to demographic ageing. Our findings underline the potentially beneficial effects of cross-border labor mobility for such countries.

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