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## Temi di discussione

(Working Papers)

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evidence from individual perceptions in Italy

by Eleonora Porreca and Alfonso Rosolia

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# IMMIGRATION AND FEAR OF UNEMPLOYMENT: EVIDENCE FROM INDIVIDUAL PERCEPTIONS IN ITALY

by Eleonora Porreca\* and Alfonso Rosolia\*

## Abstract

We test whether the native population correctly assesses the effects of immigration on their own labour market opportunities. We relate natives' self-reported probabilities of losing or finding a job to the presence of foreign-born residents in their neighbourhood. We interpret coefficient estimates through the lens of a simple learning model that allows us to disentangle the true effect of immigration from the perception bias. Our results show that natives in employment greatly overestimate the effects of immigration on the likelihood of losing their current job, given the lack of significant true effects; native jobseekers' perceptions are instead broadly unaffected by immigration – a largely correct assessment given that no significant true effects were detected. Overestimation of the negative effects of immigration on separation rates is very much concentrated among women, the less educated, younger people, residents of smaller towns, and employees on permanent contracts; the complementary groups appear to correctly assess that immigration has at best only modest effects. We briefly discuss the implications of these findings for the interpretation of empirical work on the labour market effects of immigration.

**JEL Classification:** J2, J6, D8, D9.

**Keywords:** immigration, beliefs, labour market outcomes.

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# 1 Introduction\*

In this paper we ask whether natives correctly assess the effect of immigrants on their own labour market opportunities. In non competitive models of the labour market, beliefs and information about fundamentals define agents' behaviours such as, for example, job search intensity, on-the-job effort, or propensity to accept job offers. These in turn shape observable outcomes such as wages and employment status. Thus, holding incorrect beliefs or biased information may have real effects and lead to sub-optimal choices and outcomes;<sup>1</sup> for example, a job seeker having pessimistic views of the distribution of wage offers might set a lower reservation wage, bringing about an inefficiently high acceptance rate and a lower expected wage.

A broad body of evidence documents that in advanced countries natives are poorly informed about immigrants in their countries; they typically overestimate their amount and hold too negative views of their socio-demographic characteristics and behaviours.<sup>2</sup> Yet, little attention has been paid to the possibility that the labour market effects of immigration can be partly traced to the sub-optimal behaviour of misinformed agents rather than to traditional labour market mechanisms; empirical studies are typically cast within a standard competitive labour market framework in which wage and employment effects stem exclusively from the technological parameters governing the elasticity of substitution between different labour inputs and informational imperfections are implicitly assumed away.<sup>3</sup>

Our empirical analysis is guided by a simple learning model. Agents form beliefs about their

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<sup>1</sup>See, for example, Conlon, Pilossoph, Wiswall and Zafar (2018), Mueller, Spinnewijn and Topa (2018), Spinnewijn (2015), Kassenboehmer and Schatz (2017), Dickerson and Green (2012)

<sup>2</sup>See, for example, Card, Dustmann and Preston (2005), Senik, Stichnoth and van der Straeten (2009), Grigorieff, Roth and Ubfal (2018), Alesina, Miano and Stantcheva (2018))

<sup>3</sup>For example, Card (2001), Borjas (2003), Ottaviano and Peri (2012). The few papers that study the effect of immigration within a non competitive labour market framework also implicitly assume perfect information about fundamentals. See Ortega (2000), Epstein, Kunze and Ward (2009), Moreno-Galbis and Tritah (2016), Battisti, Felbermayr, Peri and Poutvaara (2017), Chassamboulli and Palivos (2014), Iftikhar and Zaharieva (2019)).

own future labour market opportunities combining a prior and the signal provided by available relevant data, for example recent labour market developments. The prior embeds individual perceptions about immigration, which combine what the agent thinks about both the number of immigrants and their impact on his labour market opportunities; the signal reflects instead the actual effects of the true stock of immigrants. We show that regressions of perceived own labour market opportunities on measures of the true size of the immigrant population allow estimating the overall effect of immigration on individual beliefs, that is the sum of the true effect of immigration and of the perception bias; we also show that by augmenting the control set of this regression with a rich set of observable predictors of own labour market outcomes yield an estimate of the extent of the perception bias. Therefore, the difference of the two estimates yields an assessment of the true effect of immigration. It is important to stress, however, that this latter parameter combines both the potential effect of immigration due to fundamental mechanisms in the absence of misperceptions, and the real effects stemming from behaviours driven by wrong perceptions; while our empirical strategy is able to detect the presence of a perception bias, it cannot disentangle these two elements.

We implement this approach using novel data on self-assessed future labour market transition probabilities collected by the Bank of Italy in its 2016 Survey of Household Income and Wealth. We relate these probabilities to the share of immigrants in the municipality, the smallest administrative unit in Italy. We address endogeneity concerns, whereby a better reported individual outlook might reflect unobserved positive labour demand shocks that also attract more immigrants, by means of a conventional IV strategy based on historical geographical settlements of immigrants by country of origin (Card (2001)).

We find statistically significant evidence that natives are too pessimistic about the effects of immigration on their opportunities. A one standard deviation increase in the ratio of foreign-born to Italian residents in the municipality raises the perceived separation rate over the next 12 months by at least 4 percentage points, more than one fourth of the average expected rate. The

increase is largely unjustified: we find economically modest and statistically non significant true effects of immigration. Against the widespread lack of true effects of immigration on separation rates, we detect a great deal of heterogeneity in perception bias. Residents of smaller towns, females, less educated, younger workers and open-end employees are quite pessimistic about the effects of immigration; the complementary groups, instead, appear to correctly perceive the lack of substantial effects of a larger immigrant population in the municipality. Finally, we do not detect statistically significant effects of immigration on perceived or actual job finding rates.

We contribute to the literature in several respects. First, we propose a theoretically grounded empirical method to infer the amount of misperceptions about the size and effects of immigration without directly observing individual assessments in this respect. This empirical strategy can easily be adapted to other contexts where one observes opinions about an outcome of interest and wants to assess how biased is perception of relevant economic mechanisms. Second, we implement our strategy using novel data on self-reported assessments of own labour market outlook collected without any reference to immigration. To the best of our knowledge, all existing empirical research on natives' perceptions about immigration and its effects is based on replies to questions that explicitly refer to immigration and its effects on the broader economic outlook rather than on own conditions. The explicit reference to immigration is likely to introduce ideological bias and confound subsequent inference. Third, and more importantly from the policy perspective, we raise the possibility that natives' behavioural responses to wrong beliefs may partly explain the labour market effects (or lack thereof) of immigration. Empirical studies of the effects of immigration have so far neglected this possibility. Indeed, our main result that specific segments of the native population are excessively pessimistic about the consequences of immigration suggests that the occasionally detected correlation between their labour market outcomes and immigrant presence might be partly due to this mechanism rather than to standard market ones.

The paper is organised as follows. The next section lays out the simple learning model that will guide our inference. We then briefly describe the main data and then move to the results of the empirical analysis. We then conclude.

## 2 A simple theoretical framework

Our goal is to assess the amount of bias in natives' opinions about the effects of immigration on their personal labour market perspectives. To this end, we start out modeling a native's assessment of a specific future personal labour market outcome  $p_i$ , say the probability of losing the current job over the near future, as the result of a simple linear learning rule that combines available observable data relevant to this judgment (for example, recent separation probabilities in the relevant labour market, ongoing unemployment rates, etc.) with a personal prior  $\tilde{p}_i$  unobserved to the econometrician. Specifically:

$$p_i = \alpha \tilde{p}_i + (1 - \alpha) d_i \tag{1}$$

where for expositional purposes we let relevant available data be summarised by a single univariate index  $d_i$ .

Next, we introduce the possibility that natives misperceive both the relative size of the immigrant population and how it affects their own outcomes. Let  $M_n$  be the true value of the ratio of immigrant to native populations in  $i$ 's neighborhood,  $n$ ; similarly, let  $\tilde{M}_{in}$  be the same ratio as perceived by  $i$ . We allow for different relationships between observed data and the true presence of immigrants and between the prior and the perceived presence of immigrants:

$$d_i = \theta_i + \beta M_n \tag{2}$$

$$\tilde{p}_i = \mu_i + \gamma \tilde{M}_{in} \tag{3}$$

where  $\{\theta_i, \mu_i\}$  summarize the actual and the perceived effects of other determinants of own labour market perspectives and, while potentially not the same, are assumed to be positively

correlated through  $\mu_i = \theta_i + \epsilon_i$ ,  $E(\theta_i, \epsilon_i) = 0$ .

Finally, perceptions about the amount of immigrants relative to natives are related to the true ratio through:

$$\tilde{M}_{in} - M_n = \delta M_n + \xi_i, \quad \delta \geq 0, \quad E(M_n, \xi_i) = 0 \quad (4)$$

so that the amount of misperception is potentially increasing with the actual immigrant population. Also, we let  $E(\xi_i, \epsilon_i) \neq 0$  thus allowing for a potential correlation between other determinants of priors about own future outcomes and the size of individual biases about the presence of immigrants. This allows us to capture, for example, the fact that a pessimistic individual about his job perspectives is more likely to also perceive more immigrants in his neighborhood. Notice also that we do not make assumptions about  $E(\theta_i, M_n)$ , thus allowing for the possibility that the presence of immigrants is correlated to other determinants of individual labour market outcomes, such as unobserved labour market shocks that may affect both determinants of observable predictors of individual outcomes ( $\theta_i$ ) and individual priors about own perspectives ( $\mu_i$ ).

Equations (1)-(4) lay out a crude representation of the data generating process. An individual's assessment of his own employment opportunities reflects the observable share of immigrants in his neighborhood through two channels, the unobserved prior and the observed predictors. Formally, expressing the model in terms of observable quantities leads to:

$$p_i = \alpha\gamma(\delta + 1)M_n + (1 - \alpha)d_i + \alpha\mu_i + \alpha\gamma\xi_i \quad (5)$$

which shows that the endogenous share of immigrants enters both directly and indirectly through the outcome predictor,  $d_i$ . In Appendix (A) we show two results that will guide the empirical analysis of section (4).

First, we show that a least squares regression of self-reported individual expected labour market outcomes on the true stock of migrants relative to natives,  $p_i = a + bM_n + e_i$ , yields  $E(\hat{b}) = \beta + \alpha(\gamma(\delta + 1) - \beta) + \frac{cov(\theta_i, M_n)}{V(M_n)}$ , a non consistent estimate of the total effect of immigration

on a native’s assessment of his labour market outlook. This is given by the sum of the true effect  $\beta$  and of the perception bias  $\alpha(\gamma(\delta + 1) - \beta)$ . The perception bias, in turn, is simply the difference between the overall perceived effect and the true one compounded by the importance of one’s prior,  $\alpha$ . A suitable IV strategy able to account for the potential correlation between the presence of immigrants and recent labour market developments allows us to consistently estimate  $E(\hat{b}) = b_{total} = \beta + \alpha(\gamma(\delta + 1) - \beta)$ .

Second, we show that a least squares estimate of  $p_i = a + bM_n + kd_i + e_i$  yields  $E(\hat{b}) = b_{bias} = \alpha(\gamma(\delta + 1) - \beta)$ , a consistent estimate of the overall perception bias, even if the extent of immigration is endogenously determined. Therefore the quantity  $(b_{total} - b_{bias})$  provides an estimate of  $\beta$ , the true effect of immigration on individual labour market outcomes. Notice that neither of the quantities we are able to pin down reflects the effect of the prior,  $\alpha\gamma(\delta + 1)$ , or of the signal,  $(1 - \alpha)\beta$ , implied by equation (5). In fact,  $b_{bias}$  obtained from direct LS estimation of equation (5) is a biased estimate of the *structural* effect of the prior which, due to the correlation structure implied by the model, measures precisely the perception bias we are interested in.<sup>4</sup>

This simple representation of the data generating process commands three considerations. First, we refer to the parameter  $\beta$  as the true effect of immigration. Clearly, this includes also the effects of the behavioural response of misinformed agents. To convey this intuition, consider a simple search model in which each period a job seeker receives a wage offer  $w$  drawn from a cdf  $F(w)$ . If she is correctly informed about  $F$ , she will set a reservation wage  $w_F = u + \frac{\rho}{1-\rho} \int_{w_F}^{\infty} (1 - F(w))dw$ , where  $\rho$  is the discount factor and  $u$  is utility from unemployment; if instead she believes wages are drawn from a “worse” cdf  $G(w) \geq F(w) \quad \forall w$ , because of a perception bias about the competition exerted by immigrants in the local labour market, she will set a reservation wage  $w_G < w_F$ . Her own assessment of the expected wage

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<sup>4</sup>Notice also that, given the endogeneity of  $M_n$  and the fact that it also has an indirect effect on the outcome through the mediator  $d_i$ , together with the availability of only one instrument implies that IV estimates of equation (5) would not return a consistent estimate of the effects of immigration through the prior (see, for example, Deuchert and Huber (2017)).

will then be  $E(w|w \geq w_G; G)$ , that is referred to the cdf  $G$ ; this is lower than the observed ex-post mean wage,  $E(w|w \geq w_G; F)$ , that is referred to the true cdf  $F$  given the selected reservation wage  $w_G$  driven by the perception bias, which in turn is lower than the expected wage absent perception biases,  $E(w|w \geq w_F; F)$ . This example clarifies that immigration can have observable effects ( $E(w|w \geq w_G; F) - E(w|w \geq w_F; F)$ ) even if it does not affect fundamentals. It is easy to extend this simple example to the case where immigration does affect the distribution but still agents think the effect is stronger. Assume the distribution of wage offers absent immigration is  $H(w)$  such that  $G(w) \geq F(w) \geq H(w) \quad \forall w$ , implying that immigration may have some negative effect on the wage distribution. Again, the true effect of immigration, absent misperceptions, would be  $(E(w|w \geq w_F; F) - E(w|w \geq w_H; H))$ ; because misperceptions affect the reservation wage, the observed effect of immigration with respect to a counterfactual of no immigration is  $E(w|w \geq w_G; F) - E(w|w \geq w_H; H) = [E(w|w \geq w_G; F) - E(w|w \geq w_F; F)] + [E(w|w \geq w_F; F) - E(w|w \geq w_H; H)]$ , the sum of the effect of misperceptions with respect to the current wage distribution affected by immigration ( $F$ ) and the effect of immigration through fundamentals when agents act under perfect information. In the model outlined by equations (1)-(4),  $\beta$  captures this aggregate, that is it represents all observable effects of immigration, irrespective of their actual source.

Second, the estimated perception bias  $b_{bias} = \alpha(\gamma(\delta+1) - \beta)$  involves the strength of the prior,  $\alpha$ , the overall perceived impact of immigration,  $\gamma(\delta + 1)$ , and the true effect of immigration,  $\beta$ . Without further assumptions, it is not possible to learn about the single components from the data. Yet, it is possible to bound the overall perceived effect,  $\gamma(\delta + 1)$ , whenever the prior attracts a strictly positive weight. Let us begin by considering the case of a non-zero estimate of the perception bias,  $b_{bias} \neq 0$ . In this case,  $\alpha = 0$  can be ruled out. Assume  $b_{bias} > 0$ ; then it must be that  $\gamma(\delta + 1) > \beta$ . Therefore  $\gamma(\delta + 1) > \beta + \alpha(\gamma(\delta + 1) - \beta) = b_{total}$ , so that the overall perceived effect of immigration is at least as large as the estimated  $b_{total}$ . Analogously, if  $b_{bias} < 0$  then  $\gamma(\delta + 1) < b_{total}$ . The case where  $b_{bias} = 0$  is instead uninformative about whether there is no bias ( $\gamma(\delta + 1) = \beta$ ) or the prior is inconsequential for individual beliefs ( $\alpha = 0$ ).

However, this latter case is not of interest: if the prior is given no weight in forming beliefs, then any potential misconception becomes irrelevant. It seems therefore reasonable to rule out this extreme case, thereby assuming that  $\alpha \in (0, 1]$  so that if  $b_{bias} = 0$  then  $\gamma(\delta + 1) = \beta = b_{total}$ .

Third, we have assumed throughout that both perceptions and labour market effects are shaped by the neighborhood-level share of immigrants. However, while it seems plausible that perceptions are influenced most by the composition of the closest neighborhood it may be the case that employment effects reflect the share of migrants in the broader local labour market to which the neighborhood belongs. In Appendix (A) we show that if the two channels reflect the presence of immigrants at different levels of spatial aggregation both the perceived,  $\alpha\gamma(\delta + 1)$ , and the true,  $(1 - \alpha)\beta$ , effect of immigration can be separately identified.

## 3 Data

### 3.1 Opinions about own labour market outcomes

We draw our main dependent variable from the 2016 wave of the Bank of Italy’s Survey of Households Income and Wealth (SHIW). The 2016 SHIW covers 7420 households interviewed from January 2017 to September 2017. Along with the the usual detailed information on income, wealth and socio-demographic characteristics, the survey has collected novel information on individual perceptions of the likelihood of joblessness. Specifically, employed respondents are asked to assess the chances of retaining their current job over the next 12 months; job-seeking respondents, both unemployed and employed, are asked to assess the chances of finding a job in the next 12 months. Replies are reported in terms of probabilities, on a scale 0-100. Self-reported probabilities are asked only to members of the family present at the time of the interview and to members in the labour force. Therefore, the final sample consists of 3531 individuals, of which 2924 were employed at the time of interview.

In the empirical analysis individual replies are expressed in terms probability of losing the current job for the employed and of not finding a new job for the unemployed and for the job seeking employed.

Table (1) reports some descriptive statistics of the final sample. We restrict our attention to Italian citizens. Employed respondents report quite high probabilities of losing their current job; job seekers are also quite pessimistic. A breakdown by individual characteristics shows more pessimistic perceptions on both events among the low educated, those that were previously unemployed and residents in the South and in small municipalities. Youths, those on temporary contracts and with low-skill jobs report higher probabilities of losing job. On the contrary, older individuals perceive a higher probability of not finding a job.

## 3.2 Immigration

We measure the presence of immigrants in the relevant neighborhood by the ratio of foreign-born to Italian residents in a given municipality as of January 1st 2017. Therefore, we take the relevant neighborhood to be the municipality of residence. Municipalities are the smallest Italian administrative units. As of 2018 they are short of 8,000; 90 percent of them hosts at most 15,000 residents (and half of them at most 2,500). Smaller municipalities display on average a lower ratio of foreign to Italian citizens. However, foreigners are on average more visible in small centers than in large cities, where they are often concentrated in specific neighborhood. For example, in their study of the relationship between house prices and share of foreigners in urban districts, Accetturo, Manaresi, Mocetti and Olivieri (2014) show that foreign residents in the 20 largest Italian cities are highly concentrated: in 2010 the shares of foreign residents in the most immigrant-dense districts is on average about 4 times that recorded in least immigrant-dense districts. Therefore, in large municipalities most of the population is not significantly exposed to foreign residents while a small fraction experiences much more frequent interactions; in smaller municipalities, exposure is instead much more homogeneous. Therefore,

we choose to focus mainly on municipalities, rather than on larger local labour markets comprising more than one municipality, to emphasize the role of proximity in shaping perceptions (Grigorieff et al. (2018), Alesina et al. (2018)). However, we also explore the possibility that while perceptions are shaped by the nearby presence of foreign-born, the employment effects of immigration reflect the workings of the broader local labour market and therefore the labour supply of foreign-born workers living also in nearby towns belonging to the same local labour market (LLM). Specifically, LLMs are collections of neighboring municipalities whose residents' observed commuting routes largely remain within the collection, therefore suggesting it is a self-contained labour market. They are singled out by the National Statistical Agency based on data collected in the decennial population censuses. In 2011 there were 611 such LLMs, on average comprising 13 municipalities and about 100.000 residents.

### **3.3 Predictors of individual labour market outcomes**

To assess the extent of misperceptions our empirical strategy requires reliable observable predictors of the events whose likelihood respondents are asked to assess. We therefore complement the rich set of individual observable characteristics collected by the SHIW with detailed descriptions of labour market dynamics. Specifically, we focus on municipalities, and obtain municipality-level participation, employment and unemployment rates from the 2011 population censuses. More recent labour market data are available at the local labour market level (LLM), for which we consider participation, employment and unemployment rates from the 2017 Istat data and 3 lags from 2017 of percentage changes in local employment.<sup>5</sup>

We further enrich the set of predictors with individual level municipality-specific estimates of annual labour market transition rates obtained from the Labour Force Survey (LFS). In particular, we exploit recall questions on one-year earlier labour market status and the duration

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<sup>5</sup>We rely on this broader concept of labour market because yearly data are available at the LLM level since 2006 while labour market data at the municipality level are available only at decennial census dates.

of the current job or non-employment spell collected in the 2017 waves of the LFS to recover individual observed 2016-2017 transitions. We use these as dependent variables in probit models for the probability of losing one’s job or of remaining jobless; explanatory variables include individual socio-demographics, 2001 and 2011 municipal labour market characteristics obtained from population censuses and aggregate observed transitions in the municipality. These predicted probabilities are then assigned to corresponding individuals in the SHIW, that is those living in the same municipality and with the same observable socio-demographic characteristics. A more detailed description of the probit estimation and of the subsequent matching between LFS and SHIW is provided in Appendix (B).

Figure (1) compares self-reported and observed transition rates estimated from the LFS. Employed natives are quite pessimistic, as the self-reported probability of losing job is higher than the observed one across all sub-groups of the population. Job seeking natives are instead more optimistic, self-reporting a probability of not finding employment lower than the actual one across almost all sub-groups of the population. These results are in line with the literature on job search behaviour and unemployment expectation, that finds that job seekers tend to overestimate their probability of success (Mueller et al. (2018), Spinnewijn (2015)), while employed persons overestimate their chances of losing their current job (Dickerson and Green (2012)).

## 4 Empirical analysis

We implement the approach sketched in section (2) relating self-reported probabilities of losing the current job and of not finding one in the next year ( $p_i$ ) to the ratio of foreign to Italian residents in municipality  $n$  ( $M_n$ ) with a simple linear regression model:

$$p_i = bM_n + \Lambda L_{in} + \Gamma \Omega_i + \pi_r + e_i \tag{6}$$

where  $L_{in}$  is a set of observable predictors of individual transition probabilities, described in the previous section;  $\Omega_i$  is a set of individual characteristics (sex, age, education, marital status,

household size, income, years of previous unemployment, job tenure, job sector, occupational skills, municipality-level population);  $\pi_r$  are regional dummies and  $e_i$  iid residuals.

Equation (6) can thus be mapped in the learning model sketched above. Under the restriction  $\Lambda = 0$ , that is by excluding available predictors of future labour market outcomes,  $E(b_{IV}) = b_{total} = \beta + \alpha(\gamma(\delta + 1) - \beta)$ ; similarly, the unconstrained regression yields  $E(b_{LS}) = b_{bias} = \alpha(\gamma(\delta + 1) - \beta)$ , that is only the perception bias with respect to the true effect  $\beta$  of immigration.

As we show in Appendix (A) the potential endogeneity of the main explanatory variable  $M_n$  is a source of concern only when estimating equation (6) under the restriction  $\Lambda = 0$ . To address this concerns we construct an instrument based on historical settlements of foreigners by country of origin as proposed in the seminal Card (2001) paper. Specifically, total foreign population in municipality  $n$  in 2017 is predicted assuming that total arrivals in Italy from a given origin country  $c$  recorded over a long period of time distribute across municipalities as far back in time. This ensures that the increase in the number of immigrants in a given municipality does not reflect recent local labour demand shocks that also affect natives' individual labour market opportunities.<sup>6</sup> Formally, the instrument is defined as:

$$Z_n = \frac{\sum_c \lambda_{c,n,2007} F_c}{(1 + \omega) N_{n,2007}} \quad (7)$$

where  $\lambda_{c,n,2007} = \frac{F_{c,n}^{2007}}{F_c^{2007}}$  is the share of immigrants from country  $c$  residing in municipality  $n$  in 2007, a decade before our reference period, and  $F_c = \Delta_c + F_c^{2007}$  is the total number of immigrants from country  $c$  in 2017. Analogously, the denominator is defined as the number of natives in 2017 had population growth in municipality  $n$  been equal to the overall growth  $\omega$  (excluding foreigners inflows), so as to control for the potential endogeneity of mobility choices. Therefore, under the assumption that (conditional on the control set  $\{\Omega_i, \pi_r\}$ ) the initial distribution of immigrants from a certain origin country across Italian municipalities is

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<sup>6</sup>Population registry data on foreign residents does not measure foreigners legally living in Italy but not recorded in population registers and foreigners illegally in Italy. However, under a reasonable proportionality assumption about the relationship between the stock of these two groups and the officially recorded stock of immigrants, this source of measurement error is accounted for in our empirical specification. See, for example, Bianchi, Buonanno and Pinotti (2012).

orthogonal to persistent unobserved municipality effects correlated with subsequent individual labour market transitions, IV estimates of the parameter of interest in (6) are identified out of exogenous variation in the share of immigrants and can be interpreted as suggested in section (2). The main threat to the validity of the instrument is thus the possibility that the initial distribution of immigrants across Italian municipalities reflects persistent unobserved pull factors that also affect current labour demand. For example, sectoral specialization may influence both the amount and type of immigrants attracted to the local labour market and native' employment opportunities. This is even more likely since, due to data availability and recent immigration patterns, we select 2007 as our base year.<sup>7</sup> To mitigate these concerns, we also include in the control set  $\Omega$  a number of labour market indicators at the municipality level as of 2001. Specifically, we include municipality-specific participation, employment and unemployment rates and also construct a predictor for municipality-level aggregate labour demand in 2016 based on 2001 municipality-level sectoral specialization as  $\sum_s q_{n,s}^0 E_s$ , where  $q_{s,n}^0$  is the share of municipality  $m$  total employment employed in sector  $s$  in 2001, and  $E_s$  is national employment in sector  $s$  in 2016 from the National accounts (Bartik (1991)).

Finally, we underscore that all our results are based on Jackknife Repeated Replication (JRR) estimates of the variance-covariance matrix. This has two advantages. First, there is no need to cluster standard errors at the municipality level. The potential correlation within primary sampling units (municipalities) is already accounted for by the JRR estimator. Second, this estimator of the variance is robust to outliers since replication weights are constructed iteratively dropping subsets of observations within primary sampling units.

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<sup>7</sup>We choose 2007 as our base period to be able to account for the effects of the sudden large inflow of Eastern Europeans starting in the mid 2000s. Before that date these communities were quite marginal in Italy, thus seriously weakening the predictive power of the their historical settlements.

## 4.1 Main results

Table (2) reports our main results. Panel A reports results for the perceived probability that an employed native loses his job over the coming 12 months; panel B focuses instead on that of (potentially employed) job seekers of not finding a job over the same period. In line with the discussion in section (2), columns (1) and (2) report OLS and IV results for estimates of equation (6) under the restriction  $\Lambda = 0$ , that is excluding available predictors of individual outcomes. The IV estimate of coefficient of the ratio of foreign-born to Italian residents represents thus the sum of the actual effect of immigration and of the associated perception bias on own opportunities,  $b_{total}$ . In column (3) we add the rich set of predictors for individual labour market transitions; therefore, the OLS estimate of the share of immigrants now only reflects the misperceived component of the overall effect of immigration on own labour market opportunities,  $b_{bias}$ .

First, consistently with the expected sign of the endogeneity bias caused by migrants being more likely to leave less promising labour markets, IV point estimates of the overall effect of foreign-born residents on self-assessed probabilities are higher than corresponding OLS ones (cols. 1-2); the F-statistic of the first stage are reassuring about the strength of the instrument. However, the effect turns out to be positive and statistically significant only for the the perceived probability of losing the current job; the positive point estimates of the overall effect on the self-assessed likelihood of an unsuccessful job-search cannot be reliably rejected to be different from zero.

Second, estimates in column (3) measure the extent of the perception bias. This interpretation hinges on the fact that the empirical specification is augmented with reliable observed predictors of future individual transitions that concur to the formation of individual beliefs. Indeed, a formal test that  $\Lambda = 0$ , that is the coefficients of all predictors are jointly zero strongly rejects the null, as concerns both the probability of losing the job and that of not finding one. Results in column (3) show therefore that employed persons heavily overestimate the effect of immigration

on their separation probability while, again, job seekers' perception bias cannot be rejected to be null.

Third, as shown in section (2) the IV estimate in column (2) can be combined with the OLS one in column (3) to yield a measure of the true effect of immigration on labour market outcomes in addition to the individual perception bias; specifically, it is given by their difference. The true effect of immigration on the perceived probability of losing one's current job is at best weakly positive ( $\beta = b_{total} - b_{bias} = 0.8 - 0.5 = 0.3$ ) so that the perception bias ( $b_{bias}$ ) accounts for most of the response to immigration of own assessments. Indeed, a formal test that  $\beta = b_{total} - b_{bias} = 0$  cannot reject the null with a p-value of 0.2.<sup>8</sup> As shown in section (2), under the assumption that  $\alpha \in (0, 1)$  a lower bound to the combination of perceived effect ( $\gamma$ ) and perceived size ( $(\delta + 1)$ ) can be estimated at 0.8. This implies that an increase of the ratio of foreign-born to Italian residents in the municipality by one standard deviation (5.2 points in 2017) is perceived to increase the probability of losing one's current job by at least 4.2 percentage points, against a negligible true effect. As concerns the chances of success of job search, our results suggest that agents have perceptions in line with the true effect and that this is basically nil.

Notice that our implicit estimate of the true effect of foreigners on natives' labour market outcomes are broadly consistent with available evidence that in advanced countries, including Italy, immigration on average modestly improves or at best leaves unaffected natives' labour market outcomes.<sup>9</sup>

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<sup>8</sup>Under the null  $H_0 : \beta = 0$ ,  $plim \hat{b}_{total} = plim \hat{b}_{bias} = \alpha\gamma(\delta + 1)$  so that the basic intuition of Hausman (1978) can be applied.

<sup>9</sup>See for example, Card and Lewis (2005), Card (2009), Peri and Sparber (2009), Ottaviano and Peri (2012) for the US, D'Amuri, Ottaviano and Peri (2010), Dustmann, Frattini and Preston (2012), Glitz (2012), D'Amuri and Peri (2014), Cattaneo, Fiorio and Peri (2015), Foged and Peri (2016) for Europe, and Gavosto, Venturini and Villosio (1999), Venturini and Villosio (2006), Staffolani and Valentini (2010), Barone and Mocetti (2011) for Italy.

## 4.2 Heterogeneous perceptions

The empirical literature has documented that immigration can have redistributive effects, however. Some groups of the population, those more likely to compete with foreigners and less able to upgrade to avoid this competition, end up suffering in terms of wages and/or employment opportunities while the rest may even benefit from a larger immigrant labour supply. In Table (3) we pursue a similar reasoning and document whether perceptions are heterogeneous across population subgroups. We only focus on perceptions about the probability of losing the current job; the small number of individuals reporting on the probability of finding a job do not allow meaningful stratifications of the sample. Results are very differentiated across groups. More immigrants are associated with a significantly higher perceived instability among females, youths, less educated and residents of small towns. Interestingly, these are the same groups in which recent papers find stronger misconceptions about immigration (Alesina et al. (2018), Grigorieff et al. (2018)). In all these cases, our simple model suggests that perceptions reflect a null true effect of immigration, as shown by the test on the difference between the two coefficients. In the complementary groups (more educated, males, older and living in large towns) coefficient estimates are instead not statistically different from zero, thus suggesting that perceptions are broadly in line with the absence of a substantial effect on own labour market perspectives. The heterogeneous results by geographic areas indicate that natives overestimate the effect of immigration both in the South and in the Centre-North. However, the overestimation in the Southern regions is not justified by a true effect of immigration, while in the Centre-North the true effect of immigration is statistically significantly different from zero. In fact, one percentage point higher share of immigrants in the municipality is perceived to increase the probability of losing one's current job by at least 0.7 percentage points against an estimated true increase of about 0.4 percentage points.

Finally, the last panel of Table (3) splits the sample according to the degree of protection of one's job. Specifically, we estimate the effects of immigration separately for open end employees

and self-employed workers.<sup>10</sup> Italian employment regulation awards extensive protection against dismissals to open end employees, while self-employed workers are not at all insulated from shocks to labour demand.<sup>11</sup> Consistently with the substantial difference in terms of exposure to competition faced by the two groups, our results suggest that the higher likelihood of losing one's job reported by permanent employees is entirely traceable to misperceptions about the role of immigrants. The evidence is less clearcut for the self-employed, perhaps reflecting the greater heterogeneity of this group that pools high level professionals, small entrepreneurs and self-employed manual workers.

### 4.3 The geography of perceptions and of labour markets

So far, we have read the results under the assumption that both perceptions and labour market effects are shaped by the presence of immigrants in the municipality of residence, that is in the smallest neighborhood for which we can collect suitable data on the number of foreign-born residents. However, this assumption may be questioned on the ground that while perceptions plausibly reflect one's daily experience, so that living in neighborhood more densely populated by foreign-born residents tends to raise one's assessment of the phenomenon, a correct assessment of the employment effect of immigration has to take into account the composition of labour supply in the relevant labour market, hardly being the single small town of residence.

We thus extend our analysis to account for this possibility. Within the theoretical framework introduced above, this amounts to letting the predictors of own individual outcomes ( $d_i$ ) in equation (2) be a function of the share of foreign-born residents in a larger geographical unit comprising the municipality of residence, which we take to be the relevant LLM described in

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<sup>10</sup>We do not consider the few temporary employees present in the sample; the limited number of observations does not allow us to consider them separately and, at the same time, they are hardly similar to any of the two larger groups being considered.

<sup>11</sup>Italian employment protection regulation has undergone several changes over the past years. Among the most recent ones, protection against dismissals was reduced across the board for employees at larger firms in 2012 through a dramatic limitation of the cases for reinstatement after unfair dismissal; in 2014 newly hired employees were subjected to a further weakening of protections.

section (3) above. In Appendix (A) we show that, in terms of the learning model, this implies:

$$p_i = \alpha\gamma(\delta + 1)M_n + (1 - \alpha)\beta M_L + (\theta_i + \alpha\epsilon_i + \alpha\gamma\xi_i) \quad (8)$$

where  $M_L$  is the ratio of foreign-born to native residents in the LLM. In Appendix (A) we show that an IV strategy based on historical settlements across municipalities and across LLMs provides the two instruments needed to identify the coefficients of interest in (8). Clearly, we are not able to contrast the competing hypotheses about what shapes the employment effects of immigration. We can only establish whether taking into consideration this alternative possibility would significantly change our previous conclusions about the relative role of perceptions and actual labour market mechanisms in shaping individual assessments of own employment opportunities.

Table (4) reports the results of this alternative specification. We find that, analogously to evidence in table (2), only the perceived probability of losing one’s current job is affected by the presence of immigrants. Moreover, consistently with that previous evidence, we also find that this effect reflects only the incorrect assessment of the role of immigrants rather than the workings of a true labour market mechanism. A one percentage point higher ratio of foreign-born to natives in the municipality of residence, which our theory assumes only affects the prior judgment, increases the self-assessed probability of losing the current job by 0.9 percentage points, a value remarkably consistent with the lower bound to this effect (0.8 percentage points) implied by estimates in table (2). At the same time, even considering the presence of foreigners in the broader labour market beyond the municipality does not lead to a statistically significant true effect of immigration: the coefficient on the ratio of foreign-born to natives in the LLM, which in our theory captures the labour market effects, is nil. The self-assessed probability of remaining unemployed is instead unaffected by the presence of foreign-born residents in the municipality and in the LLM. Again, this is consistent with previous results and implies that natives correctly assess that immigrants do not affect their reemployment probabilities. A joint test that  $\hat{b}_1 = \hat{b}_2 = 0$  cannot reject the null with a p-value of 0.541.

## 5 Conclusions

Immigration is one of the major issues at the center of the political debate in advanced countries. Immigrants are felt to compete with natives along a number of dimensions at a time when resources are scarce: constraints to government spending severely limit the reach of welfare systems, the adoption of labour-saving technologies hampers employment opportunities of less qualified segments of the labour force, the secular growth slowdown raises concerns about future living standards. This perceived competition is consistently detected by a number of social surveys, and goes hand in hand with sizable natives' misperceptions about the amount, characteristics and behaviours of immigrants.

In this paper we ask whether natives are too pessimistic about the effects of immigration on their own labour market opportunities. Answering this question is relevant since perceptions themselves do affect behaviours and outcomes; therefore, holding wrong views about immigration and its effects may have real effects even if fundamentals are largely unaffected by increases in foreign labour supply. Our inference is guided by a simple learning model describing how agents form their assessments of the probability of losing or finding a job; we implement it using novel data on Italian households' self-assessed labour market transition probabilities. The theoretical model shows how to jointly recover estimates of the true effect of immigration and of the perception bias about the effects and amount of immigrants from regressions of agents' beliefs on the observed share of immigrants in the labour market and on other predictors of labour market outcomes.

We find that on average natives significantly overestimate the impact of immigration. A one standard deviation increase in the ratio of foreign-born to Italian residents in the municipality raises the perceived separation rate over the next 12 months by at least 4 percentage points, more than one fourth of the average expected rate. The increase is largely unjustified as at best we find economically modest and statistically non significant true effects of immigration. These effects are heterogeneous across the population. More educated, older and male natives

appear to correctly perceive the (at best very weak) effects of immigration on their separation probabilities; on the other hand, the less educated, the youths, the women, and the residents of smaller towns display sizable overestimation against still weak actual effects. As an indirect test of our empirical approach, we investigate separately the responses of permanent employees in highly protected jobs and those of self-employed workers, substantially exposed to labour demand volatility. We find that among permanent employees the entire empirical association between the probability of losing one's job and the presence of immigrants is exclusively a reflection of misperceptions; on the contrary, among self-employed workers holding riskier jobs results are less clearcut but do not suggest a significant degree of misperception.

Overall, the evidence seems broadly in line with standard studies that look at observed labour market outcomes and that typically fail to detect significant effects of immigration at the aggregate level. On the other hand, our considerations suggest that among the groups where these effects are more likely to be detected, they may be partly driven by behavioural responses to wrong beliefs.

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Table 1: Self-assessed likelihood of unemployment

	Probability of:			
	losing		not finding	
	Mean	SD	Mean	SD
All	15.4	(28.6)	59.8	(29.9)
Male	15.0	(28.7)	59.9	(31.8)
Female	15.8	(28.4)	59.7	(27.8)
Age<45	17.6	(29.5)	51.7	(29.1)
Age>=45	14.0	(27.9)	69.5	(27.9)
Lower education	16.5	(29.1)	61.7	(29.7)
Higher education	11.5	(26.3)	49.2	(28.9)
Married	13.7	(28.1)	62.0	(30.5)
Non-married	17.9	(29.1)	58.2	(29.4)
North	13.3	(27.2)	54.6	(31.0)
Centre	14.6	(28.6)	60.6	(28.1)
South	19.7	(30.5)	63.3	(29.3)
Small municipality	18.0	(31.0)	63.7	(30.2)
Medium municipality	15.7	(29.0)	58.2	(28.9)
Large municipality	11.2	(23.0)	59.2	(33.3)
Previous unemployment: yes	23.6	(30.6)	60.8	(29.6)
Previous unemployment: no	13.3	(27.6)	55.8	(31.2)
Permanent employee	13.3	(27.5)		
Temporary employee	35.3	(28.5)		
Self-employed	13.9	(28.9)		
Service sector	14.5	(28.4)		
Non-Service sector	17.7	(28.9)		
Low skill	17.0	(28.9)		
High skill	12.5	(27.7)		
Private sector	15.2	(27.6)		
Public sector	16.6	(33.6)		
Obs.	2924		682	

Table 2: Immigration and perceived job instability.

	$b_{total}$		$b_{bias}$
	No LM predictors		With LM predictors
	(1)	(2)	(3)
	OLS	IV	OLS
	A. Probability of losing job (N=2801)		
Ratio foreign-born/Italian residents	0.6*** (0.2)	0.8*** (0.3)	0.5** (0.2)
First-stage F-statistic	2783.3		
H0: $\Lambda = 0$ (p-value)			0.03
H0: $b_{total} - b_{bias} = 0$ (p-value)			0.20
	B. Probability of not finding job (N=656)		
Share of foreign-born	-0.1 (0.5)	0.3 (0.5)	0.4 (0.5)
First-stage F-statistic	274.2		
H0: $\Lambda = 0$ (p-value)			0.00
H0: $b_{total} - b_{bias} = 0$ (p-value)			0.89

Jackknife standard errors in parenthesis; replication weights used; \*\*\* p<0.01; \*\* p<0.05; \* p<0.1. All columns include sex, age, education, marital status, household size, income, years of previous unemployment, job tenure, job sector, occupational skill, municipal population, regional dummies, 2001 municipality-level Bartik and participation, unemployment and employment rates. Column (3) also includes predictors of labour market transitions: observed transition probabilities of losing job and of not finding job, 2011 municipality-level participation, unemployment and employment rates, 2017 local labour market level participation, unemployment and employment rates and 3 lags of percentage changes in local employment.

Table 3: Immigration and perceived job instability: heterogeneity.

	(IV) $b_{total}$	(OLS) $b_{bias}$	(IV) $b_{total}$	(OLS) $b_{bias}$
	South (Obs. 860)		Centre-North (Obs. 1941)	
Ratio foreign-born/Italian residents	1.0*	1.2**	0.7***	0.3***
	(0.6)	(0.6)	(0.2)	(0.1)
H0: $\Lambda = 0$ (p-value)		0.026		0.000
H0: $b_{total} - b_{bias} = 0$ (p-value)		0.841		0.000
	Less than HS (Obs. 2222)		HS or more (Obs. 579)	
Ratio foreign-born/Italian residents	0.9**	0.7**	0.1	-0.2
	(0.4)	(0.3)	(0.6)	(0.5)
H0: $\Lambda = 0$ (p-value)		0.338		0.000
H0: $b_{total} - b_{bias} = 0$ (p-value)		0.345		0.228
	Females (Obs. 1206)		Males (Obs. 1595)	
Ratio foreign-born/Italian residents	1.1***	0.9**	0.4	0.1
	(0.4)	(0.4)	(0.4)	(0.4)
H0: $\Lambda = 0$ (p-value)		0.146		0.202
H0: $b_{total} - b_{bias} = 0$ (p-value)		0.349		0.458
	Less than 45 (Obs. 816)		45 or older (Obs. 1985)	
Ratio foreign-born/Italian residents	1.1**	0.7*	0.6*	0.5*
	(0.5)	(0.4)	(0.4)	(0.3)
H0: $\Lambda = 0$ (p-value)		0.09		0.075
H0: $b_{total} - b_{bias} = 0$ (p-value)		0.238		0.490
	Small towns (Obs. 1176)		Large towns (Obs. 1625)	
Ratio foreign-born/Italian residents	2.0***	1.4***	0.2	-0.2
	(0.5)	(0.3)	(0.4)	(0.2)
H0: $\Lambda = 0$ (p-value)		0.053		0.379
H0: $b_{total} - b_{bias} = 0$ (p-value)		0.133		0.078
	Open end (Obs. 1995)		Self-empl (Obs. 558)	
Ratio foreign-born/Italian residents	0.8**	0.7**	1.0**	0.7
	(0.4)	(0.3)	(0.5)	(0.5)
H0: $\Lambda = 0$ (p-value)		0.054		0.289
H0: $b_{total} - b_{bias} = 0$ (p-value)		0.608		0.251

Jackknife standard errors in parenthesis; replication weights used; \*\*\*  $p < 0.01$ ; \*\*  $p < 0.05$ ; \*  $p < 0.1$ .

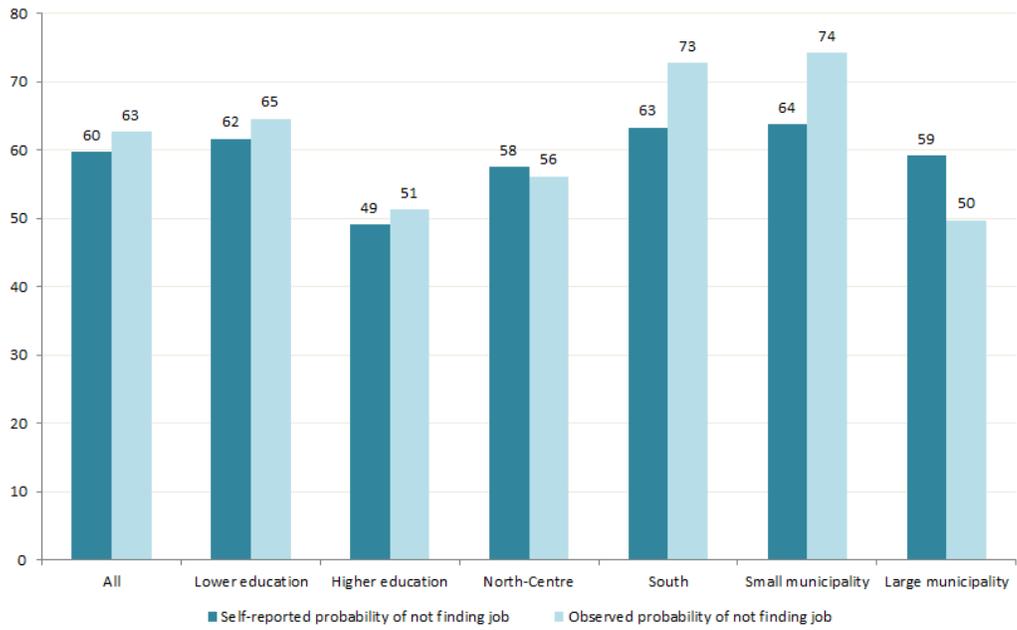
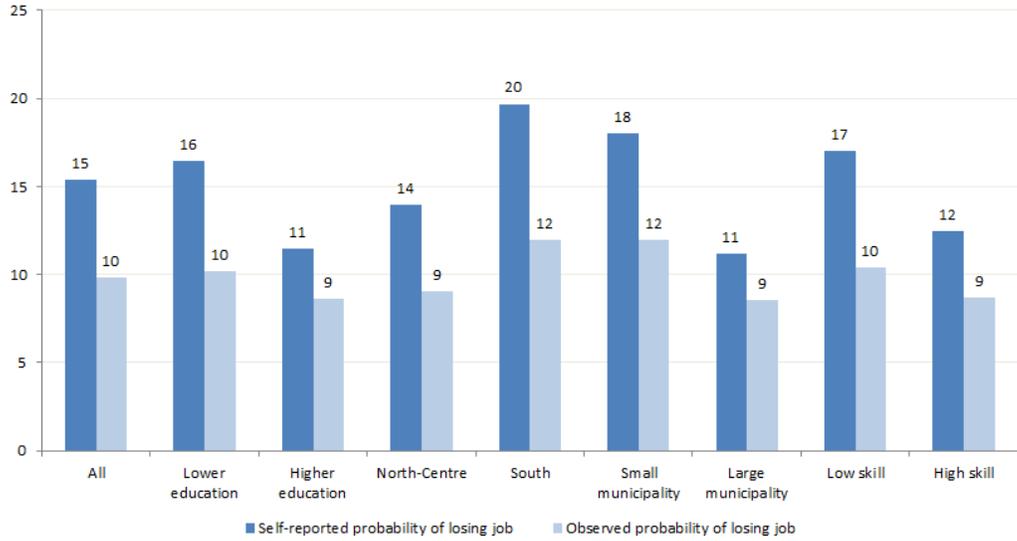
Column (IV) includes sex, age, education, marital status, household size, income, years of previous unemployment, job tenure, job sector, occupational skill, municipal population, regional dummies, 2001 municipality-level Bartik and participation, unemployment and employment rates. Column (OLS) also includes predictors of labour market transitions: observed transition probabilities of losing job and of not finding job, 2011 municipality-level participation, unemployment and employment rates, 2017 local labour market level participation, unemployment and employment rates and 3 lags of percentage changes in local employment.

Table 4: Immigration and perceived job instability: geography

	Self-assessed probability of:	
	losing job	not finding job
Ratio foreign-born/Italian residents in:		
...municipality ( $b_1 = \alpha\gamma(\delta + 1)$ )	0.9*** (0.3)	0.6 (0.6)
...local labour market ( $b_2 = (1 - \alpha)\beta$ )	-0.4 (0.4)	-0.8 (1.0)
	F-tests of first stage regressions	
Ratio foreign-born/Italian residents in:		
...municipality	885.6	200.6
...local labour market	1229.3	336.8
Obs.	2801	656

Jackknife standard errors in parenthesis; replication weights used; \*\*\* p<0.01; \*\* p<0.05; \* p<0.1. IV regression include sex, age, education, marital status, household size, income, years of previous unemployment, job tenure, job sector, occupational skill, municipal population, regional dummies, 2001 municipality-level Bartik and participation, unemployment and employment rates.

Figure 1: Self-reported and observed probabilities



# A Interpretation of coefficient estimates

## Data generating processes

Formation of beliefs

$$p_i = \alpha \tilde{p}_i + (1 - \alpha) d_i \quad (\text{A.1})$$

Prior

$$\tilde{p}_i = \mu_i + \gamma \tilde{M}_{in} \quad (\text{A.2})$$

Signal

$$d_i = \theta_i + \beta M_n \quad (\text{A.3})$$

Unobserved determinants of signal and prior

$$\mu_i = \theta_i + \epsilon_i \quad E(\epsilon_i, \theta_i) = 0 \quad (\text{A.4})$$

Perceptions about immigrant presence

$$\tilde{M}_{in} - M_n = \delta M_n + \xi_i \quad E(\xi_i, M_n) = 0, \quad E(\xi_i, \mu_i) = E(\xi_i, \epsilon_i) \neq 0 \quad (\text{A.5})$$

Endogeneity of immigration

$$M_n = \rho Z_n + \nu_n \quad E(\nu_n, \theta_i) \neq 0 \quad (\text{A.6})$$

## Total effect of immigration

Substitute the data generating process for prior (A.2) and signal (A.3) into (A.1):

$$\begin{aligned} p_i &= \alpha(\mu_i + \gamma \tilde{M}_{in}) + (1 - \alpha)(\theta_i + \beta M_n) \\ &= \alpha\gamma \tilde{M}_{in} + (1 - \alpha)\beta M_n + \alpha\mu_i + (1 - \alpha)\theta_i \end{aligned} \quad (\text{A.7})$$

Use expressions for misperceptions (A.5) and for unobserved determinants of signal and prior (A.4) into above:

$$\begin{aligned} p_i &= \alpha\gamma \tilde{M}_{in} + (1 - \alpha)\beta M_n + \alpha\mu_i + (1 - \alpha)\theta_i \\ &= (\alpha\gamma(\delta + 1))M_n + (1 - \alpha)\beta M_n + (\theta_i + \alpha\epsilon_i + \alpha\gamma\xi_i) \\ &= (\beta + \alpha(\gamma(\delta + 1) - \beta))M_n + u_i \end{aligned}$$

where

$$E(M_n, u_i) = E(M_n, (\mu_i + \alpha\epsilon_i + \alpha\gamma\xi_i)) = E(M_n, \theta_i) + \alpha E(M_n, \epsilon_i) + \alpha\gamma E(M_n, \xi_i)$$

which under our working assumptions amounts to  $E(M_n, \theta_i) = E(\nu_n, \theta_i) \neq 0$ . Therefore LS estimation of

$$p_i = a + bM_n + e_i$$

leads to inconsistent estimates of the object of interest. A suitable IV strategy addresses this issue and yields a consistent estimate of the total effect of immigration,

$$E(\hat{b}) = (\beta + \alpha(\gamma(\delta + 1) - \beta))$$

### Misperceptions about immigration

Consider estimating

$$p_i = a + bM_n + kd_i + e_i \quad (\text{A.8})$$

LS estimate of parameters in (A.8) can be represented in matrix form as (I drop subscript and variable names now represent the corresponding vectors of data):

$$\begin{bmatrix} \hat{b} \\ \hat{k} \end{bmatrix} = \left( \begin{bmatrix} M' \\ d' \end{bmatrix} \begin{bmatrix} M & d \end{bmatrix} \right)^{-1} \begin{bmatrix} M'p \\ d'p \end{bmatrix} \quad (\text{A.9})$$

To express  $p$  in terms of the two variables considered in the above estimate,  $M, d$ , substitute into equation (A.1) the expressions for prior (A.2) and then those for misperceptions (A.5) and for unobserved determinants (A.4) to get:

$$\begin{aligned} p_i &= \alpha(\mu_i + \gamma\tilde{M}_{in}) + (1 - \alpha)d_i \\ &= (\alpha\gamma(\delta + 1))M_n + (1 - \alpha)d_i + (\alpha\mu_i + \alpha\gamma\xi_i) \\ &= (\alpha\gamma(\delta + 1))M_n + (1 - \alpha)d_i + u_i \end{aligned} \quad (\text{A.10})$$

Then use (A.10) into (A.9) to get:

$$\begin{aligned} \begin{bmatrix} \hat{b} \\ \hat{k} \end{bmatrix} &= \begin{bmatrix} \alpha\gamma(\delta + 1) \\ 1 - \alpha \end{bmatrix} + \begin{pmatrix} M'M & M'd \\ d'M & d'd \end{pmatrix}^{-1} \begin{bmatrix} M'u \\ d'u \end{bmatrix} \\ &= \begin{bmatrix} \alpha\gamma(\delta + 1) \\ 1 - \alpha \end{bmatrix} + \frac{\begin{bmatrix} d'd & -M'd \\ -M'd & M'M \end{bmatrix} \begin{bmatrix} M'u \\ d'u \end{bmatrix}}{(M'M)(d'd) - (M'd)(M'd)} \end{aligned} \quad (\text{A.11})$$

We are interested in the coefficient  $\hat{b}$ :

$$\hat{b} = \alpha\gamma(\delta + 1) + \frac{(d'd)(M'u) - (M'd)(d'u)}{(M'M)(d'd) - (M'd)(M'd)} \quad (\text{A.12})$$

$$\begin{aligned} &= \alpha\gamma(\delta + 1) + \frac{V(d)cov(M, u) - cov(M, d)cov(d, u)}{V(M)V(d) - cov(M, d)^2} \\ &= \alpha\gamma(\delta + 1) + \frac{V(\theta + \beta M)cov(M, \alpha\mu + \alpha\gamma\xi) - cov(M, \theta + \beta M)cov(\theta + \beta M, \alpha\mu + \alpha\gamma\xi)}{V(M)V(\theta + \beta M) - cov(M, \theta + \beta M)^2} \end{aligned} \quad (\text{A.13})$$

where in moving from (A.12) to (A.13) we have used, slightly abusing notation, standard asymptotic theory. Noticing that  $cov(\theta, \mu) = V(\theta)$ , few straightforward operations lead to

$$E(\hat{b}) = \alpha(\gamma(\delta + 1) - \beta) \quad (\text{A.14})$$

This shows that estimating parameters in equation (A.8) by LS returns the coefficient of interest even if  $E(M_n, u_i) \neq 0$ . Notice that precisely because of this endogeneity, while being the quantity of interest for our purposes,  $E(\hat{b})$  is not the “structural” coefficient on  $M_n$  in equation (A.10),  $(\alpha\gamma(\delta + 1))$ .

## Municipalities and LLMs

Consider an alternative data generation process in which equation (A.3) above (the signal) is substituted by:

$$d_i = \theta_i + \beta M_L \quad (\text{A.15})$$

where, analogously to  $M_n$ ,  $M_L$  is the ratio of foreign-born to native residents in  $i$ 's local labour market, that is the one her municipality belongs to ( $n \in L$ ). Assume also that this ratio is the result of  $M_L = \phi Z_L + \nu_L$ , with  $Z_L$  sharing all orthogonality conditions of  $Z_n$  above. Finally, assume  $Z_n$  and  $Z_L$  are related by  $Z_n = Z_L + e_n$ , with  $E(e_n | n \in L) = 0$ . This latter assumption establishes the mechanical link between the municipality-level and LLM-level instruments based on historical settlements: foreign-born are distributed heterogeneously across the municipalities belonging to a given LLM.

Consider estimating equation (8) in the main text by IV using these two instruments,  $\{Z_n, Z_L\}$ . Proceeding as before, let the IV estimator be:

$$\begin{bmatrix} \hat{b}_1 \\ \hat{b}_2 \end{bmatrix} = \left( \begin{bmatrix} Z'_n \\ Z'_L \end{bmatrix} [M_n \quad M_L] \right)^{-1} \begin{bmatrix} Z'_n p \\ Z'_L p \end{bmatrix} \quad (\text{A.16})$$

Therefore, we have that:

$$\hat{b}_1 = \frac{(Z'_L M_L)(Z'_n p) - (Z'_n M_L)(Z'_L p)}{(Z'_n M_n)(Z'_L M_L) - (Z'_n M_L)(Z'_L M_n)} \quad (\text{A.17})$$

$$\hat{b}_2 = \frac{(Z'_n M_n)(Z'_L p) - (Z'_L M_n)(Z'_n p)}{(Z'_n M_n)(Z'_L M_L) - (Z'_n M_L)(Z'_L M_n)} \quad (\text{A.18})$$

Noticing that  $E(e_n | n \in L) = 0$  implies that  $plim(e'_n Z_L) = plim(e'_n M_L) = 0$ , using the orthogonality conditions implied by  $Z_n, Z_L$  being valid instruments and substituting for the expressions for  $M_n, M_L, p$  proves that:

$$E(\hat{b}_1) = \alpha\gamma(\delta + 1)$$

$$E(\hat{b}_2) = (1 - \alpha)\beta$$

## B Matching SHIW and LFS

In order to obtain the realized transition probabilities from the occupational status in 2017 to that in the next year, we should use information on realized occupational status in 2018 of the same sample. However, the SHIW-2016 is the last available wave of the survey and no panel data are available. To this end, we make use of the Labour Force Survey (LFS) from the 2017, which provides recall occupational status in the previous year, and perform a statistical matching with SHIW-2016 to import the realized probability of losing job and of not finding job. The LFS is provided on a quarterly basis by Istat and constitutes the official statistics on the Italian labour market aggregates.

We use this data source for two reasons: first, it includes recall data on the occupational status in the previous year, allowing for the estimation of realized transition probabilities; second, the survey characteristics are comparable to the SHIW so that a statistical matching between the two sources is reasonable. However, an important caveat is warranted. Ideally, we would like to describe the most recent available transition patterns at the time of the interview, therefore we should use LFS from the 2018 in order to obtain realized transition probability of losing job and not finding job from 2017 to 2018. Unfortunately, the 2017 waves are the last ones for which we observe the municipality of residence, a crucial element of our imputation strategy. Therefore, we use realized transition probabilities from the occupational status in 2016 to that in 2017 as a proxy for the realized transitions of interest, between 2017 and 2018, under the assumption that labour market developments were not substantially different. Table (B.1) seems to suggest this is a reasonable assumption as labour market aggregates remained fairly stable.

Table (B.1) summarizes the salient characteristics of the two surveys along with the occupational status gathered from the SHIW and from the LFS, in order to check whether the preliminary conditions for a statistical matching are met, i.e. samples drawn from the same population, comparable sampling design and similar distribution of the variable of interest. The reference population, the sampling design and the reference units (primary and secondary) are very similar between the two data sources. The occupational status in the SHIW is self-declared by the household members, while the LFS provides both the self-declared status and the occupational status defined according to the International Labour Organization (ILO) standards. These define employed individuals as those of working age who: i) worked for at least one hour in the last week in any activity for pay or profit, ii) worked for at least one hour in the last week without pay in family enterprise, iii) temporary not at work in the last week, but had a job (maternity, sick leave, etc.); unemployed individuals as those of working age who: i) were not in employment, ii) carried out activities to seek employment in the previous 30 days, iii) were currently available to take up employment in the subsequent two weeks or i) were starting a job in the subsequent three months and were available to take up employment in the subsequent two weeks. The table shows that self-declared status in the SHIW and in the LFS are very similar, whereas the percentages of individuals out of labour force defined according to the ILO standards are quite different. In fact, the latter definition is characterized by higher incidence of individuals out of labour force and lower share of unemployment than the self-declared status in the two surveys. This is due to the fact that the ILO definition considers out of labour force

also those who i) did not actively seek a job but were available to work ii) actively seek a job but were not available to work. However, these individuals self-declared to be unemployed. From this table we can conclude that the self-declared status from the LFS should be preferred to the ILO definition, and that we can rely on shares of employed, unemployed and inactive by geographic area and sex very similar between the SHIW and the LFS.

The matching between SHIW and LFS is performed at the municipality level and controlling for individual demographic characteristics that are homogeneous between the two data sources. In particular, it is conducted through two steps: first, we estimate the realized transition probabilities at the individual level and in each municipality, controlling for sex, age and education, using the LFS sample. In this way, we obtain the realized transition probability for each possible combination of sex, education and age in each municipality. Second, we match LFS and SHIW at municipality level and the estimated transition probabilities in each matched municipality are attributed to individuals in the SHIW with the same combination of sex, age and education. Thanks to the similar sampling design, about 68% of municipalities in the SHIW are also present in the LFS. For the remaining individuals residing in municipalities that are not also in the LFS, we attribute the realized transition probability through the propensity score matching. In particular, the propensity score matching is performed within each Italian region and it associates each observation in the SHIW with the most similar observation in the LFS, in terms municipal population size, municipal immigrant rate, sex, age and education.

Table B.1: Labour market outcomes in SHIW and in LFS

Occupational status	(1)	(2)		(3)		(4)		(5)
	SHIW 2016 Self-declared status in 2017	Self-declared status in 2018	Self-declared status in 2018	Self-declared status in 2017	Self-declared status in 2017	Self-declared status in 2016	Self-declared status in 2016	ILO status in 2017
<i>All</i>								
employed	36.8	38.1	37.5	37.5	36.9	38.0		
unemployed	10.7	8.7	9.4	9.4	9.7	5.0		
out of labour force	52.5	53.2	53.2	53.2	53.4	57.0		
<i>North</i>								
employed	41.4	43.4	42.8	42.8	42.3	43.4		
unemployed	7.1	5.1	5.5	5.5	5.9	3.3		
out of labour force	51.4	51.5	51.6	51.6	51.8	53.3		
<i>Centre</i>								
employed	39.5	40.9	40.2	40.2	39.4	40.8		
unemployed	9.4	7.2	7.8	7.8	8.3	4.6		
out of labour force	51.1	51.8	52.0	52.0	52.2	54.6		
<i>South</i>								
employed	29.0	29.4	28.7	28.7	28.3	29.3		
unemployed	16.2	14.4	15.3	15.3	15.5	7.4		
out of labour force	54.8	56.2	56.0	56.0	56.2	63.4		
<i>Male</i>								
employed	43.7	45.4	44.8	44.8	44.2	45.3		
unemployed	11.6	9.8	10.4	10.4	10.8	5.4		
out of labour force	44.7	44.9	44.8	44.8	45.0	49.3		
<i>Female</i>								
employed	30.2	31.2	30.5	30.5	30.0	31.1		
unemployed	9.9	7.7	8.3	8.3	8.6	4.5		
out of labour force	59.9	61.0	61.1	61.1	61.4	64.4		

Table entries are percentages of population in a given labour market status. Cols.(1)-(4) refer to self-defined condition; col.(5) refers to ILO definitions. Col. (1): SHIW, conditions as of February-march 2017; cols. (2)-(x): LFS, conditions at time of interview; cols. (x): LFS, retrospective conditions. Reference population is residents in households.

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