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DISCUSSION PAPER SERIES

IZA DP No. 12510

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Evidence from Italian Administrative Data**

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JULY 2019

## DISCUSSION PAPER SERIES

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# Immigration and Work-Related Injuries: Evidence from Italian Administrative Data

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JULY 2019

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## ABSTRACT

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# Immigration and Work-Related Injuries: Evidence from Italian Administrative Data\*

There is growing evidence that foreign-born workers are over represented in physically demanding and dangerous jobs with relatively higher injury hazard rates. Given this pattern, do increasing inflows of foreign-born workers alleviate native workers' exposure to injuries? This paper provides evidence of the effects of immigration on the incidence and severity of work-related accidents. We combine administrative data on work-place accidents in Italy with the Labour Force Survey from 2009 to 2017. Our approach exploits spatial and temporal variation in the distribution of foreign-born residents across provinces. Using province fixed-effects and an instrumental variable specification based on historical settlements of immigrants, we show that inflows of foreign-born residents drive reductions in the injury rate, paid sick leave, and severity of impairment for natives. Next, we investigate potential underlying mechanisms that could drive this effect, such as increased unemployment and selection of the workforce, and the sorting of native workers into less physically demanding jobs. Our results rule out that decreased injuries are driven by higher native unemployment. We find that employment rates are positively associated with immigration, in particular for workers with higher education. While not statistically significant at conventional levels, we also find that average occupational physical intensity for natives is lower in provinces that receive larger foreign-born inflows.

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

**Keywords:** immigration, labour-market flexibility, work-related injuries, health

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# 1 Introduction

Injuries and work-related illness cost the European Union 3.3% of its GDP (EU-OSHA 2018). In its most recent statistics, Eurostat (2017) reported a total of 3.2 million non-fatal accidents at work in the EU-28 during 2015. Injuries are costly not only due to direct medical care expenses, but also in terms of lost productivity and higher risk premiums. Recent research shows that less generous medical care compensation for injured workers translates into a drop in post-recovery earnings for the affected workers (Powell and Seabury, 2018). National statistics and the epidemiological literature provide increasing evidence that foreign-born workers are over-represented in physically demanding jobs in many host economies. This is accompanied by a relatively higher exposure to injury-risk than native workers (Orrenius, 2012). In the last decade, Europe has been receiving growing inflows of foreign-born workers and the consequences of immigration are at the centre of its political debate. Because foreign-born workers tend to sort into more demanding occupations, their increasing presence in labour markets may contribute to a decline in native workers' injuries. Our study provides an empirical contribution to the scarce literature that studies immigration and health outcomes. More specifically, our work estimates that immigration alleviates native workers' injury rates and the severity of these injuries, measured by prescribed paid sick leave and the degree of impairment. To the best of our knowledge, this is the first paper that analyses the impact of immigration on the occupational injury rate and severity for native workers.

This study is based on administrative data on occupational injuries and immigration in Italy. Figure 1 reports the share of work-related injuries among the foreign-born and native employed population resident in Italy between 2009 and 2017. A significant gap between the two demographic groups is evident: the former has an injury rate between 0.3 and 1 percentage points higher than the latter. While the difference has been shrinking over time, injuries are still approximately 25% higher for migrants in 2017. The overexposure to risk for immigrant workers in Italy has been documented in numerous studies (Giraud et al., 2017; Bena and Giraud, 2014; Salvatore et al., 2013). Figure 2 plots natives' injuries per 100 workers on a larger scale, together with the evolution of the migrant population in the country since 2009 on the opposite axis. The figure shows a decrease in natives' injuries by 30% of its initial value. This trend is mirrored by an increase in the presence of foreign-born residents in the country. Italy has been receiving large and increasing migration inflows in the last decades. The share of working-age foreign-born residents in Italy has grown from 7% of the respective native population in 2009 to more than 10% in 2017. Most immigrant workers in Italy

have low education and find employment in low-skill sectors (Bratti and Conti, 2018). A lower risk aversion or risk perception, a comparative advantage in health endowments, lower bargaining power, and limited outside options may determine the higher exposure of foreign-born workers to work-related accidents compared to native workers (Orrenius and Zavodny, 2009). While these figures represent only national-level correlations, they help to introduce our main research question: given that migrants hold riskier jobs, does their increasing presence in the labour market contribute to alleviating the incidence and severity of work-related accidents amongst natives?

The degree of substitution between migrants and natives in the labour market is a well debated question in the literature. In a basic supply and demand model, a labour supply shock of additional migrant inflows would affect negatively the labour market outcomes of competing native workers. However, many studies find that immigrant inflows have small or no empirical effects on natives' outcomes (Card, 2005; Borjas et al., 2008; Dustmann and Frattini, 2014). A growing body of literature suggests that one potential explanation for the limited impact on wages and employment is that immigration may 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 occupations that require more communication-intensive skills, where they have a comparative advantage over foreign-born workers. In particular, Foged and Peri (2016) analyze the context of Denmark and find that inflows of refugees distributed through a dispersal policy caused a shift towards less manual-intensive occupations for low-skilled native workers. Most of the existing empirical evidence focuses on the impact of immigration on natives' wages and earnings. However, a reallocation of native workers within the labour market in response to foreign-born inflows could also have consequences in terms of health and safety of the positions held by native workers. Only a few studies have analyzed the impact of immigration on the health outcomes of natives. In the context of Germany, Giuntella and Mazzonna (2015), using the longitudinal survey GSOEP, find 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), with data from the Labour Force Survey, find that, in response to migration inflows in the years 2003-2013, medium-skilled native workers in the UK reallocated towards occupations with a lower injury risk index score and lower physical burden. The authors do not find a similar pattern for low-skilled native workers. Measuring improvements in risk exposure through changes in jobs may not allow identifying an effect if workers maintain the same occupation. Crucially, by relying for the first time on the administrative data of work-related accidents, our analysis overcomes this limitation

and provides a novel contribution.

The literature that analyses the effect of immigration on natives in Italy is limited and focuses predominantly on the labour market (Bratti and Conti, 2018; Giuntella, 2012). Staffolani and Valentini (2010) find a positive impact of immigration on native workers' wages. Mocetti and Porello (2010) show that immigration correlates positively with inter-regional inflows of native skilled workers and negatively with low-skilled ones, especially along the South-North internal trajectory. Using data from the Italian Labour Force Survey of 2007, Salvatore et al. (2013) shows that male migrants self-report significantly higher rates of work injuries than natives, especially in the construction sector. To the best of our knowledge, there are no studies providing causal evidence on the relationship between the presence of foreign-born workers and occupational injuries of native workers. We explore not only whether the presence of foreign-born workers has an effect on natives' injury rates, but also on their severity.

We combine administrative data of workforce injuries from the National Institute for Insurance Against Accidents at Work (INAIL), with the Italian Labour Force Survey (LFS) data, and the flow of foreign-born residents recorded by the Italian National Statistical Office (ISTAT), from 2009 until 2017. A common concern in the analysis of the consequences of immigration is that the concentration of the foreign-born across provinces may be endogenous with respect to the labour demand. Residency decisions may directly or indirectly correlate with local labour market conditions, including health and safety of the work environment. We address these endogeneity issues in two ways. First, we include province and year fixed effects in our model, to rule out province-specific fixed characteristics and year-specific shocks to the economy. Secondly, we employ the widely used "shift-share" instrument à la Card (2001), which relies on imputing the share of foreign-born residents of a province from historical settlements by country of origin. Past distribution shares provide the weights that we use to allocate recent yearly national migration inflows across provinces. The macroeconomic conditions of the period under analysis also support the assumption that the impact of immigration does not simply mirror underlying labour demand trends. As shown in Figure 3, employment rates decreased during the Great Recession that followed the Financial crisis of 2007-2008, and recovered afterwards. The share of immigrants increased continuously under both economic conditions, and the injury rate of native workers maintained a declining trend.

We find that immigration reduces the rate of natives work-related accidents and their severity, measured by the number of sick days off work and the degree of impairment. In addition to a shift in natives' occupations, a decrease in native workers' injuries may also reflect an allocation of

foreign-born workers towards riskier tasks within the same job. Unfortunately, a lack of data on the specific tasks performed by employees means we are unable to directly investigate this channel or to disentangle a migrant-native reallocation in terms of occupations. However, our analysis addresses an important channel: it rules out that a reduction in native injuries is driven by an increase in natives' unemployment. We find not only that employment rates respond positively to migrant inflows, but also in greater magnitude for highly educated workers. One interpretation of our results is that a relative increase in the share of workers with higher levels of education translates into an improvement in terms of workers' health safety. Consistently, while not statistically significant at the conventional level, we find that the physical intensity of jobs held by native workers is lower in provinces that receive higher migrant inflows.

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 Immigration and work injuries in Italy: data and facts

Our study combines administrative data from (i) the registry of work-related injuries collected by the Italian National Insurance Institute for Employment Injuries (INAIL), (ii) the cross-sectional Labour Force Survey “Rilevazione sulle Forze di Lavoro” of the Italian National Statistical Office (LFS-ISTAT) between 2009 and 2017, and (iii) the ISTAT municipal registry of foreign-born and Italian residents, for the years 1990 and 2009-2017. 1990 is the most remote year for which there is data on residence permits by country of origin and province. Unfortunately, LFS data prior to 2009 cannot be used because the province variable is missing. We restrict our analysis to the working age population (16-65 years).

The National Institute of Occupational Insurance (INAIL) provides compensation for occupational accidents, health complications, and work-related illnesses suffered by workers resident in Italy. Its administrative archive contains information about basic demographic characteristics of injured workers (age, gender, country of birth), work location (province), sector, whether the accident happened at work or while traveling, dates of occurrence and notification, days of absence for sickness prescribed by the doctor, and the degree of impairment.<sup>1</sup> The Italian Law mandates that

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<sup>1</sup>Information about the European directives on safety and health at work can be found here:



all accidents that cause at least one day of absence are reported within 48 hours of receipt of the medical certificate, and all fatal accidents are reported within 24 hours of receipt of the medical certificate. This applies to all employers, including those with alternative or private insurance policies and including the public sector. Sanctions for notification delays range between 548 (the lowest amount for one-day accidents) and 4,932 euros (maximum for injuries with more than three days of absence).<sup>2</sup> 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 304,687 and 68,388 respectively. 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-level injury and employment data for the full population of workers, we perform the analysis at province level. We calculate the injury rate by province of employment  $p$  in year  $t$  (2009-2017) as follows:

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

The denominator in Equation 1 takes into account the total employed native-born population of a province, computed from the LFS. 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 native and foreign-born workers, by province of residence, for each year of the sample period studied, weighted according to the provided sampling procedure. Sampling weights allow us to obtain to a sample that is representative at the national level for the native and foreign born population, and at the province level for the number of employed natives.<sup>3</sup> We follow ISTAT's occupational status classification to distinguish 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.

The main explanatory variable in our analysis is the share of foreign born residents among the province population.<sup>4</sup> As of January 1, 2017, the foreign-born population in Italy reached more

<https://osha.europa.eu/en/safety-and-health-legislation/european-directives>

<sup>2</sup><https://www.inail.it/cs/internet/attivita/prevenzione-e-sicurezza/promozione-e-cultura-della-prevenzione/comunicazione-infortunio.html>

<sup>3</sup>Due to its sampling design, the LFS is not representative of foreign born migrant workers by province and does not allow us to calculate their employment share nor injury rate at this administrative level.

<sup>4</sup>Notice that population data is recorded by citizenship, while we construct the number of workers by differentiating

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). It is important to note that incoming migrants without a regular work/residence permit are not included in municipal registries. Irregular migrants may also have a lower likelihood of being reported to INAIL in case of an accident. As highlighted by [Bratti and Conti \(2018\)](#), however, the spatial distribution and the ratio of irregular migrants in Italy are highly correlated with those of regular migrants, within provinces and over time. [Bianchi et al. \(2012\)](#) provide evidence of this by analyzing the regularization episodes that took place in 1995, 1998 and 2002. Similarly, it is possible that the number of accidents for natives is biased due to the presence of informal workers who are less likely to report their accidents. Unfortunately, we do not have any data to estimate the injury rates amongst informal workers or to control for the shadow economy at the province level. However, there is evidence that the incidence of the shadow economy on added values has been relatively stable at the sector level in the past decade ([ISTAT, 2018](#)). Native workers may also under report minor injuries because of the increased job competition with foreign-born workers. In this case, the severity of the reported injuries would be higher in provinces where immigration is greater. Instead, we find reassuring results regarding the possibility of differential under-reporting across provinces. As we show in Section 4, we find that the severity of injuries decreases with immigration, both for overall accidents and for those with permanent impairment. Under-reporting may thus still be present but should lead only to an underestimation of the reduced form impact due to measurement error.

Figure 3 reports the share of men and women aged 15-65 who are employed, from 2009 until 2017. We observe that the shares decline until 2014, corresponding to the economic crisis (recovering in 2012 for women but declining again), and start to increase again afterwards. The decline in employment could partially explain the contemporaneous decline in injury rates among natives, if selection in the labour market occurred. It is worth noticing that, as employment rates recover, the natives' injury rates maintain their downward sloping trend (while they stabilize and slightly increase again for migrants), as shown in Figure 1.

Because information on foreign-born residents by province and country of origin in 1990 (our 

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Italians from individuals with a foreign country of origin. This is consistent with the expectation of differential labour market conditions due to native versus foreign origin ([Hamermesh, 1997](#)). We compute the number of employees in the province where they perform their main occupation, while migrant shares refer to the province in which foreign-citizens register their residence.

baseline for the instrumental variable estimation) is not broken down by sex, we perform the analysis by pooling men and women together. Table 1 reports descriptive statistics for the sample of 91 provinces across the nine years of analysis.<sup>5</sup> The average foreign-born share of the local population is 8.44%, ranging between 1 and 17%. The province-level mean injury rate for native workers is 2.47%. The average number of sick leave days prescribed by a doctor among province accidents is 27 for all injuries and 92 for those with a permanent impairment (“severe” injuries). The degree of impairment is measured by an index that ranges between 0 and 100, increasing in severity. We replace as missing all cases that have not yet received a final official evaluation. The average province-level degree of impairment is 1.29 for all native injuries and 7.39 when restricted to severe injuries.

### 3 Empirical strategy

The objective of our analysis is to investigate whether the presence of migrants affects native workers’ occupational injuries and their severity. We identify the relationship between immigration and the injury rate 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 fixed-effects estimations:

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

$INJ_{p,t}^{nat}$  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.  $\alpha_p$  and  $\eta_t$  are province and time fixed effects. Migrants may choose to locate in administrative provinces whose characteristics correlate with the degree of occupational health safety. For example, a growing labour demand attracting more migrants may also be associated with an increase in the share of labor force that has less experience in terms of workers’ safety or with more frequent overtime shifts, and this could lead to higher injury hazard rates. In order to tackle this source of endogeneity, we instrument the share of resident migrants in the local labour market based on historical settlements and networks, following the “shift-share” approach (Card, 2001), extensively employed in the literature. The rationale behind this strategy is that the initial distribution of migrants across provinces is independent of future changes in the local labour market conditions. By constructing an instrumental variable based on

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<sup>5</sup>In order to obtain consistent units of analysis over our period of study, we reclassified the 107 current local administrative units into 91 provinces, grouping together those that new legislative settings aggregated or separated.

historical shares by area of origin, the estimation captures the variation of migrant shares which is due to country of origin network-related 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:

$$\hat{M}C_{c,p,t} = ShM_{c,p,1990} * FlowM_{c,t} + StockM_{c,p,1990} \quad (3)$$

$ShM_{c,p,1990}$  is the share of migrants from origin  $c$  settled in province  $p$  on 1st January 1990 (not distinguished by sex). To obtain the imputed number of migrants from origin  $c$  in province  $p$  at time  $t$  ( $\hat{M}C_{c,p,t}$ ), we multiply the national-level inflows of migrants at time  $t$  by area of origin  $FlowM_{c,t}$  by their “historical” (year 1990) province-level shares, and then we add the initial (1990) stock of migrants from  $c$  in  $p$ .

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

$$\hat{M}_{p,t} = \sum_c (\hat{M}C_{c,p,t}) / Pop_{p,t} \quad (4)$$

We then 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  $\hat{M}_{p,t}$ . Our main dependent variable is the share of injuries among the working-age, native-born population. However, we also estimate the impact of immigration on the severity of work-related accidents. We measure the severity of injuries using (i) the degree of impairment and (ii) the average number of sick leave days prescribed in the province. Then, we restrict the estimations to those injuries that INAIL classifies as conveying any degree of permanent impairment (“severe” injuries).

Next, our analysis moves to a discussion of the potential underlying mechanisms that may convey a reduction in native workers’ injury rates and in their severity. In particular, we investigate whether there is selection in the denominator (i.e. the workforce upon which we compute the injury rate) in terms of education and unemployment, and a decrease in the degree of physical intensity of native workers’ occupations. Using the same specification and dimension of analysis, we study the impact of immigration on (i) a measure of job physical demand, and (ii) employment rates for native workers at the province level.

## 4 Results

### 4.1 Foreign-born resident inflows and native workers' injuries

This section presents the estimates of the impact of immigration on the incidence of native workers' injuries. The main outcome - injury rate - is constructed as the proportion of all yearly injuries amongst individuals aged 16-65, by province, suffered by native-born residents. The main explanatory variable is the share of immigrants among the total number of residents within a province, in a given year (2009 to 2017). Table 2 reports the results that we obtain by estimating Equation 2 including province-specific fixed-effects and year fixed effects with robust standard errors (Column 1), standard errors clustered at the province level (Column 2), the two-stage least squares (2SLS) instrumental variable estimations (Column 3), and its first stage (Column 4). The OLS regression with province and year fixed effects shows a negative relationship between the share of foreign born residents and the injury rate of native workers at the province level. The coefficient for immigration is statistically significant at the 5% level. In Column 2, it is not statistically significant. When we instrument the share of migrants with the share imputed through historical settlements, we find a drop in work-related injuries that is statistically significant at the 10% level. More specifically, an increase in the share of foreign born residents by 10 percentage points corresponds with a reduction in the injury rate of native workers by 2.1 percentage points. This represents a drop of 8.5% with respect to a mean hazard rate of 2.47. The instrumental variable estimation addresses the concern that migrant location directly or indirectly correlates with contemporaneous changes in the labour market conditions that include natives' exposure to injury risk. As explained in Section 3, we adopt the "shift-share" or network-based instrumental variable approach (Card, 2001), based on 1990 settlements by continent of origin, weighting the origin-specific number of residents by year by their historical distribution across provinces, and summing all areas of origin. The first stage coefficient shows a positive and significant prediction. The specific F-test for the "shift-share" instrument is slightly below the critical value of 10 (8.19).

Some recent contributions to the literature raise two main concerns regarding the use of this class of instruments, namely that historical distributions of migrants across provinces by country of origin may not be exogenous, and also that inflows of migrants by country of origin may be too persistent (Jaeger et al., 2018). This implies that the observed impact may in fact conflate long-term and short-term effects. As suggested by Brunello et al. (2019), the choice of using 1990 data to construct the initial composition of migrant shares by country of origin presents two advantages that

mitigate these concerns. 1990 precedes the Maastricht Treaty that established freedom of movement across the European Union for its citizens. Second, it predates the enlargement of the EU (2004-2007) to countries such as Poland, Romania, and Bulgaria, which now constitute a large share of the stock of foreign-born residents in Italy. It also predates the breakup of Yugoslavia and the Balkan Wars which increased refugee inflows. Figure A.4 in Appendix shows that the composition of migrants in 1990 by continent of origin was very different to the current picture. A sharp increase in the presence of Eastern Europeans is evident, while the relative presence of migrants from North Africa, the rest of Africa, and North America have relatively declined. In order to address the concern that long-term effects may confound short-term responses to immigration (Jaeger et al., 2018), as a robustness check we include the lag of the instrument in the main regression. Table A.6 in Appendix displays the results: the coefficient for the migrant share remains negative and statistically significant for injury rates and for the degree of impairment.

## 4.2 The severity of work injuries: paid sick leave and degree of impairment

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 two additional outcomes: the average degree of impairment (1-100) and the average number of days away from work that doctors assign to the injured workers, (i) for all injuries and (ii) by selecting only those accidents that are classified with a degree of *permanent* impairment (“severe” injuries). Table 3 presents the results of the 2SLS second stage instrumental variable estimation. We find that a higher share of immigrants in the province implies a decrease in all indicators of severity. In particular, a one percentage point increase in the share of foreign-born citizens decreases the average paid sick leave days prescribed by the doctor by almost two days, with statistical significance at the 5% level. The effect corresponds to 7% of a province average. For severe injuries, the impact is of 8.5 days (9% of the mean) and a decrease by 0.4 degrees in impairment (6% of the mean value), both significant at the 10% level.

Our estimations show that not only does the share of injuries among workers decline, but also their severity falls in response to immigration. The decrease in severity is not only an important result per se, but also because it reassures against the possibility of relatively higher misreporting of injuries in provinces where greater inflows of foreign-born residents may induce a higher competition for jobs in the labour market. If labour supply shocks made natives more likely to hide injuries in order to keep their job, we would observe an increase in the severity of the reported injuries: accidents with more severe impairment are less easy to neglect and hide because they prevent from

working and because of strict law enforcements and penal responsibilities for the employers. On the contrary, we find that the severity decreases, supporting the hypothesis that there is no selective under-reporting in provinces with higher immigration.

### **4.3 Discussion of the mechanism. Job physical intensity, employment rates, workforce selection, and reallocation of injury risk**

Basic theoretical predictions of the impact of immigration on host labour markets in a partial equilibrium model imply that an increase in foreign-born labour supply should affect competing workers through a decrease in wages (Borjas et al., 2008). The impact hinges crucially on the degree of substitution between migrant and native workers in specific segments of the labour market, which the literature has thoroughly debated but still produces contradictory empirical results (Dustmann et al., 2016; Ottaviano and Peri, 2012). One key implication of the theory is that potential downward pressure on wages generates an incentive for native workers to relocate into occupations characterized by relatively higher abstract, communication and institutional or local norm-based content, in which they have a comparative skill advantage over foreign-born workers. This hypothesis has found increasing evidence in areas of relatively high job flexibility such as the US (Peri and Sparber, 2009), Denmark (Foged and Peri, 2016), the UK (Giuntella et al., 2018), and in a large set of European countries (DAmuri and Peri, 2014). Similarly to the impact on wages, labour supply shocks may affect working conditions in a broader sense, including employees' bargaining power in the definition of shifts and working hours and other conditions that may contribute to determining workers' exposure to injury risk. The degree to which native workers can upgrade towards less demanding occupations is a potential mediator for the impact of immigration on work-related injuries, both through a pressure on wages and through potentially worsened working conditions. To address the mechanism of a reallocation of migrant and native workers between physically intensive jobs, we map three-digit isco88 and isco08 occupation codes into a 1-10 scale of physical demand using the General Index for Occupational Physical Intensity (OPI) constructed by Kroll (2016).<sup>6</sup> First we show that foreign-born workers are more likely to experience a higher OPI. Then, we investigate whether native workers tend to concentrate into occupations with lower physical demands in response to immigration. In Table 5, we show that foreign-born workers sort

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<sup>6</sup>The index combines information on working conditions such as exposure to gas emissions, dust, working in extreme temperatures or immersion in wet environments, and the performance of demanding tasks such as heavy load carriage/lifting, etc.

into occupations with higher OPI than natives, using individual level data from the LFS. The estimates show that foreign-born men are likely to experience a 30% higher OPI index with respect to a mean value of 6 points (all estimates control for province, year, and trimester fixed effects, and Column 2 controls for basic demographic characteristics such as age, education, marital status, and family composition). Columns 3 and 4 of Table 5 report fixed-effects and two stage least squares estimations of province-level average native workers' OPI in response to foreign-born inflows, as from Equations 2 and 4. The coefficients for the migrant share variable are not statistically significant at standard levels. However, they have a negative sign which is consistent with the hypothesis of job reallocation for native workers. An increase in the share of foreign-born residents in a province is associated with a lower average physical demand for native worker's occupations.

Even in absence of job reallocation, native workers may benefit from migrant inflows if those migrants perform the riskier tasks within a firm. As suggested by [Orrenius \(2012\)](#), this may occur due to lower bargaining power, limited outside options, different risk perception, different risk aversion, or language barriers. The ability to identify an impact on native workers' injuries independently from their occupational shifts constitutes an important contribution of this paper to the literature. This is possible thanks to the use of universal injury data in Italy. As the coefficients and standard errors reported in Table 5 show, we would have not detected a statistically significant effect of immigration on natives' injuries if the analysis relied on the physical demands of their occupations.

The decrease in injury rates and in their severity may be due to a selection of the workforce in provinces that receive higher inflows of foreign-born workers. In other terms, the effect may be driven by an increase in natives' unemployment and a resulting positive selection in terms of education or skills of the remaining employed population. In order to address this potential channel, we analyze changes in unemployment and in the composition of the employment rate by education. Our findings rule out that the effect is driven by an increase in natives' unemployment. In fact, we detect the opposite dynamic of higher employment rates where foreign-born shares are higher, and this is particularly true for the fraction of the population with tertiary education. Table 4 reports the results: a one percentage point increase in migrant shares increases employment rates by 2.3 and 1.2 percentage points respectively among the population with tertiary and with secondary or lower education (see Columns 2 and 4 with 2SLS results).<sup>7</sup> Consistently, the coefficient is also positive and statistically significant when the dependent variable is the share of workers with high

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<sup>7</sup>Results from a regression on the *unemployment* rate are totally consistent and available upon request.



education (1.3 pps increase). A positive selection of the workers in terms of education is consistent with a decrease in the injury rate both because highly educated workers usually work in occupations characterized by lower physical demand and injury risk exposure (Giuntella et al., 2018). Education may also be positively associated with a stricter implementation of safety measures and a reduction in risky behaviours.

Our findings of increased employment and in the share of highly educated workers are consistent with two hypotheses that have been confirmed empirically in the literature. On one side, individuals with higher education may increase their labour force participation in response to larger shares of foreign-born workers taking up service occupations. This is particularly true for high skilled female workers that may substitute time away from home production activities as their supply becomes relatively more available and less expensive in the market (Cortes and Tessada, 2011). Second, a change in the composition of a provinces workforce may also be due to internal migration dynamics. In particular, less educated or low-skilled workers may be less likely to move to, or stay in, provinces where migrant shares increase. Mocetti and Porello (2010) show that this is indeed the case for local labour markets in Italy. They find that the internal migration of highly-educated natives is positively associated with the concentration of foreign-born, while low educated natives experience the opposite dynamic. In particular, foreign-born inflows substitute low-educated natives' South-North trajectory.

## 5 Conclusion

Our analysis supports the hypothesis that inflows of foreign-born residents of working age reduce the likelihood and severity of job-related injuries amongst native workers. We detect that a ten percentage point increase in the share of migrants reduces the injury rate by 2 percentage points, 8.5% of its mean value. Furthermore, prescribed sick leave declines by 2 days for overall injuries, and 8 days for those with a permanent impairment (7-8% of the mean). This work shows that immigration can have a positive effect on native workers by reducing their injury rate and severity. The existing literature shows that, in the UK, middle-skilled natives shift towards jobs with a lower injury risk (Giuntella et al., 2018), away from manual-intensive tasks, and, in Nordic countries, towards a higher communication-based component as a result of migration (Foged and Peri, 2016; Peri and Sparber, 2009). Our study contributes to this literature by estimating the impact of immigration on native workers' health, with an additional innovation: we rely on the complete

archive of labour market injuries, using administrative data. This feature crucially allows an identification of the effect independently from the effect on job reallocation of native workers. We show the existence of an immigrant-native injury gap that absorbs a significant part of the reduction in natives' accidents. Importantly, we rule out that improvement in accident rates for native workers is driven by higher unemployment, and/or by selective layoffs in terms of education for the native labour force. On the contrary, we find an increase in the employment rate of native individuals with a tertiary school diploma, and also those with lower education. The effect is higher for the former population. Our results can indeed be explained by a positive selection of the labour force in provinces with higher foreign-born inflows, if more educated workers select into jobs with lower physical intensity. Potential avenues for future research building on our findings include a deeper scrutiny of the mechanisms behind these results. Providing access to individual-level data such as matched employer-employee archives would help to shed further light on changes in risk exposure both at the worker and at the firm level. Additionally, future research may focus on migrants sorting into riskier jobs and address the role of language-related communication issues and selection based on risk aversion and discrimination.

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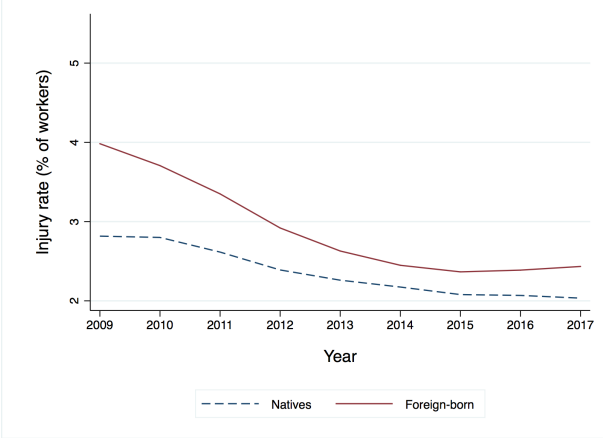
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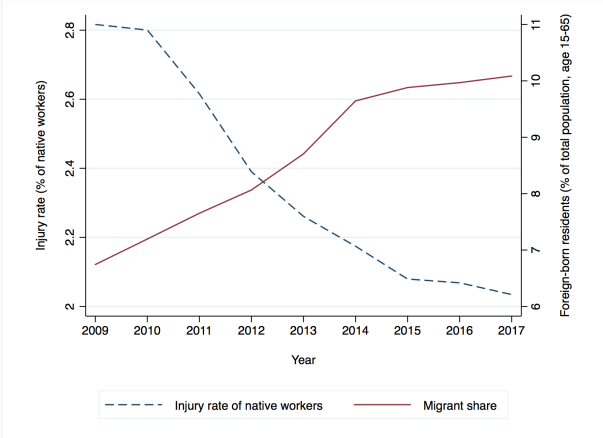
# Tables and Figures

Figure 1: Injury rate in the foreign-born and the native employed population (16-65) in Italy



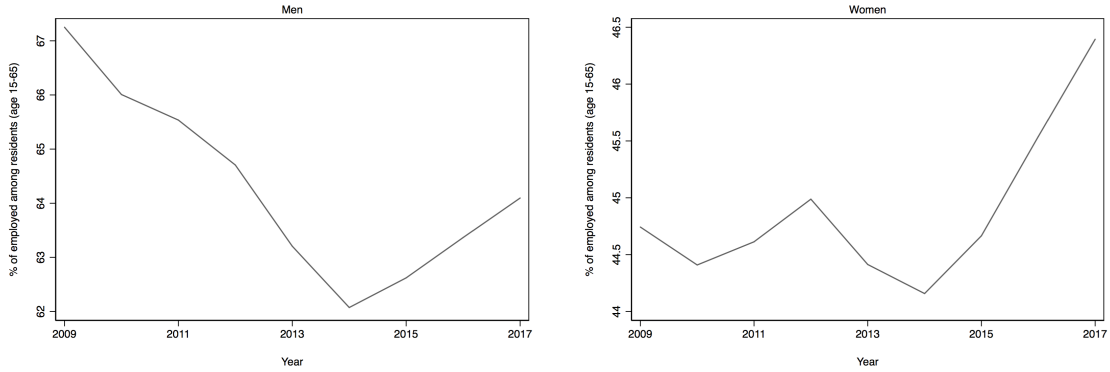
Source: Authors' estimations from ISTAT demographic data, LFS-ISTAT, and the INAIL archive of work-related accidents.

Figure 2: Injury rates among native workers (16-65) and share of foreign-born residents in Italy



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

Figure 3: Native workers (% of resident population) in Italy (age 16-65)



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

Table 1: Descriptive statistics, Italian provinces (2009-2017)

	N	Mean	SD	Min	Max
Foreign-born Share	819	8.44	3.95	1.02	17.04
Injury Rate (% of Workers)	819	2.47	0.80	0.87	5.66
Injury Rate (% of Residents)	819	1.42	0.63	0.32	3.97
<b>Severity</b>					
Sick Leave Days per Accident	819	27.11	5.28	13.35	45.55
Degree of Impairment per Accident	819	1.29	0.49	0.36	3.57
Days (severe)	819	92.04	15.21	53.30	168.55
Impairm.(severe)	819	7.39	0.95	4.19	11.20

Source: Authors' estimation from ISTAT demographic data, INAIL archive of work injuries, and the Italian Labour Force Survey (LFS-ISTAT), years 2009-2017.

Table 2: Foreign-born residents and native workers' injury rates

	(1)	(2)	(3)	(4)
	OLS-FE	FE	IV	First Stage
Foreign-born Share	-0.03** (0.01)	-0.03 (0.02)	-0.21* (0.12)	
Instrument $\hat{M}_{c,p,t}$				0.28*** (0.10)
Mean Dep. Var.	2.47	2.47	2.47	8.44
StDev Dep. Var.	0.80	0.80	0.80	3.95
N	819	819	819	819
F-Stat (First Stage)				71.10
F-Stat (First Stage) Excl. Instr.				8.19

Source: Authors' estimation from ISTAT demographic data, INAIL archive of work injuries, and the Italian Labour Force Survey (LFS-ISTAT), years 2009 to 2017. All regressions include province and year fixed effects and control for the log of province GDP. Standard errors in parentheses are clustered at the province level, except for column (1) in which they are robust. Asterisks denote statistical significance at the 1(\*\*\*), 5(\*\*) or 10(\*) percent level.

Table 3: Foreign-born residents and the severity of natives' injuries (2SLS - Second Stage)

	(1)	(2)	(3)	(4)
	All Injuries		Severe Injuries	
	Mean days	Impairment	Mean days	Impairment
Foreign-born Share	-1.939** (0.969)	-0.090 (0.058)	-8.489* (4.808)	-0.415* (0.251)
Mean Dep. Var.	27.113	1.295	92.039	7.386
StDev Dep. Var.	5.281	0.494	15.214	0.949
N	819.000	819.000	819.000	819.000

Source: Authors' estimation from ISTAT demographic data, INAIL archive of work injuries, and the Italian Labour Force Survey (LFS-ISTAT), years 2009 to 2017. All regressions include province and year fixed effects and the log of province GDP. "Mean days" are sick paid leave days prescribed by the doctor (avg. of municipality's injuries). "Impairment" is an index of the severity of impairment. "Severe Injuries" refers to those with a degree of permanent impairment. Robust standard errors in parentheses, clustered at the province level. Asterisks denote statistical significance at the 1(\*\*\*), 5(\*\*) or 10(\*) percent level. First stage results are in Table 2.

Table 4: Immigration, Employment, and Education

	(FE)	(IV)	(FE)	(IV)	(FE)	(IV)
	(1)	(2)	(3)	(4)	(5)	(6)
	Employment Rate				% High Edu Workers	
	High Education		Lower Education			
Foreign-born Share	0.64** (0.31)	2.30* (1.21)	0.35** (0.15)	1.23** (0.60)	0.21 (0.20)	1.34* (0.80)
Mean of Dep. Var.	75.81	75.81	54.64	54.64	18.90	18.90
StDev of Dep. Var.	7.56	7.56	10.51	10.51	3.85	3.85
N	819.00	819.00	819.00	819.00	819.00	819.00
R2	0.13		0.27		0.52	

Source: Authors' estimation from ISTAT demographic data and the Italian Labour Force Survey (LFS-ISTAT), years 2009 to 2017. FE in odd columns, IV-2SLS in even columns. Sample size is 819 (91 provinces). All regressions include province and year fixed effects, the log of province GDP, and a constant. Robust standard errors in parentheses, clustered at the province level. Asterisks denote statistical significance at the 1(\*\*\*) , 5(\*\*) or 10(\*) percent level. Results from the first stage are in Table 2.



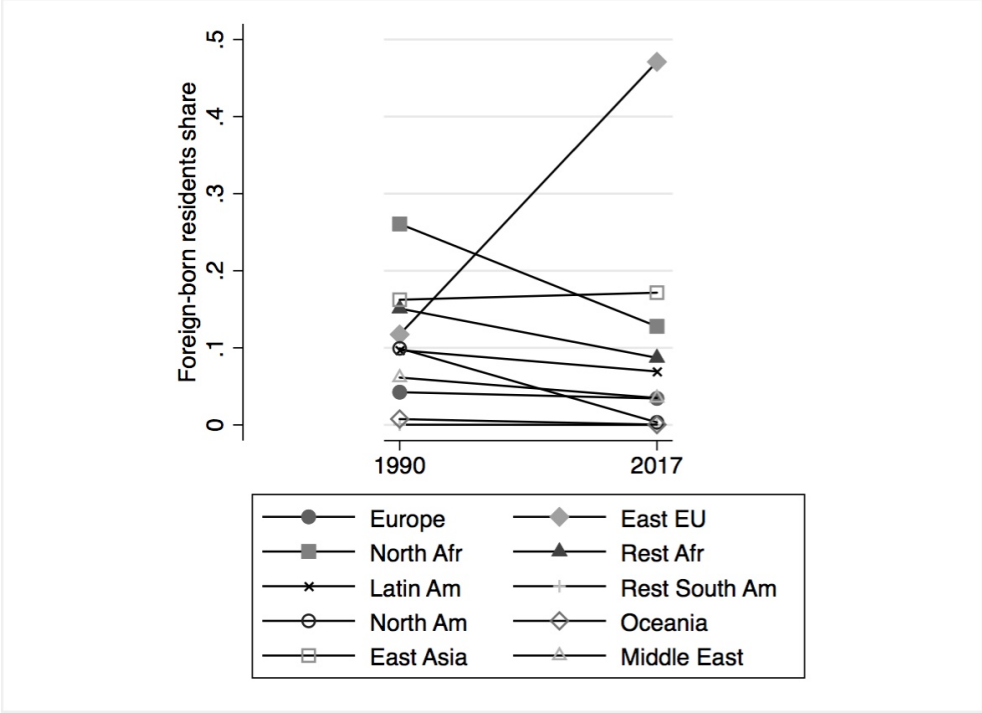
Table 5: Foreign-born and native Occupational Physical Intensity (OPI) exposure

	(1)	(2)	(3)	(4)
Dependent variable: OPI	Individual data		FE	2SLS
			Province level	
Foreign-born	2.015*** (0.005)	1.810*** (0.005)		
Female	-1.062*** (0.004)	-0.890*** (0.004)		
Migrant Share			-0.011 (0.013)	-0.053 (0.064)
Constant	6.112*** (0.007)	6.800*** (0.012)	6.624*** (2.353)	7.723** (3.263)
Mean of Dep. Var.	5.938	5.944	5.827	5.827
Trimester FE	yes	yes		
Demographic controls	no	yes		
StDev of Dep. Var.	2.794	2.791	0.367	0.367
N	1.84e+06	1.64e+06	819	819
R2	0.101	0.203	0.039	

Source: Authors' estimation from the Italian Labour Force Survey, years 2009 to 2017. OPI index ranges between 1 and 10, from lower to higher physical intensity (Kroll, 2016). All regressions include province and year fixed effects and a constant. Socio-demographic controls include age, education (tertiary vs lower) civil status (single, married, separated/divorced, widow), and family composition (single, couple with/without offspring, single mother, single father). Robust standard errors in parentheses. Columns 3 and 4 report FE and 2SLS results of the native workers' average OPI at the province level in response to foreign-born inflows, as from Equations 2 and 4. First stage results are in Table 2. Standard errors in Columns 3 and 4 are clustered at the province level. Asterisks denote statistical significance at the 1(\*\*\*), 5(\*\*) or 10(\*) percent level.

# A Appendix

Figure A.4: Shares of continent-specific residence permits in 1990 and 2017 in Italy



Source: Authors' estimations from ISTAT demographic data and 1990 residence permits by country of origin. Shares are computed as a fraction of the total foreign-born presence in Italy.

Table A.6: Immigration and work-related injuries, 2SLS. Lagged instrument

	(1)	(2)	(3)	(4)	(5)
	Injury (%)	Days of sick leave	Impairment	Days(severe)	Impairm.(severe)
Foreign-born Share	-0.243* (0.124)	-3.044 (1.856)	-0.160* (0.087)	-6.771 (4.936)	-0.394 (0.324)
<i>Instrument<sub>t-2</sub></i>	-0.005 (0.020)	0.075 (0.394)	0.021 (0.020)	-1.309 (1.127)	0.030 (0.051)
Constant	13.972** (7.128)	218.532 (138.212)	5.723 (5.334)	698.815* (377.246)	35.598 (22.581)
Mean Dep. Var.	2.320	27.231	1.312	91.698	7.416
StDev Dep. Var.	0.717	5.401	0.511	14.603	0.959
N	637.000	637.000	637.000	637.000	637.000

Source: Source: Authors' estimation from ISTAT demographic data and the Italian Labour Force Survey (LFS-ISTAT), years 2009 to 2017. Sample size is 819 (91 provinces). All regressions include province and year fixed effects, the log of province GDP, and a constant. Robust standard errors in parentheses, clustered at the province level. Asterisks denote statistical significance at the 1(\*\*\*) , 5(\*\*) or 10(\*) percent level.