# Immigration and work injury risk

## Evidence from Italian administrative data[*]

**Preliminary. Please do not circulate.**

Caterina Alacevich[†]        Catia Nicodemo[‡]

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### Abstract

We find a significant gap in work-related accidents between immigrants and natives. This suggests that foreign-born workers may sort into job positions with a higher injury risk and alleviate the exposure of native workers. Do migrant inflows reduce the incidence and severity of work-related accidents among native workers? We provide new evidence on the effects of immigration on work injuries of natives. Our approach exploits spatial and temporal variation in the net inflows of foreign-born individuals across provinces in Italy. We combine administrative data on the universe of work-place accidents with the Labour Force Survey from 2009 until 2017. We document, using a fixed effects and instrumental variable specification, that inflows of foreign-born individuals are associated with a reduction of injury rates for the native population. Yet, also the severity of natives' accidents, measured by paid sick absence, decreases with the inflow of foreign-born residents.

**JEL**: C55, J61, J28, I1

**Keywords**: Immigration, labor-market, work-related injuries, health

[†]Universitat Pompeu Fabra, The Ratio Institute
[‡]University of Oxford, CHSEO

# 1 Introduction

Injuries and work-related illness cost the European Union 3.3% of its GDP (EU-OSHA 2018). There were 3.2 million non-fatal accidents at work in the EU-28 during 2015 (Eurostat 2017). Recent research shows that the generosity of medical care compensation for injured workers can have a strong impact on the future earning potential of the affected workers, implying longer-term consequences for the allocation of public money to work-related accidents and illnesses (Powell and Seabury, 2018). Designing effective work-injury compensation and preventive measures requires an understanding of the scale and characteristics of the phenomenon, so as to reduce its incidence and alleviate its burden on governments' budgets.

Figure 1 shows the share of occupational injuries among the working-age resident population in Italy (2008-2017), by gender. The trend is plotted separately for foreign-born residents and natives. While the downward trend is shared by both natives and foreign-born residents, the figure evidences a significant gap between the two populations. Male migrants have a disadvantage that stabilized at approximately 2 percentage points over the last four years (0.3 percentage points for female migrants). Italy has received large inflows of immigrants in the last decade, and, like in most advanced economies, the consequences of immigration are at the center of its political debate. The number of foreign-born residents in Italy has grown by 25% from 2013 to 2018, reaching a total of 5, 144, 440 at 1st January 2018. Most of the immigrant workers in Italy are comparatively poorly-educated and employed in low-skill sectors. Using data from the Italian Labor Force Survey of 2007, Salvatore et al. (2013) shows that male migrants self-reported significantly higher rates of work injuries than natives, especially in the construction sector.

The presence of a significant injury risk gap between immigrants and natives suggests that foreign-born workers may enter into occupations characterized by a higher injury risk. Large migrant inflows may thus contribute to reducing the incidence and severity of work-related accidents among native workers. Does the presence of migrants alleviate the injury risk of natives? The objective of our study is to provide new empirical evidence regarding the effects of immigrant inflows on work injury rates of natives.

The degree of substitution between immigrants and natives in labor markets is a thoroughly debated question in the literature. Most of the existing empirical evidence focuses on the impact of immigration on natives' earnings, finding that immigrant inflows have small or no effects on natives' outcomes (Card (2005), Borjas et al. (2008), and Dustmann and Frattini (2014)), contrary to the implications of a basic demand and supply model. A growing body of literature suggests that immigration not only has the potential to affect the wages of natives, but can also trigger a shift in the types of jobs that natives hold. Peri and Sparber (2009) and Foged and Peri (2016) show that immigration can push natives into jobs that require communication skills, due to their comparative advantage in this sector. A reallocation of native workers within the labor market in response to immigrants' inflows could have consequences for the health and safety of the positions held by native workers. Migrants and natives may select into occupations, firms, or tasks that are characterized by a different degree of injury risk. Yet, differential risk aversion or risk perception, a comparative advantage in health endowments to trade-off for a salary, lower bargaining power, and limited outside options, may converge in determining a higher exposure to workplace accidents for immigrants.

Only a few studies have analyzed the impact of immigration on the health outcomes of natives. Using data from Germany, Giuntella and Mazzonna (2015) detect that higher concentrations of

migrant workers make native residents less likely to self-report adverse health outcomes. The effect is particularly pronounced for blue-collar and low-skilled individuals. Giuntella et al. (2018) find that, in response to immigration, medium-skilled native workers in the UK reallocated towards occupations with a lower injury risk index score and lower physical burden in the years 2003-2013. The authors do not find a similar effect on low-skilled native workers. One interpretation of their results is that, given that their measure of health improvements relies on occupational shifts, their analysis does not allow them to identify any effects on low skilled workers who remain in their roles.

We analyze the impact of immigration on per-capita injuries, independently from occupational shifts, relying on the data universe of work-related accidents in the Italian private sector from 2009 to 2017. Using administrative data of workforce injuries from the National Institute for Insurance Against Accidents at Work (INAIL), combined with the Labour Force Survey (LFS) data and the flow of foreign-born residents recorded by the Italian National Statistical Office (ISTAT) from 2003 until 2017, we explore whether the presence of foreign-born workers has an effect on natives' injury rates and on the severity of accidents at work.[1]

The literature that analyses the effect of immigration on natives in Italy is predominantly focused on the labor market (Mocetti and Porello, 2010; Staffolani and Valentini, 2010; Giuntella, 2012; Bratti and Conti, 2018). To the best of our knowledge, there are no studies providing causal evidence on the relation between foreign-born and native workers' health outcomes in Italy.

The concentration of migrants and natives across provinces may be endogenous with respect to injury risk exposure, as workers' residence and work location decisions may directly or indirectly correlate with occupational health and safety, and local labor market conditions. To overcome endogeneity and unobserved variable bias, we employ the widely used "shift-share" instrument à la Card (2001), which consists in imputing the share of foreign-born residents by province from historical settlements and recent migration inflows by country of origin.

We find that immigration has a positive effect on the reduction of natives' fatal work-related accidents, injuries, and on the their severity, measured by the number of sick days off work. Further research on the mechanisms that could explain these findings is necessary.

This paper is organized as follows. Section 2 provides details about the data used and the immigration and safety regulation background in Italy. Section 3 describes the empirical strategy, followed by the results and their interpretation in Section 4. Section 5 includes our concluding remarks.

## 2 Background and data

Our study combines administrative data from the registry of work accidents and injuries collected by the Italian National Insurance Institute for Employment Injuries (INAIL), the Labour Force Survey "Rilevazione sulle Forze di Lavoro"(LFS) of the Italian National Statistical Office (ISTAT) between 2009 and 2017, and the ISTAT municipal registry of foreign-born and Italian residents, for the years 2002 and 2009-2017. We restrict our analysis to individuals within the working age range of 16-65 years.

The National Institute of Occupational Insurance (INAIL) is the institution in charge of covering insurance for occupational accidents, health complications, and work-related illnesses of Italian workers, and provides statistics regarding their occurrence at the province, region and national level.

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[1]In our further analysis, we will explore the implications in terms of health expenditure associated with the immigration effect on the work injury rate of natives.

The INAIL administrative archive contains information about the demographic characteristics of workers (age, gender, country of birth), work location, the sector of the injured worker, whether the accident happened at work or during a displacement, the date of the occurrence and report, the days of absence for sickness, and an identification number for each employer. In 1994, Europe introduced the obligation to assess the risks to the safety and health of workers in all public and private sectors. In 2008, a new European regulation required all public and private firms to prepare a specific Risk Assessment Document that should contain a list of the risks related to safety and health attached to each job (work environments, machinery, etc.)[2] The Italian law mandates that all employers, including those with alternative or private insurance policies, report the occurrence of all accidents that cause at least one day of absence within 48 hours of receipt of the medical certificate, and within 24 hours in case of a fatal accident. Sanctions for notification delays range between 548 (lowest amount for one-day accidents) and 4,932 euros (maximal for injuries with more than three days of absence).[3] The total number of injuries in 2008 was $520,401$ for native males and $114,056$ for foreign-born males. In 2017, the numbers were, respectively, $304,687$ and $68,388$. Females reported, respectively, a total of $227,041$ and $31,534$ injuries in 2008, and $1762,029$ and $27,241$ injuries in 2017.

In the absence of matched individual-injury data for the universe of workers, we thus perform the analysis at the province level. We calculate the injury rate by province of employment $p$ at time $t$ (2009-2017) as follows, separately for men and women:

$$INJ_{p,t} = \frac{\text{Number of accidents }_{p,t}}{\text{Number of workers }_{p,t}} * 100 \tag{1}$$

We use two measures for the denominator of Equation 1. The first is the total working-age population resident in province $p$ at time $t$ (age 15-65), by citizenship (ISTAT demographic data). This measure is more conservative, because it includes inactive and unemployed people. The second measure takes into account only the number of employed people, computed from the LFS. Because the LFS, due to its sampling design, is not representative of actual immigrant shares by province, nor their employment rates, it does not allow us to calculate the share of migrant workers by province. It is important to note that migrants without a regular work/residence permit are not included in the municipal registries and may also have a lower likelihood of being reported to INAIL in case of an accident. Similarly, the accidents of native workers in the shadow economy may be less likely to be reported. Figure 5 displays a map of the work injury rate among the male and female native and migrant resident populations, across Italian provinces, in 2017. As of January 1, 2017, the foreign-born population in Italy reached more than 5 million individuals, mostly concentrated in the Northern regions. The largest community was constituted by Romanians, 23% of the total foreign-born residents, followed by Albanians (9% ) and Moroccans (8.7%) (Istat, 2018). Based on ISTAT's municipal registry of residents in each province by country of origin, Figure 3 shows the evolution of the share of male and female foreign-born residents aged 15-65 in Italy, between 2009 and 2017. A generally increasing trend reverses in 2012 and continues growing afterwards. These figures motivate the present analysis, which aims to analyze a potential relationship between the injury rate of male native workers and the increase in the overall migrant population. The number

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[2]Information about the European directives on safety and health at work can be found here: https://osha.europa.eu/en/safety-and-health-legislation/european-directives

[3]https://www.inail.it/cs/internet/attivita/prevenzione-e-sicurezza/promozione-e-cultura-della-prevenzione/comunicazione-infortunio.html

of migrants in the ISTAT demographic archive takes into account only those who are signed up in the municipal residence registry, therefore excluding undocumented migrants and underestimating their total number.[4]

The LFS, produced by ISTAT, collects quarterly socio-demographic information including country of birth and more general questions about employment status and job characteristics (hours worked, sector, type of contract, etc.), for all individuals in a sample of households that is representative at the national and province level. From this database, we extract the total number of natives and foreign-born workers, by gender and province of residence, for each year of the sample period studied, weighted according to the provided procedure.[5] We focus on individuals aged 15 to 65. We follow the ISTAT classification based on self-reported occupational status to distinguish the employed individuals from the inactive and the unemployed. For 2017, we have 11,575,355 native male workers and 8,211,183 female native workers.

Figure 4 reports the share of employed men and women among the respective native population aged 15-65, from 2009 until 2017. We can observe that the shares decline until 2014, corresponding to the economic crisis (recovering in 2012 for women but declining again), and recover afterwards. The decline in employment could partially explain the contemporaneous decline in injury rates among natives. However, as shown in figure 1, as employment rates recover, natives' injuries maintain their downward sloping trend, while they stabilize and slightly increase again for migrants. Figure 3 displays the evolution of the share of male and female foreign-citizen residents aged 15-65 in Italy, in the same period. These figures motivate the object of the present analysis, which aims at analyzing a potential relationship between the injury rate of male native workers and the increase in the overall migrant population. The number of migrants in the ISTAT demographic archive takes into account only those who are signed up in the municipal residence registry, therefore excluding undocumented foreign-born residents and underestimating their total number. Finally, Figure 4 shows that the share of employed men and women among the respective native population aged 15-65 declines between 2013 and 2014 and then recovers, surpassing its initial level. The final descriptive statistics are reported in the Appendix.

## 3   Empirical Strategy

The objective of our analysis is to investigate whether the presence of migrants affects native workers' injury rates. We identify the relationship between immigration and the occupational injury risk of domestic workers through changes in the concentration of migrant workers across and within local administrative units over time. The following linear model specifies our baseline estimations, separately for male and female workers:

$$INJ_{p,t}^{nat} = \alpha_p + \beta MIG_{p,t} + \eta_t + \epsilon_{p,t}. \tag{2}$$

$INJ_{p,t}^{nat}$ represents the share of injuries among native workers in province $p$ at time $t$. $MIG_{p,t}$ is the share of migrants among province $p$'s residents, by sex. $\alpha_p$ and $\eta_t$ are province and time fixed effects.

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[4]Due to constraints in the availability of data, our study is subject to a number of limitations. Population data is recorded by citizenship, while we construct the employment status by country of origin, as we expect different labour market conditions due to the foreign origin (Hamermesh, 1997). We compute the number of employees in the province where they perform their main occupation, while the share of immigrants refers to the province in which foreign-citizens register their residence.

[5]We have reclassified the local administrative units into 100 provinces for the entire sample period, bundling together the provinces that new legislative settings have aggregated or separated over our period of study.

We additionally include province-specific time trends, to account for time-varying pull factors that may determine the relocation of natives and migrants across provinces, in response to changes in the labor market and economic conditions. Migrants may endogenously locate in administrative provinces whose characteristics correlate with the degree of occupational health safety. In order to tackle this source of endogeneity of immigrants, we instrument the share of resident migrants in the local labor market based on their historical settlement, following the "shift-share" approach (Card, 2001), extensively employed in the literature. The rationale behind this strategy is that the historical distribution of migrants across provinces is independent of future changes in the local labor market conditions. By constructing an instrumental variable based on historical shares by area of origin, the estimation captures the variation of migrant shares which is due to historical settlements rather than contemporaneous location-specific characteristics. First, we impute the distribution of migrant inflows by country of origin $c$ at time $t$ across provinces $p$ by allocating future national-level inflows on the basis of their historical spatial allocation:

$$\hat{MC}_{c,p,t} = ShM_{c,p,2002} * FlowM_{c,t} + StockM_{c,p,2002} \tag{3}$$

$ShM_{c,p,2002}$ is the share of migrants from origin $c$ settled in province $p$ in January first of 2002. To obtain the imputed number of migrants from origin $c$ in province $p$ at time $t$ ($\hat{MC}_{c,p,t}$), we multiply the national-level inflows of migrants at time $t$ by area of origin $FlowM_{c,t}$ by their "historical" (year 2001) province-level shares, and then we add the initial (2001) stock of migrants from $c$ in $p$. Additionally, we perform the same estimation, but multiply the shares in 2002 by country of origin and province to the stock of immigrants from area $c$ at time $t$:

$$\hat{MC}_{c,p,t} = ShM_{c,p,2002} * StockM_{c,t} \tag{4}$$

Next, for each province, we sum all areas of origin and divide by the total number of male or female residents (aged 15-65), obtaining the imputed share of migrants in $p$ ($\hat{M}_{p,t}$), for each sex:

$$\hat{M}_{p,t} = \sum_c (\hat{MC}_{c,p,t})/WPop_{p,t} \tag{5}$$

We thus proceed with a two-stage least-squares estimation, instrumenting the share of migrants among the resident population in the administrative unit ($MIG_{p,t}$) with the imputed share $\hat{M}_{p,t}$, separately by sex. Natives' injury risk adjustment may not immediately respond to the inflow of migrants. For this reason, we add lags of the explanatory variable, in order to assess a slower developing impact of the immigrant presence on the injury rate of native workers. We cluster our standard errors at the province level.

## 4 Results

### 4.1 Work-related injury rate

This section presents the estimates of the impact of immigration on the incidence and severity of native workers' injuries. The main outcome, injury rate, is constructed as the share of total yearly injuries among native employed individuals aged 16-65, by province. The explanatory variable is the share of immigrants among the total number of residents within a province, at a given year (2009-2017). We carry out the analysis separately by sex, as men and women report different

injury rates and typically work in different sectors. Table 1 reports the results that we obtain by estimating Equation 2 including province-specific fixed-effects (all columns), and then adding province-specific time-trends (Columns 2 and 5) and year fixed-effects (Columns 3 and 6). An increase in the share of migrants by 10 percentage points corresponds to a reduction in the injury rate of native workers by 3.4 percentage points in the case of men, and 1.8 percentage points for women. The coefficient reduces its magnitude as we add province-specific time-trends and time-fixed effects, implying a 0.9 and 0.6 decrease in percentage points for male and female natives. Despite the robustness of our results to the inclusion of province trends, which allow controlling for underlying dynamic changes in local labor markets, which may work as push or pull factors for migrants, there is still a concern that migrants' locations directly or indirectly correlate with changes in the injury rate of natives. For this reason, as explained in Section 3, we adopt the "shift-share" or network-based instrumental variable approach (Card, 2001). Table 2 reports the results of the two-stage least-squares estimation obtained by instrumenting the share of migrants by province with the imputed stock obtained by weighting the origin-specific number of residents by year by their historical distribution across provinces, and summing all areas of origin. The first stage F-statistics and coefficients show a positive and significant prediction for both men and women migrant shares (even Columns). The IV estimates of the impact of immigration on native workers' injury rates confirm the OLS-based findings, with increased magnitude. When the share of immigrants grows by 10 percentage points, natives' injuries fall by 5.4 (men) and 2 (women) percentage points. However, the coefficient for the impact of male immigrants (Column 3) loses its significance at standard levels, when including province time-trends. These preliminary results still require some caution in their interpretation if the distribution of migrants in 2002 does not date back enough in time to determine their cross-sectional location in an exogenous way, or if the inflows of migrants by country of origin in our sample are very persistent (Jaeger et al., 2018). In our future research, we will address these issues by gathering older demographic data (currently not available at the province and country of origin level), and matched individual-level data on employment and workplace safety.

## 4.2 The Severity of Injuries: Deaths and Days of Absence

Next, we analyze whether the presence of foreign-born residents contributes to a decrease in the severity of work-related accidents. To do so, we focus on three additional outcomes: the share of fatal injuries (%), the incidence of work-related deaths among native workers (%), and the average number of days away from work that doctors assign to the injured workers.

Table 3 presents the results that we obtained by estimating Equation 2 for those outcomes. Looking at male workers' injuries, we found that a higher share of immigrants in the province implies a decrease in all the indicators of severity. A ten percentage point increase in the share of foreign-citizens decreases the share of fatal accidents over all reported injuries by 0.18 percentage points (0.7 if we include province time-trends), with significance at the 5% level.

The share of deaths among workers is in fact very low and does not allow us to detect an effect that is statistically different from zero. The coefficient for natives' average sick leave days is only statistically significant if we include province-specific time-trends (negative 66.12). Unfortunately, the INAIL dataset does not correctly report measures of the assigned degree of severity for each injury, but only for a potentially non-random and very limited number of cases. For this reason, we do not have the opportunity to study this additional outcome. However, the indicators that we selected to investigate the severity of injuries seem to show that, not only do the share of injuries

among workers decline, but also their severity may fall in response to inflows of typically low-skilled male migrant residents. These results should still be interpreted with caution if INAIL statistics do not succeed in including fatalities and injuries of native workers in the shadow economy. The coefficients for female native worker deaths are not significant at the standard levels. This is somewhat consistent with the fact that the injury rate for women is lower, and with the finding that the impact of immigration on the injury rate of Italian women has a significantly smaller magnitude than in the case of men.

## 5    Conclusion

Our analysis supports the hypothesis that migrant inflows alleviate the injury risk of native workers, with a relatively stronger impact for men. The smallest impact that we detect implies that a ten percentage point increase in the share of migrants reduces the injury rate by 3.4 percentage points for men, and 1.8 percentage points for women. Not only the incidence of work-related accidents, but also the severity of such accidents, significantly falls in the case of male native workers. Despite the limitations given by the province-level dimension of variation in our data, this analysis shows that immigration can have a positive effect on native workers' exposure to accidents.[6] Our results are consistent with previous findings of a shift in middle-skilled natives' occupations towards jobs with a lower injury risk in the UK (Giuntella et al., 2018), away from manual-intensive tasks and towards a higher communication-based component (Foged and Peri, 2016; Peri and Sparber, 2009). We contribute to this literature by extending the analysis to the universe of labor market injuries, pooling all skill groups, and showing the existence of an immigrant-native injury gap that absorbs a significant part of the reduction in natives' accidents. Starting from this evidence, we will extend our future research to a focus on the potential mechanisms behind these results and to an estimation of the costs and gains in terms of productivity and of the health expenditure associated with the number of accidents. The existing literature also suggests that inflows of mainly unskilled foreign-born women concentrated in the household production sector may provide an opportunity for skilled natives to increase their labor market participation (Cortes and Tessada, 2011). The net effect on injuries for native women would thus depend on the relative increase in their participation in occupations with higher injury risk exposure. This focus is beyond the scope of this paper, but we believe that it constitutes an additional interesting possible avenue for future work.

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[6] An ideal estimation of the individual-level occurrence of injuries for native and migrant workers would require a match between the employment and injuries administrative archives based on a unique individual identifier. This is not a possibility at the moment in the case of Italy.

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# Tables and Figures

Figure 1: Injury rate among foreign-born and native resident population (15-65) in Italy
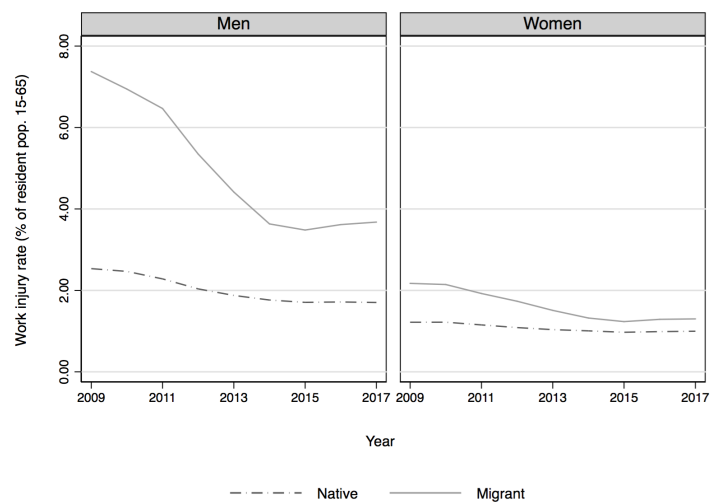


Source: Authors' estimations from ISTAT demographic data and the INAIL archive of work-related accidents.

Figure 2: Injury rates among foreign-born and native working population (15-65)
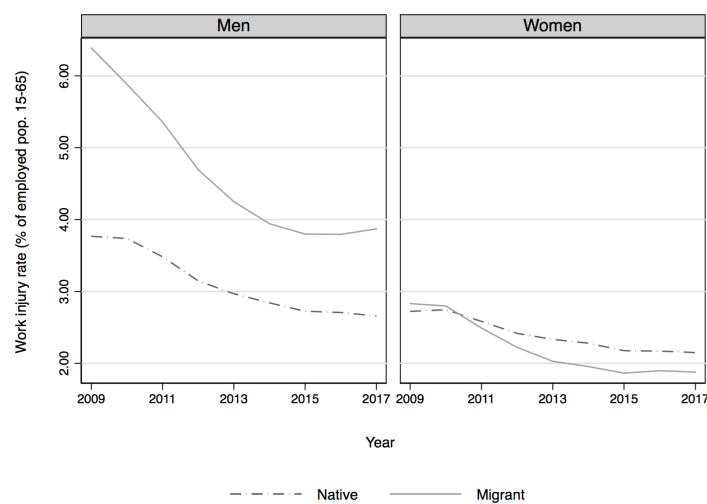


Source: Authors' estimations from LFS-ISTAT data and the INAIL archive of work-related accidents.

Figure 3: Share of foreign-born residents in Italy (age 15-65)



Source: Authors' estimations from ISTAT demographic data on foreign-citizens registered in municipal residence archives.

Figure 4: % native workers among resident population in Italy (age 16-65)
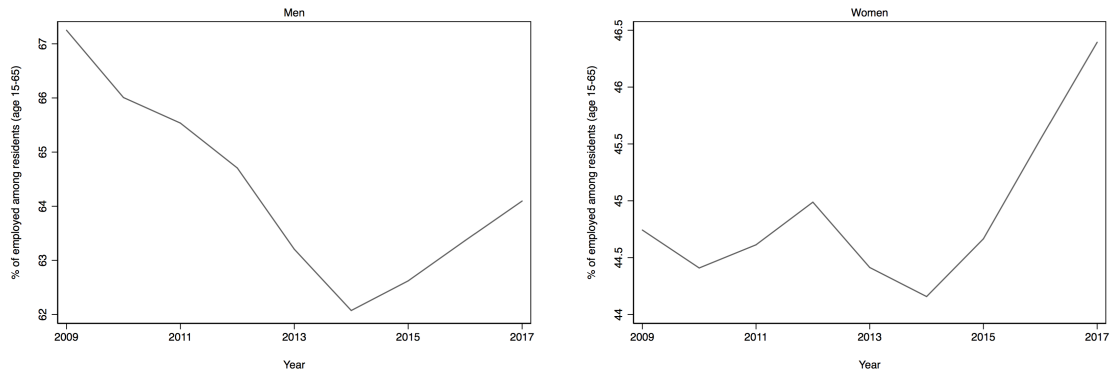


Source: Authors' estimations from ISTAT demographic data and the Italian Labour Force Survey (RFL-ISTAT). The employment rate is computed as the fraction of employed workers (by country of birth: Italy) among the resident population (Italian citizenship)

Figure 5: Injury Rates in 2017 at the province level (age 15-65)
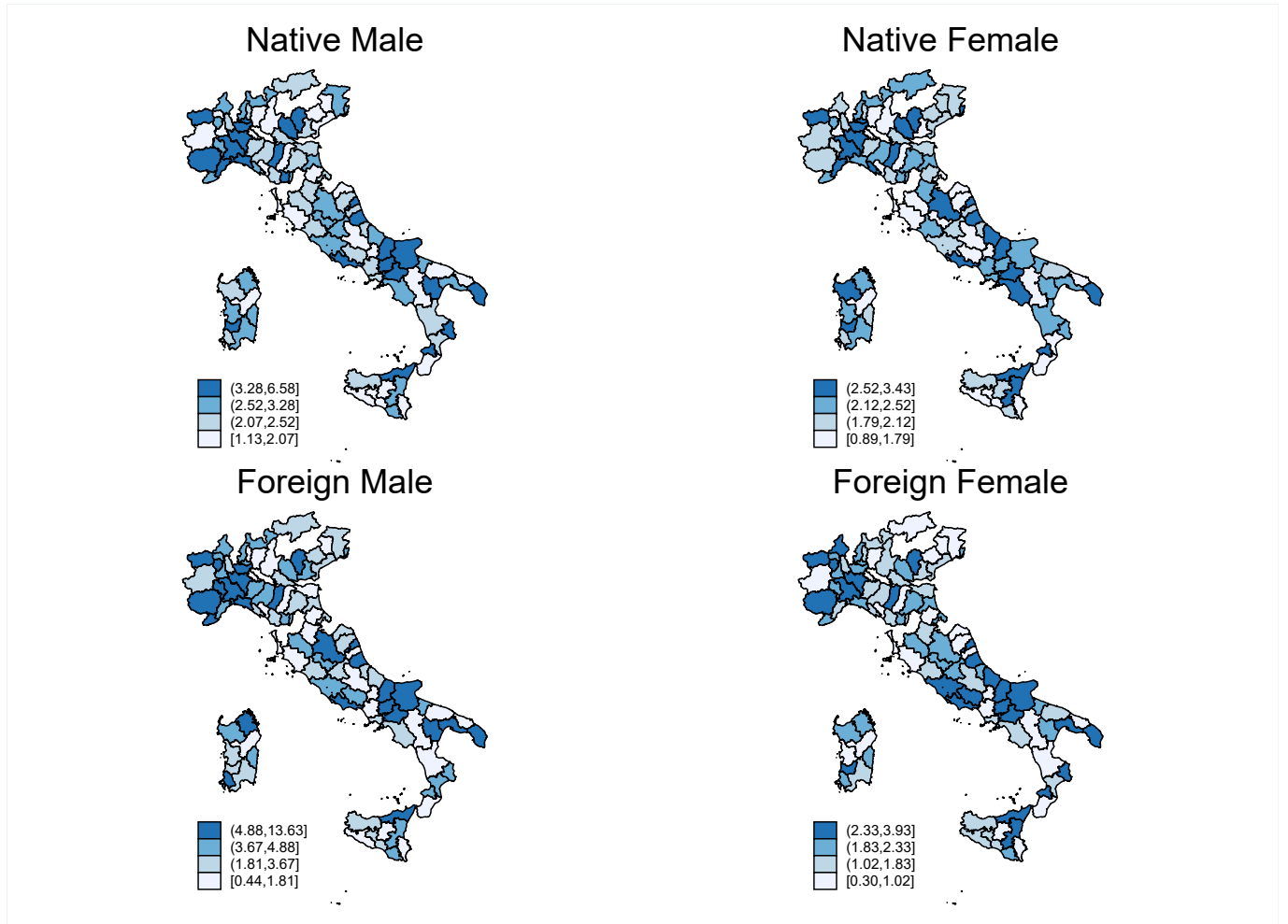


## Native Male

(3.28,6.58]
(2.52,3.28]
(2.07,2.52]
[1.13,2.07]

## Native Female

(2.52,3.43]
(2.12,2.52]
(1.79,2.12]
[0.89,1.79]

## Foreign Male

(4.88,13.63]
(3.67,4.88]
(1.81,3.67]
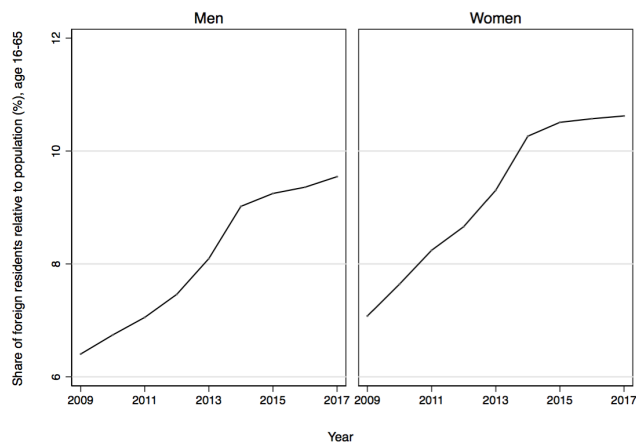[0.44,1.81]

## Foreign Female

(2.33,3.93]
(1.83,2.33]
(1.02,1.83]
[0.30,1.02]

Source: Authors' estimations from ISTAT demographic data and the INAIL archive of work-related accidents. Injury rates are computed as total injuries by country of birth (Italy vs foreign-born), divided by the resident population aged 15-65 by sex and citizenship.

Table 1: Fixed-effects estimation of native workers' injury rates by province (age 16-65)

| Dep. var: Injury Rate | Men | | | Women | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Share of Migrants | -33.615*** | -18.786*** | -8.863*** | -17.612*** | -10.995*** | -5.756** |
| | (1.444) | (2.246) | (2.111) | (0.725) | (1.318) | (2.389) |
| Observations | 900 | 900 | 900 | 900 | 900 | 900 |
| R-squared | 0.903 | 0.976 | 0.986 | 0.908 | 0.958 | 0.963 |
| Province FE | YES | YES | YES | YES | YES | YES |
| Province Trend FE | NO | YES | YES | NO | YES | YES |
| Year FE | NO | NO | YES | NO | NO | YES |
| Mean of Dep. Var. | 3.253 | 3.253 | 3.253 | 2.423 | 2.423 | 2.423 |

Source: Authors' estimation from ISTAT demographic data, INAIL archive of work injuries, and the Italian Labour Force Survey (LFS-ISTAT). Robust standard errors in parentheses. Asterisks denote statistical significance at the 1(***), 5(**) or 10(*) percent level.

Table 2: 2SLS estimation of native workers' injury rates by province (age 16-65)

| | Men | | | | Women | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | Injury | First stage | Injury | First stage | Injury | First stage | Injury | First stage |
| Migrant Share | -53.839*** | | -6.271 | | -19.638*** | | -5.326 | |
| | (2.818) | | (10.345) | | (0.793) | | (4.898) | |
| Instrument | | 0.532*** | | 0.102*** | | 0.678*** | | 0.143*** |
| | | (0.034) | | (0.013) | | (0.028) | | (0.020) |
| Mean of Dep. Var. | 3.253 | 0.079 | 3.253 | 0.079 | 2.423 | 0.091 | 2.423 | 0.091 |
| StDev of Dep. Var. | 1.181 | 0.038 | 1.181 | 0.038 | 0.658 | 0.041 | 0.658 | 0.041 |
| N | 900.000 | 900.000 | 900.000 | 900.000 | 900.000 | 900.000 | 900.000 | 900.000 |
| R-squared | 0.865 | 0.933 | 0.975 | 0.994 | 0.907 | 0.957 | 0.957 | 0.994 |
| F-Stat (First Stage) | 249.713*** | | 62.573 *** | | 601.660*** | | 53.198*** | |
| Province FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Province Trend FE | NO | NO | YES | YES | NO | NO | YES | YES |
| Time FE | NO | NO | NO | NO | NO | NO | NO | NO |

Source: Authors' estimation from ISTAT demographic data, INAIL archive of work injuries, and the Italian Labour Force Survey (LFS-ISTAT). Robust standard errors in parentheses. Asterisks denote statistical significance at the 1(***), 5(**) or 10(*) percent level.

Table 3: Severity of native workers' injuries: death and days of absence (FE)

| | Men | | | | | | Women | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Death/Injuries (%) | | Death Rate (%) | | Absence Days | | Death/Injuries (%) | | Death Rate (%) | | Absence Days | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Migrant Share | -1.83* | -6.68* | -0.04* | -0.14* | -11.07 | -66.12** | -0.81 | -1.39 | -0.01 | -0.01 | -24.66** | -8.09 |
| | (0.96) | (3.44) | (0.02) | (0.08) | (12.81) | (29.95) | (0.52) | (1.77) | (0.01) | (0.04) | (12.42) | (27.51) |
| Province FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Time Trends | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes |
| Mean of Dep. Var. | 0.31 | 0.31 | 0.01 | 0.01 | 24.95 | 24.95 | 0.06 | 0.06 | 0.00 | 0.00 | 18.04 | 18.04 |
| StDev of Dep. Var. | 0.22 | 0.22 | 0.00 | 0.00 | 5.20 | 5.20 | 0.10 | 0.10 | 0.00 | 0.00 | 3.81 | 3.81 |
| N | 900.00 | 900.00 | 900.00 | 900.00 | 900.00 | 900.00 | 900.00 | 900.00 | 900.00 | 900.00 | 900.00 | 900.00 |
| R-squared | 0.52 | 0.57 | 0.32 | 0.39 | 0.87 | 0.93 | 0.18 | 0.25 | 0.15 | 0.23 | 0.78 | 0.87 |

Source: Authors' estimation from ISTAT demographic data, INAIL archive of work injuries, and the Italian Labour Force Survey (LFS-ISTAT), years 2009-2017. Robust standard errors in parentheses. Asterisks denote statistical significance at the 1(***), 5(**) or 10(*) percent level.

Table 4: Severity of native workers' injuries: death and days of absence (2SLS: Second Stage)

| | Men | | | | | | Women | | | | | |
| | Death/Injuries (%) | | Death Rate (%) | | Absence Days | | Death/Injuries (%) | | Death Rate (%) | | Absence Days | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Migrant Share | 14.24** | -5.24* | 0.21 | -0.12** | 310.56*** | 220.48*** | 2.58 | 1.17 | 0.07 | 0.00 | -101.77 | 395.85*** |
| | (6.38) | (2.90) | (0.14) | (0.05) | (115.03) | (80.39) | (2.99) | (6.02) | (0.06) | (0.13) | (63.73) | (120.53) |
| Time Trends | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes |
| Mean of Dep. Var. | 0.31 | 0.31 | 0.01 | 0.01 | 24.95 | 24.95 | 0.06 | 0.06 | 0.00 | 0.00 | 18.04 | 18.04 |
| StDev of Dep. Var. | 0.22 | 0.22 | 0.00 | 0.00 | 5.20 | 5.20 | 0.10 | 0.10 | 0.00 | 0.00 | 3.81 | 3.81 |
| N | 900.00 | 900.00 | 900.00 | 900.00 | 900.00 | 900.00 | 900.00 | 900.00 | 900.00 | 900.00 | 900.00 | 900.00 |
| R-squared | 0.32 | 0.57 | 0.22 | 0.39 | 0.73 | 0.91 | 0.15 | 0.24 | 0.11 | 0.23 | 0.77 | 0.82 |

Source: Authors' estimation from ISTAT demographic data, INAIL archive of work injuries, and the Italian Labour Force Survey (LFS-ISTAT), years 2009-2017. Second-stage estimations. Robust standard errors in parentheses. Asterisks denote statistical significance at the 1(***), 5(**) or 10(*) percent level.

# 6 Appendix

Table 5: Descriptive Statistics: Native workers' injuries and migrant shares by province

| | Native | | | | Foreign-born | | | |
| | **Men** | | **Female** | | **Men** | | **Female** | |
| Year | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
|---|---|---|---|---|---|---|---|---|
| **2009** | | | | | | | | |
| Share of Migrants (% of residents) | 6.83 | 3.54 | 7.52 | 3.06 | 6.83 | 3.54 | 6.83 | 3.54 |
| Injury rate (% of workers) | 3.76 | 1.28 | 2.72 | 0.66 | 6.03 | 4.99 | 6.03 | 4.99 |
| Injury rate (% of residents) | 2.38 | 1.26 | 1.19 | 0.58 | 6.15 | 5.85 | 6.15 | 5.85 |
| Death % | 0.29 | 0.14 | 0.05 | 0.05 | 0.32 | 0.39 | 0.32 | 0.39 |
| **2010** | | | | | | | | |
| Share of Migrants (% of residents) | 7.33 | 3.70 | 8.23 | 3.28 | 7.33 | 3.70 | 7.33 | 3.70 |
| Injury rate (% of workers) | 3.72 | 1.29 | 2.74 | 0.67 | 5.30 | 3.25 | 5.30 | 3.25 |
| Injury rate (% of residents) | 2.32 | 1.22 | 1.19 | 0.58 | 5.65 | 5.25 | 5.65 | 5.25 |
| Death % | 0.29 | 0.16 | 0.05 | 0.06 | 0.44 | 0.69 | 0.44 | 0.69 |
| 2011 | | | | | | | | |
| Share of Migrants (% of residents) | 7.79 | 3.84 | 8.97 | 3.52 | 7.79 | 3.84 | 7.79 | 3.84 |
| Injury rate (% of workers) | 3.47 | 1.21 | 2.58 | 0.59 | 4.81 | 3.03 | 4.81 | 3.03 |
| Injury rate (% of residents) | 2.16 | 1.18 | 1.13 | 0.57 | 5.14 | 4.71 | 5.14 | 4.71 |
| Death % | 0.28 | 0.15 | 0.06 | 0.07 | 0.37 | 0.51 | 0.37 | 0.51 |
| **2012** | | | | | | | | |
| Share of Migrants (% of residents) | 6.89 | 3.37 | 8.33 | 3.34 | 6.89 | 3.37 | 6.89 | 3.37 |
| Injury rate (% of workers) | 3.13 | 1.08 | 2.41 | 0.59 | 4.30 | 2.77 | 4.30 | 2.77 |
| Injury rate (% of residents) | 1.96 | 1.05 | 1.07 | 0.51 | 5.12 | 3.93 | 5.12 | 3.93 |
| Death % | 0.31 | 0.16 | 0.05 | 0.06 | 0.40 | 0.60 | 0.40 | 0.60 |
| **2013** | | | | | | | | |
| Share of Migrants (% of residents) | 7.48 | 3.51 | 8.96 | 3.49 | 7.48 | 3.51 | 7.48 | 3.51 |
| Injury rate (% of workers) | 2.95 | 1.01 | 2.33 | 0.56 | 3.86 | 2.32 | 3.86 | 2.32 |
| Injury rate (% of residents) | 1.80 | 0.97 | 1.02 | 0.51 | 4.29 | 3.47 | 4.29 | 3.47 |
| Death % | 0.31 | 0.17 | 0.05 | 0.08 | 0.44 | 0.55 | 0.44 | 0.55 |
| **2014** | | | | | | | | |
| Share of Migrants (% of residents) | 8.28 | 3.78 | 9.85 | 3.76 | 8.28 | 3.78 | 8.28 | 3.78 |
| Injury rate (% of workers) | 2.82 | 0.98 | 2.27 | 0.55 | 3.59 | 2.19 | 3.59 | 2.19 |
| Injury rate (% of residents) | 1.69 | 0.92 | 0.99 | 0.50 | 3.59 | 2.93 | 3.59 | 2.93 |
| Death % | 0.31 | 0.21 | 0.05 | 0.07 | 0.38 | 0.58 | 0.38 | 0.58 |
| **2015** | | | | | | | | |
| Share of Migrants (% of residents) | 8.42 | 3.74 | 10.04 | 3.81 | 8.42 | 3.74 | 8.42 | 3.74 |
| Injury rate (% of workers) | 2.70 | 0.95 | 2.17 | 0.52 | 3.46 | 2.19 | 3.46 | 2.19 |
| Injury rate (% of residents) | 1.63 | 0.88 | 0.96 | 0.48 | 3.43 | 2.72 | 3.43 | 2.72 |
| Death % | 0.37 | 0.23 | 0.06 | 0.08 | 0.41 | 0.60 | 0.41 | 0.60 |
| **2016** | | | | | | | | |
| Share of Migrants (% of residents) | 8.49 | 3.63 | 10.09 | 3.82 | 8.49 | 3.63 | 8.49 | 3.63 |
| Injury rate (% of workers) | 2.69 | 0.93 | 2.17 | 0.51 | 3.46 | 2.17 | 3.46 | 2.17 |
| Injury rate (% of residents) | 1.63 | 0.88 | 0.97 | 0.49 | 3.61 | 3.07 | 3.61 | 3.07 |
| Death % | 0.31 | 0.16 | 0.05 | 0.07 | 0.32 | 0.39 | 0.32 | 0.39 |
| **2017** | | | | | | | | |
| Share of Migrants (% of residents) | 8.65 | 3.56 | 10.15 | 3.81 | 8.65 | 3.56 | 8.65 | 3.56 |
| Injury rate (% of workers) | 2.63 | 0.90 | 2.15 | 0.51 | 3.53 | 2.35 | 3.53 | 2.35 |
| Injury rate (% of residents) | 1.61 | 0.88 | 0.97 | 0.51 | 3.60 | 2.85 | 3.60 | 2.85 |
| Death % | 0.29 | 0.16 | 0.06 | 0.07 | 0.36 | 0.50 | 0.36 | 0.50 |
| **Total** | | | | | | | | |
| Share of Migrants (% of residents) | 7.78 | 3.68 | 9.13 | 3.65 | 7.78 | 3.68 | 7.78 | 3.68 |
| Injury rate (% of workers) | 3.11 | 1.16 | 2.39 | 0.62 | 4.28 | 3.08 | 4.28 | 3.08 |
| Injury rate (% of residents) | 1.92 | 1.08 | 1.05 | 0.53 | 4.53 | 4.14 | 4.53 | 4.14 |
| Death % | 0.31 | 0.18 | 0.05 | 0.07 | 0.38 | 0.54 | 0.38 | 0.54 |
| **Obs** | | | | 4000 | | | | |

Source: Authors' estimation from ISTAT demographic data, the INAIL archive of work-related accidents, and the Italian Labour Force Survey (LFS-ISTAT). Province-level data are weighted by the native worker population.