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ARTICLE

# Immigration, amnesties, and the shadow economy

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**Abstract**

This paper investigates the effects of immigration and immigration amnesties on the shadow economy. We make use of an array of Italian immigration data and original shadow economy estimates for the years 1996–2006, comprising a panel of local-level aggregate statistical information, and a microlevel survey of representative households. We find a robust and positive relationship between the presence of immigrants and the unobserved economic activity at the local level. Nevertheless, the impact of immigration on the Italian unofficial economy is relatively small in magnitude. We also exploit the discontinuity created by the implementation of the 2002 immigration amnesty, which increased the stock of documented migrants by almost 50%. According to our results, the Italian 2002 immigration policy only slightly weakens the link between immigration and the extent of the unobserved economic activity.

KEYWORDS
amnesties, immigration, immigration policies, shadow economy

JEL CLASSIFICATION
H26, J61, K37

# 1 | INTRODUCTION

Immigration and immigration policies are at the forefront of the political debate, especially in destination countries. Both the political narrative and economic research are often concentrated on the effects that immigration might have on the local labor market as well as on other relevant socio-economic aspects such as public finances, local services, and crime. This paper investigates two aspects of immigration, which are, to our knowledge, yet to be explored. First, it examines the relationship between immigration and the shadow economy. Second, it analyzes whether this link is affected by immigration amnesties, which head to substantial variations to the stock of documented and undocumented immigrants in a country.

The shadow economy accounts for between a third and a half of total GDP in developing countries (La Porta & Shleifer, 2008) and more than 20% of official income in developed economies such as Belgium, Greece, Italy, and Spain (Schneider et al., 2010). Implementing sound policies to reduce the shadow economy is often central in the policy debate, challenging scholars to research in this area and to identify the socio-economic determinants of this phenomenon.

This paper's contribution is threefold: first, it expands the literature on the effects of immigration on economic and noneconomic outcomes; second, it contributes to the literature on the shadow economy and its causes; finally, it relates to works exploring how legal status and immigration amnesties affect both the native and immigrant populations.

There are various reasons to believe that the link between immigration and unrecorded economic activity exists. Immigrants make up a relevant share of the workforce (6% in 2006) and are overrepresented in sectors in which irregular work is more frequent (construction, hospitality and domestic services; Barbagli, 2007). They may also lack access to networks beyond their national community, language skills, or be subject to outright discrimination[1]: for all these reasons, they may have a higher propensity to accept (or be offered) irregular jobs even if legally resident. This is confirmed by evidence that immigrants—documented and undocumented—are often employed in low-skilled, less secure jobs, and are overrepresented within irregular workers (see, for instance OECD, 2009; but also Quassoli, f1999, for a more specific analysis of the Italian case in the 1990s). Finally, it goes without saying that undocumented immigrants are not allowed to accept regular work. Immigration amnesties may weaken the link between immigration and shadow economy: gaining legal status clearly improves the bargaining power and employment conditions of immigrants who are potentially eligible for the amnesty relative to other undocumented immigrants (Devillanova et al., 2018). One may also speculate that shrinking the pool of undocumented immigrants (and, therefore, the supply of irregular work) may affect the irregular-job market decreasing the equilibrium quantity.

The two phenomena at the center of the analysis (immigration and shadow economy) are both imperfectly observable and imperfectly measured; to establish the exact transmission mechanism one would need microeconomics data at the individual or firm level, which are not usually publicly available. Our analysis relies instead on publicly available aggregate-level data; to overcome these challenges and arrive at reliable and robust findings, we make use of an array of different data sources and estimation techniques. Specifically, in the first part of the paper we examine the impact of immigration on the informal economic activity at the local level over the period 1996–2006 in Italy. In the second part of the paper, we study the role of immigration amnesties in Italy.

[1] This is particularly true for Italy, where immigrants experience worse labor market outcomes than natives with similar (observable) individual characteristics (Del Boca & Venturini, 2003).

In particular, we focus on the 2002 Italian immigration reform, when almost 700,000 undocumented immigrants were granted legal status, increasing the stock of documented immigrants by almost 50%. The occurrence of the above-mentioned amnesty, the large variation of both immigration and shadow economy within the country and across time, and the existence of detailed local-level data on regular and regularized immigrants make Italy a very good case study to analyze immigration, shadow economy and the link between these two phenomena.

As a measure of immigration, we use administrative data on the issuance of residence permits at the local (province, NUTS-3) level in a year. Employing data on documented immigrants only is a necessity, as information on undocumented immigrants is sparse and not always reliable. In the body of the paper, we go through a number of exercises aimed at attenuating the omitted variable bias potentially caused by the use of residence permits. We also exploit data on amnestied immigrants to better take into consideration the undocumented immigration.

Our two main measures of the province-level shadow economy are obtained by combining the standard electricity consumption (EC) approach with (i) a revised version of the currency demand approach (CDA; Ardizzi et al., 2013) and (ii) the methodology adopted by the Italian Revenue Agency to measure tax evasion (Pisani & Polito, 2006), respectively. To further explore the robustness of our findings, we use two additional measures of the informal economic activity: the regional-level official estimates of the share of irregular employment measured by the Italian National Statistical Institute (ISTAT) and a measure of the individual propensity to work informally calculated through the Italian Survey of Household Income and Wealth (SHIW) of the Bank of Italy (Capasso & Jappelli, 2013).

We find that the share of the shadow economy is positively correlated with the presence of immigrants. This link is statistically and economically significant, and our results are robust to an instrumental variable analysis and a number of checks. However, the effect of immigration on the Italian underground economy results in a substantially smaller absolute value than other variables, such as GDP per capita. The size of this effect becomes even smaller after the 2002 immigration amnesty. This finding highlights how immigration should be added to the long list of covariates that have been found to strongly correlate with the Italian informal economic activity and confirms that economic development is the main determinant of the relative size of the shadow economy.[2]

The paper is organized as follows: Section 2 describes the institutional background, Section 3 reviews the relevant literature, Section 4 includes the empirical analysis, and Section 5 concludes.

## 2 | INSTITUTIONAL BACKGROUND ON IMMIGRATION

Italy has historically been a country of emigration, with people moving towards the Americas between the nineteenth and twentieth centuries, and towards Northern Europe after World War Two. Unlike other European countries like France or the United Kingdom, Italy has a very limited colonial past, and therefore did not experience the flows of immigration that orfollowed decolonization. Immigration started to become a visible phenomenon only in the 1980s; early

[2] According to La Porta and Shleifer (2008, 2014), the economic growth comes from the formal sector and the expansion of the formal economy leads to the decline of the informal sector. Ulyssea (2018) specifies that, considering both the informality related to the informal firms and the informality linked to the formal firms actually undertaking informal activities, lower informality can be, but it is not necessarily associated with higher output.

government interventions were mainly aimed at regularizing the stock of immigrants already residing in the country, rather than at managing the inflows.

Since 1998, the system became based on quotas set yearly by the government. Each year, the so-called "Decree on [Immigrant] Flows" sets the number of new working residence permits to be issued in a year, subdivided by sector (construction, domestic services, and a residual category). These permits are contingent on job contracts and tend to regularize a quota of the existing (working) undocumented immigrants. The 1998 immigration reform also triggered a number of bilateral agreements with some of the main countries of emigration, in order to facilitate the repatriation of undocumented immigrants, in exchange for reserved subquotas. Each quota is then partitioned across the Italian provinces based on an estimated labor demand for foreign workers.[3]

The EU enlargement process indirectly affected immigration policies: from 2007 onwards freedom of movement was granted to immigrants from Eastern-European countries, which joined the EU starting from 2004. From that moment onwards, workers from countries such as Poland and Romania have been allowed to work in Italy with no need for a visa or a work permit. For this reason, we chose our period of analysis to end in 2006.

Immigrant inflows have also been managed through a number of amnesties throughout the years. An amnesty issued in 1995 regularized over 250 thousand immigrants. Three years later (and not many months after finishing the processing of 1995 applications), another amnesty was issued and about 200 thousand undocumented immigrants were regularized. This paper focuses on the 2002 amnesty, which was comprised of an (otherwise restrictive) immigration bill passed by the newly formed right-wing government. The bill was passed in September 2002, and applicants had to prove they were working in Italy on the June 10, 2002. Employers had to pay a one-off regularization fee, as partial reimbursement for the evaded social security contributions. The government itself was surprised by the take-up of this amnesty: the great majority of applications were processed in 2003; out of about 700,000 applications, over 650,000 residence permits were issued, which accounted for almost 50% of the stock of legal immigrants on the day before the amnesty. The two previous amnesties had a much smaller take-up and the processing time of the applications went on to great length, so much so that the amnesty-issued residence permits are spread across more years and overlap with the intake coming from the annual "Decree on [Immigrant] Flows."

## 3 | LITERATURE REVIEW

To our knowledge, we are the first to try to establish a robust empirical link between immigration and the shadow economy. Several studies emphasize the role of social and institutional quality in shaping incentives to enter the official sector of the economy, but none look specifically into immigration. For example, Enste and Schneider (2000)'s review points out how the level of taxation and the regulatory burden is major explanatory factors of the size of the shadow economy. Friedman et al. (2000) stress that the burden of bureaucracy and corruption are prominent with respect to the sheer tax burden as the reason for entrepreneurs go underground. Also Dabla-Norris et al. (2008) find a robust link between the shadow economy, regulatory burden, and the level of legal enforcement analyzing a World Bank firm-level survey. Other studies on the informal economy highlight that firm size is an important explanatory factor: La Porta and Shleifer (2008, 2014)

[3] The official Association of the Chambers of Commerce advises the government for this purpose.

find that unofficial firms tend to be smaller, less efficient, and with lower (human and physical) capital content. Therefore, growth-enhancing policies are effective instruments to substantially reduce the weight of the informal sector. Even if not directly related to immigration, other works explore the links between the shadow economy and economic phenomena closely related to it, such as inequality, financial development, and banking crisis (Capasso & Jappelli, 2013; Chong & Gradstein, 2007; Colombo et al., 2016).[4]

Focusing on the relationship between immigration and the shadow economy, and on how this link is affected by immigration amnesties, our paper also speaks to the literature on the economic effects of immigration and immigration policies. A central role in this literature is played by the debate on the effects of immigration on local labor market outcomes (such as wages and employment), starting from Card (1990) seminal study on the Mariel boatlift. The more prominent contributions—based on United States and European data—include Borjas (1994, 2003), Borjas and Katz (2005), Card (2001, 2005), Peri and Sparber (2009), Ottaviano and Peri (2012), D'Amuri and Peri (2014), Foged and Peri (2015), and Basso et al. (2019). Very few studies specifically explore the link between immigration and labor market outcomes in Italy. Among these works, we mention Gavosto et al. (1999), who obtain a positive effect of immigration on the unskilled natives' wages, and Venturini and Villosio (2006), who find that the probability of transition by natives from employment to unemployment does not seem to be affected by immigration.[5] A number of other authors examine the impact of amnesties on labor market outcomes (Chassamboulli & Peri, 2014; Kaushal, 2006; Kossoudji & Cobb-Clark, 2002; Lozano & Sorensen, 2011). As what concerns the Italian immigration policies, Devillanova et al. (2018) focus on the 2002 regularization—the same this paper looks into—and obtain a positive effect of the prospect of legal status on the employment outcomes of undocumented immigrants who are eligible for the amnesty.

Given the possible links between shadow economy and criminal activities, this paper can also contribute to the literature on the effects of immigration and immigration policies on crimes (Bell et al., 2013; Butcher & Piehl, 2007; Comino et al., 2020; Freedman et al., 2018; Mastrobuoni & Pinotti, 2015). The literature focusing on the Italian data shows that immigration only increases the incidence of robberies, while the impact on the overall crime rate is not significantly different from zero (Bianchi et al., 2012).[6] Moreover, the amnesties seem to have a negative effect on criminal activity in Italy (Pinotti, 2017); however, the magnitude of this effect appears to be relatively small (Fasani, 2018).

Our paper can be placed in continuity with these above-mentioned contributions, exploring the link between shadow economy and immigration and highlighting how regularization programs are correlated with the decrease of the incidence of the informal sector in a locality.

[4] Capasso and Jappelli (2013) in particular link the lack of financial development with the incidence of the shadow economy. In their paper, they first introduced a measure of the shadow economy based on social security evasion using data from the Bank of Italy Survey of Household Income and Wealth, which is also used in this paper.

[5] Venturini (1999) explores the competition between national workers and foreigners working irregularly in Italy.

[6] We are particularly indebted to the Bianchi et al. (2012)'s work, as we use a similar econometric specification to attenuate the omitted variable bias caused by the presence of (unmeasured) irregular immigrants.

# 4 | EMPIRICAL ANALYSIS

## 4.1 | Data

### 4.1.1 | The estimates of the shadow economy

The shadow economy is a phenomenon that cannot be directly observed. We can only adopt estimates of the informal sector that attempt to appropriately approximate its entity.

Official estimates of the Italian unobserved economic activity are regularly published by ISTAT. Unfortunately, these measures are only available at the regional (NUTS-2) level, with only 20 observations per year. To better exploit the higher degree of heterogeneity characterizing more disaggregated data, we have decided to rely on new province-level measures of unobserved economic activity as main indicators and check the robustness of our results using the regional-level ISTAT measures. We also use a measure of the individual propensity to evade as additional robustness check. Each indicator is inevitably imperfect and may underestimate specific parts of the underground economic activity; finding consistent results across indicators will be a sign of the robustness of our findings.

Our two main measures of unobserved economic activity are obtained by combining the standard EC approach with (i) a revised version of the CDA and (ii) the methodology adopted by the Italian Revenue Agency to measure tax evasion, respectively.

To create our first series *Shadow1*, we estimate the growth rates of the Italian unrecorded income at a province level for the period 1996–2006 using the EC approach and then peg them to preexisting base year estimates of total unobserved economy obtained by Ardizzi et al. (2013) for the year 2005. The traditional CDA (Tanzi, 1980, 1983) implies the isolation of the demand for currency related to unofficial transactions by estimating a basic equation for currency demand that includes income, interest rate, and tax burden as explanatory variables. Ardizzi et al. (2013) reinterpret the traditional CDA and introduce three main innovations: (i) as dependent variable in the money demand equation they adopt the flow of cash withdrawn from bank accounts relative to total noncash payments instead of the stock of liquid assets; (ii) they enrich the set of independent variables directly linked to the unobserved economy activity, including two further indicators of detected tax evasion on top of tax burden; (iii) they also control for the illegal production and incorporate illegal activities in their estimates. The innovations introduced by Ardizzi et al. (2013) represent a significant improvement in the literature on the CDA. In particular, they address the three main criticisms of the standard CDA basic assumptions (Schneider & Enste, 2000): (i) the absence of underground economic transactions in the base year; (ii) the equal velocity of money in the official and unofficial sector; (iii) no determinant of the shadow economy except the excessive tax burden in the money demand equation.

Employing the Ardizzi et al. (2013)'s figures as base-year estimates of the size of the unobserved economic activity in 2005,[7] we obtain the growth rates of the Italian unrecorded income at the province level for the period 1996–2006 using the EC approach. The EC technique estimates total (observed plus unobserved) income growth by assuming that the ratio of electricity consumption to the overall economic activity is constant through time. Under such an assumption, the EC

[7] Ardizzi et al. (2013) report estimates of both underground economic activities (that do not include illegal production) and total unobserved economic activities for the period 2005–2008. We replicate our results by using as base year estimates their measures of underground economy for 2005 and 2006, respectively, and their figures of total unobserved economy for 2006. All the results obtained are in line with the findings reported in this paper and available upon request.

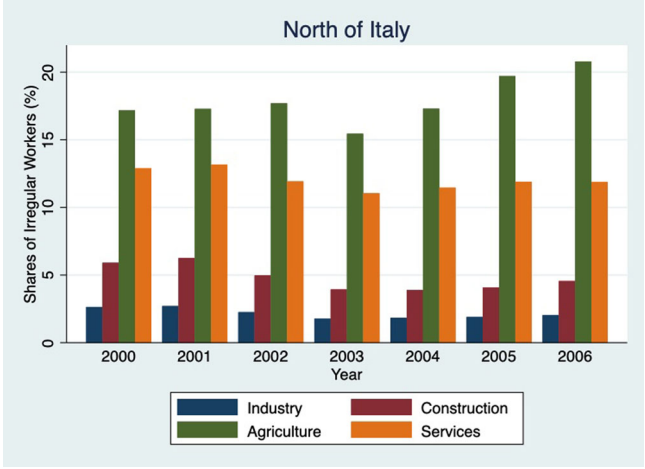


**FIGURE 1** Shares of irregular workers: north of Italy [Colour figure can be viewed at wileyonlinelibrary.com]

growth is used as a proxy for the growth of total GDP. Once the growth in the overall economic activity is obtained, the difference between the growth rate of official income and the growth rate of total income is imputed to the growth in the unobserved economy (Kaufmann & Kaliberda, 1996)[8] .

Our second series of the shadow economy as a share of GDP at the province level (*Shadow2*) is derived by using our EC unofficial income growth rates and, as alternative base year estimates, more narrow measures of shadow economy obtained by the Italian Revenue Agency for the year 2000 (Pisani & Polito, 2006). Specifically, these estimates of tax evasion measure the province-level values of the undeclared tax base for IRAP (Imposta Regionale sulle Attività Produttive), a corporate tax on firm revenues. The use of two alternative shadow economy series allows us to reinforce the reliability of our results. The selection of a panel of 82 provinces has been mainly driven by the availability of both the Ardizzi et al. (2013) and the Italian Revenue Agency's base-year estimates.[9]

The EC method has been extensively used to estimate the Italian shadow economy growth (Chong & Gradstein, 2007; Colombo et al., 2016; Friedman et al., 2000; La Porta & Shleifer, 2008) and allows us to obtain disaggregated series, but we are well aware that this methodology has its drawbacks. A commonly raised objection to the EC technique is that not all unofficial economic activities require a considerable amount of electricity and other energy sources such as gas and oil can be used (La Porta & Shleifer, 2008). This might be particularly true for developed countries like Italy characterized by high shares of unobserved economic activities in sectors such as construction, agriculture, and domestic services.

As shown in Figure 1, in Northern Italy, the highest shares of irregular workers calculated by ISTAT[10] were employed in agriculture and services during the period 2000–2006, with irregularity rates ranging between 15% and 21% and 11% and 13%, respectively. According to these numbers,

[8] The data on electricity consumption and official GDP are from Terna (the company owning the national electric grid) and ISTAT, respectively.

[9] We have replicated our entire analysis by using a larger panel of 101 provinces for which the *Shadow2* series is available. The findings obtained by using a larger panel of provinces are in line with the results reported in this paper and available upon request.

[10] This index represents the number of irregular (full-time equivalent) workers as a share of total (full-time equivalent) workers.

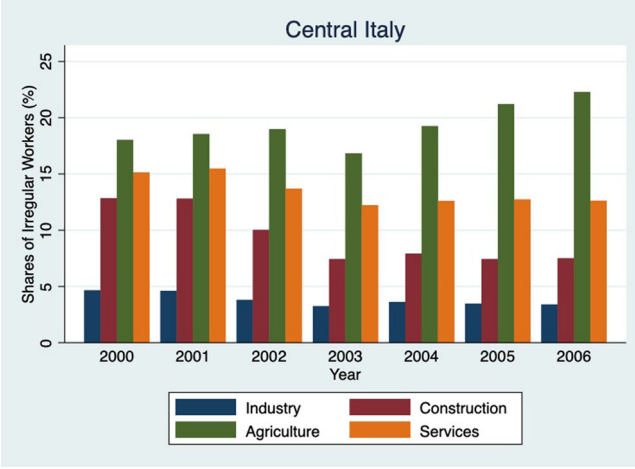


**FIGURE 2** Shares of irregular workers: central Italy [Colour figure can be viewed at wileyonlinelibrary.com]

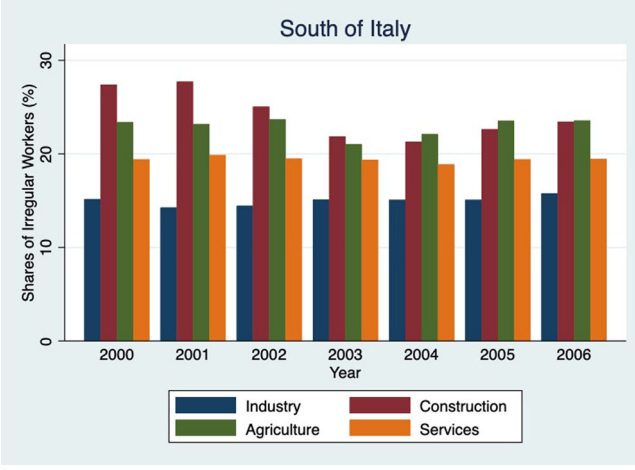


**FIGURE 3** Shares of irregular workers: south of Italy [Colour figure can be viewed at wileyonlinelibrary.com]

the incidence of irregular employment was significantly smaller in construction and industry (excluding construction), with irregularity rates ranging between 4% and 6% and 2% and 3%, respectively. Looking at the estimates for Central Italy (Figure 2), slightly higher shares of irregular workers were employed in agriculture, services, and industry (excluding construction) during the same period of time, while the incidence of irregular employment was more signifcant in the construction sector, with irregularity rates ranging between 7% and 13%. The incidence of irregular employment in Southern Italy during the period 2000–2006 was significantly higher in each of the four sectors. As reported in Figure 3, the irregularity rates ranged between 21% and 28% in the construction sector, 21% and 24% in agriculture, 19% and 20% in services, and 14% and 15% in the industry (excluding construction). All in all, official estimates tell us that the Italian job market is characterized by substantial shares of unobserved economies especially in the construction, agriculture, and service sectors. As reported by the International Energy Agency, the Italian construction industry has been reported to consume a substantial amount of electricity over the past few decades. Specifically, in 1990 about 70% of the total energy consumed in the Italian construction sector was electricity. This percentage remained above 50% throughout the period 1990–2000 (source: International Energy Agency World Energy Balances).

Critics of the EC methodology also emphasize the potential downward bias caused by energy-saving technological progress. However, it cannot be taken for granted that the technological change will reduce the energy intensity of aggregate production (Jevons, 1965). In fact, following an improvement in energy efficiency, the fall in energy prices might cause a substitution effect towards more energy-intensive goods and production techniques. Furthermore, the income effect might raise household consumption of all commodities, including energy consumption.[11] An overall decline in the shadow economy estimates obtained by adopting the EC method could actually support the objection that the use of electricity is more efficient over time as a consequence of the technological progress. Nevertheless, our measures describe a reduction in the relative size of unobserved income only for a small subset of provinces.[12]

A further argument against the choice to approximate the growth of the Italian shadow economy with the EC method is related to the use of the official GDP figures provided by ISTAT. Official GDP already incorporates estimates of the Italian unobserved economic activity and to use its growth rates as a proxy for the dynamics of the official income might not be considered appropriate. As mentioned above, ISTAT only publishes shadow economy figures at the regional level. Therefore, the choice of alternative estimates has been mainly urged by the absence of official data at a more disaggregated level. National estimates of the Italian shadow economy based on the use of the EC approach have been extensively adopted in the literature (Chong & Gradstein, 2007; Colombo et al., 2016; Friedman et al., 2000; La Porta & Shleifer, 2008), and they usually show high correlation with other standard proxies of the informal economic activity. To further support our choice, we check the correlation between our main estimates (*Shadow1*) and a series obtained by pegging the growth rates of the share of self-employed at the province level to the Ardizzi et al. (2013)'s CDA base-year figures. The percentage of the labor force that is self-employed has been commonly employed as a proxy for the relative size of the shadow economy (Colombo et al., 2016; Loayza & Rigolini, 2011). We obtain a correlation coefficient higher than 0.95. This should suggest that, despite the inclusion of unofficial economic activities in national accounts, the EC remains a valid approach to estimate the dynamics of the shadow economy phenomenon.

In addition to our *Shadow1* and *Shadow2* series, we use the above-mentioned share of irregular employment calculated by ISTAT at the regional level (*Shadow3*) as a robustness check. This index represents the number of irregular (full-time equivalent) workers as a share of total (full-time equivalent) workers. Labor supply survey data—on which the ISTAT measurement is based—are inevitably sensitive to the way the questionnaire is formulated and strongly depend on the respondents' willingness to cooperate. Nevertheless, the use of several statistical and administrative sources makes the ISTAT estimate of the undeclared work a very reliable measure of the Italian unobserved economic activity. Unfortunately, as explained above, this measure is only available at the regional level, with only 20 observations per year, with obvious consequences on statistical power.[13]

[11] Allan et al. (2007) report a rebound effect between 30% and 50%. Dimitropoulos (2007) obtains even stronger rebound effects.

[12] The mean value of the annual growth rates of the EC estimates over the period 1996–2006 only decreases by more than 1% in one province (Trieste).

[13] A further problem with these data comes from some methodological changes due to the adoption of the European System of Account 95. ISTAT provides two overlapping time series: 1990–2002 and 2000–2009, with potentially incongruous figures in the intersection of these intervals. Our results are qualitatively unaffected by the use of one, the other, or an average of the two time series for the 3 years of overlap. The use of time fixed effects may contribute to the stability of our estimates.

**TABLE 1** Summary statics: Region- and province-level aggregate datasets

| Variable | Mean | Std. Dev. | *N* |
|---|---|---|---|
| Provincial-level variables | | | |
| Shadow1 (EC) | 23.109 | 13.824 | 901 |
| Shadow2 (EC) | 18.058 | 7.198 | 901 |
| Immigration (residence permits per 100,000 inhabitants, logarithm) | 7.637 | 0.732 | 901 |
| GDP (logarithm, per capita) | 9.275 | 0.589 | 901 |
| Social capital | 0.742 | 0.072 | 901 |
| Civil service efficiency | 1.267 | 0.276 | 901 |
| Regional-level variables | | | |
| Shadow3 (ISTAT) | 14.831 | 5.306 | 220 |
| Immigration (residence permits per 100,000 inhabitants, logarithm) | 7.545 | 0.774 | 240 |
| GDP per capita, logarithm | 3.182 | 0.27 | 240 |
| Social capital | 0.721 | 0.061 | 240 |
| Civil service efficiency | 1.269 | 0.215 | 240 |

Abbreviations: EC, electricity consumption; ISTAT, Italian National Statistical Institute.

To conclude, to further enrich our analysis, we follow the microeconomic approach suggested by Capasso and Jappelli (2013) and adopt a measure of the individual propensity to work in the unofficial sector as a final robustness check. In order to obtain this microeconomic indicator of the shadow economy, we use the Bank of Italy's Survey on Household Income and Wealth (SHIW) that is a biannual cross-sectional survey comprising about 8,000 households (24,000 individuals). The survey sample is a representative subset of the Italian resident population and provides detailed information on demographic characteristics, income and wealth. The SHIW questionnaire does not include a direct question on the extent to which each individual works in the unofficial sector. However, as suggested by Capasso and Jappelli (2013), it is possible to infer the degree of irregular activity through the following two questions: (i) How old were you when you started working? (ii) For how many years did you or your employer not pay social security contributions?. With these two questions, we are able to construct our fourth measure of informal activity (*Shadow4*) for the years in our sample period when the survey was performed (1995, 1998, 2002, 2004, 2006). Specifically, we divide the number of years not covered by social security contributions by the length of the entire working life.[14] Also this survey-based measure is subject to criticism, as it is well known that surveys tend to rely on respondents truthfully answering the survey questions (Enste & Schneider, 2000). Nevertheless, we believe that our microeconomic index is a good indicator of the incidence of irregular jobs in a local labor market and—unlike the aggregate series *Shadow1*, *Shadow2*, and *Shadow3*—it allows us to control for the individual-level characteristics of surveyed workers. In this respect, we need to stress that our microeconomic indicator is aimed at measuring the propensity to evade social security in a single locality as proxied by the survey sample in the locality, not the propensity to evade the immigrant population, as this would require cohort data that is not available to us.

The detailed descriptive statistics of our provincial and regional and microeconomic shadow economy estimates are reported in Tables 1 and 2, respectively.

[14] Our microeconomic estimate of the informal activity does not include individuals who do not report years of contributions, are not part of the labor force, or who work in the public or agricultural sectors.

**TABLE 2** Summary statistics: microlevel dataset

| Variable | Mean | Std. Dev. | *N* |
|---|---|---|---|
| Shadow4 (SHIW) | 25.312 | 28.407 | 39,939 |
| Immigration (residence permits per 100,000 inhabitants., logarithm) | 7.78 | 0.709 | 40,579 |
| Disposable income, logarithm. | 9.768 | 1.042 | 36,995 |
| Age | 42.784 | 12.388 | 40,579 |
| Age sq. | 1983.909 | 1059.075 | 40,579 |
| Male | 0.601 | 0.49 | 40,579 |
| Married | 0.680 | 0.466 | 40,579 |
| Education | 3.711 | 1.403 | 40,579 |
| Nonemployed | 0.283 | 0.451 | 40,579 |
| Self-employed | 0.196 | 0.397 | 40,579 |
| Civil service efficiency | 1.268 | 0.203 | 40,579 |
| Social capital | 0.746 | 0.059 | 40,579 |

Abbreviation: SHIW, Italian Survey of Household Income 3 and Wealth.

### 4.1.2 | Immigration

As a measure of immigration, we adopt the number of valid residence permits per 100,000 inhabitants issued in a province (Interior Ministry and ISTAT). This measure is largely used in the literature on immigration in Italy (Barone et al., 2016; Bianchi et al., 2012) and does not account for undocumented immigrants. As undocumented immigrants are unobservable in official statistics, it may introduce an omitted variable bias: the natural positive link between undocumented immigrants and the informal economic activity may bias the analysis of the impact of immigration on the size of the shadow economy.[15] Following Bianchi et al. (2012), we adopt a two-way fixed-effects specification to help overcome this issue. Specifically, we define the logarithm of total immigrants ($M^*$) as the sum of the logarithm of documented immigrants ($M$) plus geographical (province or regional) ($\alpha_l$) and time ($\delta_t$) fixed effects,[16] that is,

$$M^*_{l,t} = \alpha_l + \delta_t + M_{l,t.} \tag{1}$$

As long as the presence of undocumented immigrants is correlated with the number of documented immigrants and the locality and time fixed effects (which seems reasonable to assume), this strategy reduces measurement error. Finally, and more generally, the instrumental variable (IV) analysis we perform may also help eliminate omitted variable bias.

The data on residence permits are highly detailed and give us valuable information about the province of residence, gender composition, type of permit, and country of origin of immigrants.

[15] Camacho et al. (2017) build a theoretical model in which shadow economy and undocumented migrants are strategic complements: a large informal sector may foster illegal immigration, and, simultaneously, a large cohort of undocumented migrants may increase firms' incentives to go underground.

[16] This procedure is standard in the crime literature. Since the reported criminal activity usually underestimates the true number of committed crimes, the econometric analysis on the determinants of crime may be biased by their correlation with the nonreported crimes. This problem is usually dealt with by taking logarithms of crime rates and including fixed effects for geographical areas and time periods; see, for instance, Gould et al. (2002); Oster and Agell (2007) and Fougère et al. (2009).

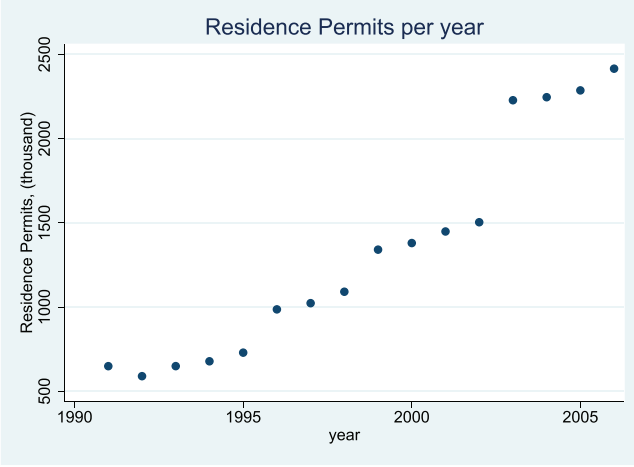


**FIGURE 4** Number of residence permits per year [Colour figure can be viewed at wileyonlinelibrary.com]

Specifically, the residence permits issued in Italy during the period 1996–2006 were generally equally distributed between men (52.2%) and women (47.8%). The three main continents of origin were Europe (44.1% of total residence permits), Africa (26.1%), and Asia (18%). 11.6% of total permits were granted to immigrants from North and South America and less than 1% to immigrants coming from Oceania and to the stateless. 29.7% of total permits were issued for family reasons, 2.2% for study, and only less than 1% for political asylum. More than 60% of residence permits were issued for employment reasons. These data clearly show a strong discontinuity generated by the 2002 Bossi–Fini immigration reform (Figure 4).

Data on amnestied immigrants are available at the province level (Italian National Council for Economics and Labor, CNEL),[17] but only as an aggregate number. The large difference between residence permits in 2002 and 2003 can be considered a good proxy for the number of amnestied immigrants in 2003. As long as the propensity to apply for regularization is not too heterogeneous across localities, this also gives us an insight on the number of undocumented immigrants in 2002. The correlation between the significant increase in the amount of documented immigrants in 2003 and the exact number of amnestied immigrants is actually very high and equal to 0.98. Therefore, exploiting the official data on immigrants published by ISTAT and the information on amnestied immigrants provided by CNEL, we create an additional measure of immigration to use as a robustness check. Specifically, using the gap between documented immigrants in 2003 and 2002 we estimate the number of undocumented immigrants for different subgroups in 2002, as a share of the preamnesty regular immigrants of the same subgroup.[18] These shares are then used to calculate the "imputed" number of undocumented immigrants in each province for the period preceding the amnesty (1996–2001).

### 4.1.3 | Controls

The presence of different types of measures of the shadow economy implies the use of different datasets and, therefore, different sets of controls.

[17] CNEL only provides information about the province of residence of amnestied immigrants.

[18] Subgroups are defined by province of residence, gender, and nationality.

Two datasets are based on aggregate province- and regional-level estimates of the shadow economy. For these two datasets, we use aggregate measures as controls. According to the literature, the main drivers of the informal economic activity include tax and regulatory burden, the quality of public institutions and the level of economic development. In our analysis, the level of economic development is captured by the (real, log) per capita GDP, while the quality of institutions is proxied by two indicators. First, we include the turnout at the most recent European Parliament elections, as a proxy for social capital. As these elections are not directly linked to the election of a government, it is widely believed in the literature that turning out is analogous to voluntarily providing a public good.[19] These elections are held every 5 years; therefore, our datasets include data from 1994, 1999, and 2004. Furthermore, similarly to Capasso and Jappelli (2013), we also employ an index of the efficiency of local civil courts as a proxy for civil service efficiency. This is the only nationwide measurable (and measured) output of the central civil service, and we believe that it may help to capture different levels in the efficiency of enforcement.[20] We cannot employ any measure of tax burden as these indicators are usually defined at the national level. Moreover, the use of tax burden as independent variable in our model would not be appropriate, as this measure is used in the estimation of the shadow economy. To be consistent with the aggregation level of our dependent variables, all our controls are aggregated at the provincial or regional level.

The microlevel analysis based on the SHIW survey includes individual-level characteristics such as household disposable income, age, gender, marital status, education, and whether the individual is nonemployed or self-employed. Similar to the aggregate-level data, it also includes additional controls aggregated at the regional level,[21] such as social capital and the civil-court efficiency index.

Table 1 presents the summary statistics for the aggregate variables, while Table 2 reports the summary statistics for the microlevel dataset.

## 4.2 | Empirical strategy and results

Our approach first focuses on establishing whether there exists a link between the presence of immigrants and the share of the informal sector in the economy. In the first instance, we rely on simple ordinary least squares (OLS) regressions, and then we use an instrumental-variable approach to deal with potential reverse causality problems, that is, the possibility that localities with a larger share of the shadow economy might be more attractive to immigrants. We then analyze the effects of the 2002 Italian immigration reform and its impact on the link between immigration and the extent of informal economic activity.

[19] See Palfrey and Rosenthal (1983, 1985) and Grafstein (1991).

[20] Measures of economic development and quality of institutions are standard determinants of the informal economic activity.

[21] The SHIW survey only includes the regional identifiers of interviewed subjects.

### 4.2.1 | The relationship between immigration and the shadow economy

By using our *Shadow1* and *Shadow2* series, we conduct OLS regressions with province and year fixed effects. The specification can be described as follows:

$$sh_{p,t} = \alpha + \beta M_{p,t} + \gamma Z_{p,t} + u_p + \tau_t + \varepsilon_{p,t}, \quad (2)$$

where $sh_{p,t}$ is the proxy for the size of the shadow economy in province $p$ at time $t$, $M_{p,t}$ is the log of immigrants per 100,000 inhabitants in province $p$ at time $t$, and $Z$ is the matrix of controls including the per capita GDP (deflated and logged), the index of efficiency of civil courts and the turnout at the more recent European elections. Finally, $\tau_t$ and $u_p$ represent year and province fixed effects, respectively, while $\varepsilon_{p,t}$ is the error term.

The main variable of interest, immigration, is expected to be positively related to the informal activity. According to Del Boca and Venturini (2003), immigrants in Italy earn significantly less than natives. This is partly due to the fact that they are on average younger and low-skilled.[22] Moreover, immigrants also experience worse labor market outcomes than natives with similar individual characteristics. On those grounds, we expect a significantly high concentration of immigrants in the informal sector. In line with the literature on the determinants of the shadow economy, we also expect a negative relationship between the measures of GDP, social capital, and civil service efficiency and the extent of the unobserved economic activity (see Capasso & Jappelli, 2013).

The causal nexus between immigration and unobserved economic activity could be in the opposite direction to the one described above: we cannot exclude the possibility that immigrants are attracted to geographical areas where the demand for undeclared workers is higher. Taking into consideration this potential endogeneity problem, we also estimate the relationship between immigration and the shadow economy by adopting a two-stage least square (2SLS) approach, which requires an instrument for the immigration variable. The choice of this instrument is based on a specific strategy that has been widely used in the literature (see Basso et al., 2019; Bellés-Obrero et al., 2021; Bianchi et al., 2012; Card, 2001, 2005; D'Amuri & Peri, 2014; Edo et al., 2019; Lonsky, 2021; Rozo & Sviatschi, 2021). We use an instrument à la Bartik (1991) to control for the "assortative matching" of immigrants into localities with larger availability of irregular jobs. The instrument is based on the reallocation of the stock of immigrants in a given year across localities, according to the distribution that each national group had at some earlier point in time, typically the first year in the dataset. As earlier data are available to us, we decided to use 1991 instead, five years earlier than the start of our dataset and the earliest year for which data is available. For each nationality present in Italy, we calculate the stock of immigrants from that country in a given year and reallocate them across provinces according to the way they were distributed in 1991.[23]

[22] For example, through the Current Population Survey in the United States we know that in the year of interest for this paper roughly 10% of native workers are considered low skilled as opposed to about 30% among immigrants. According to data published by the Italian Ministry of Labour, more than 45% of citizens from outside of the European Union with a STEM degree are employed as low-skilled workers in Italy (Ministry of Labour, 2018).

[23] We perform this exercise using both the top 20 countries of origin in 1991, covering more than 90% of the stock of immigrants in each year, and all countries of origin. The results are generally unchanged, and we report only the former. Of course, we correct the coding in order to encompass the geopolitical changes, taking as a point of reference the countries existing in 1991.

Specifically, our instrumental variable for immigration can be calculated as

$$m_{pt}^{IV} = \sum_{j} \lambda_{pj} m_{jt}, \quad \text{with } \lambda_{pj} = \frac{m_{pj1991}}{m_{j1991}}, \tag{3}$$

where $j$ is the country of origin of the immigrant, $p$ is the province of residence, and $t$ is the year.

This methodology relies on the observation that new waves of immigrants tend to exploit their national networks and settle in locations where a community of immigrants from the same country already exists. According to Jaeger et al. (2018), the estimates based on this type of "shift-share" instrument might conflate the short- and long-run responses to immigration shocks. This can be particularly true if the spatial distribution of immigrant inflows is stable over time. Jaeger et al. (2018) therefore suggest to use the share from a baseline year as far as possible for the period analyzed (Basso et al., 2019). As what concerns our sample, our choice of a reference year (1991) substantially separate from the analyzed time period (1996–2006) ensures significant variation in the relative distribution of immigrants by country of origin between the baseline year and our period of analysis.[24] Moreover, the correlation across Italian provinces between the instrument and its lag is not consistently high. Specifically, we obtain a correlation ranging between 0.41 and 0.95 during the subperiod 1996–2000 with only seven provinces showing a correlation higher than 0.7. The correlation is higher than 0.8 only for five provinces during the years 2001–2006.

We start our analysis by focusing on the *Shadow1* series. In Table 3, we show the results of the OLS (columns 1 and 2) and 2SLS (columns 3 and 5) regressions. The first stage regressions are reported in columns 4 and 6.[25] As expected, the relationship between immigration and the size of the unobserved economic activity is always positive and highly statistically significant. The magnitude of the correlation coefficient is relatively small. Specifically, focusing on the 2SLS estimates, we can see that—controlling for the per capita GDP, social capital, and civil service efficiency—an increase of 1% in the number of immigrants (per 100,000 inhabitants) in a province is associated with a 0.024 increase in the share of the shadow economy (column 5). Without controls, the 2SLS immigration effect increases to 0.035 (column 3). To put it in context, in our sample period the number of immigrants at the province level grew on average 19% per year (8% in nonamnesty years). Employing our main results (column 5), a 19% increase in immigration is therefore linked to a 0.41 increase in the percentage share of the shadow economy, while an 8% change corresponds to a 0.18 increase.

Looking at the additional explanatory variables, the link between per capita GDP and the size of informal economy is—as expected—always negative and statistically significant, and its magnitude is decidedly larger than the immigration coefficients. In particular, an increase of 1% in the per capita GDP is related to a reduction of 0.175 percentage points in the relative size of the informal sector (column 5). The civil service efficiency coefficient is positive and not statistically significant (column 5). This unexpected result might be related to the negative correlation between

[24] The immigration pattern in Italy has changed substantially over the years. For example, Albanians and Romanians have been the two largest immigrant groups for almost two decades, but neither of them is included in the top five countries of origin in 1991. The first Yugoslav wars (1991–1995) determined an important inflow of immigrants from these countries (mostly Croatia, Bosnia, and Slovenia) in the time between our instrument's reference point (1991) and the beginning of our dataset (1996). Immigrants from Albania and former Yugoslavia also concentrated first in the arrival areas (respectively, the southeast for Albanians and the northeast for immigrants fleeing Yugoslavia) and then spread towards the most affluent areas of the country, where jobs could be more easily found.

[25] According to the standard diagnostic tests, the immigration variable is endogenous and the instrument is not weak and well explains the endogenous variable.

**TABLE 3** Effect of immigration on the shadow economy (*Shadow1*), OLS and IV estimates

| | OLS | | 2SLS | | 2SLS | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Shadow1 | Shadow1 | Shadow1 | First Stage | Shadow1 | First Stage |
| Immigration ($\beta$) | 1.423*** | 1.551*** | 3.451*** | | 2.384** | |
| | (0.53) | (0.48) | (1.33) | | (1.13) | |
| Immigration (instrumental variable) | | | | 0.636*** | | 0.725*** |
| | | | | (0.10) | | (0.12) |
| log real GDP | | −17.344*** | | | −17.461*** | 0.424 |
| | | (3.07) | | | (1.53) | (0.29) |
| Social capital | | −3.928 | | | −4.354** | −0.155 |
| | | (3.10) | | | (1.70) | (0.30) |
| Civil service efficiency | | 0.140 | | | 0.220 | −0.114*** |
| | | (0.20) | | | (0.19) | (0.03) |
| *N* | 902 | 901 | 902 | 902 | 901 | 901 |
| Within $R^2$ | 0.28 | 0.40 | | | | |
| Controls | N | Y | N | N | Y | Y |
| Fixed effects | Prov., time | Prov., time | Prov., time | Prov., time | Prov., time | Prov., time |
| Underid test | | | 24.97 | | 25.52 | |
| Weak Id test | | | 37.31 | | 37.59 | |

Abbreviations: 2SLS, two-stage least square; OLS, ordinary least squares. Standard errors in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

immigration and civil service efficiency (column 6). Unsurprisingly, our measure of social capital is negatively and significantly linked to the size of the shadow economy (column 5).

Our results based on the *Shadow2* series are reported in Table 4 and are analogous to the ones just described, albeit more volatile. In particular, we observe that an increase of 1% in the presence of immigrants in a province is associated with a 0.057 increase in the share of the shadow economy (column 5). This would be equivalent to an increase of 1 (0.44) percentage points if immigration grew at its average growth rate of 19% (8%). The effect of the per-capita GDP is still larger than the immigration coefficients, negative and statistically significant: a 1% increase in the per capita GDP is related to a 0.166 reduction in the relative size of the informal sector (column 5). [26]

As a further robustness check, we replicate the empirical analysis by adopting two additional alternative measures of the shadow economy: the first one is the ISTAT regional-level measure of irregular employment (*Shadow3*(ISTAT)) and the second one is the microeconomic indicator of the individual propensity to work in the informal sector (*Shadow4*(SHIW)). In Table 5, we show these additional OLS and 2SLS estimates. The results are similar to those reported in Tables 3 and 4: the relationship between immigration and the two additional measures of the informal economic activity is always positive and highly significant. Specifically, looking at the 2SLS estimates, we can see that a 1% increase in the share of immigrants is associated with an increase in

[26] In Tables 3–5, the 2SLS results are qualitatively similar to those of OLS. One finding of note is that the magnitude of the coefficient on *Immigration* is always larger than the magnitude of the corresponding coefficient in OLS. The gap is particularly significant in Table 4. A possible explanation for the large difference is the above-mentioned measurement error in the immigration variable, biasing the coefficient on *Immigration* in OLS towards zero. This problem is usually mitigated by the instrumental variable approach (see Gujarati, 2003; Theil, 1971; Das et al., 2011).

**TABLE 4** Effect of immigration on the shadow economy (*Shadow2*), OLS and IV estimates

| | OLS | | 2SLS | | 2SLS | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Shadow2 | Shadow2 | Shadow2 | 1st Stage | Shadow2 | 1st Stage |
| Immigration ($\beta$) | 0.745* | 0.839** | 7.381*** | | 5.767*** | |
| | (0.42) | (0.38) | (1.87) | | (1.53) | |
| Immigration (instrumental variable) | | | | 0.636*** | | 0.725*** |
| | | | | (0.10) | | (0.12) |
| log real GDP | | −15.838*** | | | −16.528*** | 0.424 |
| | | (2.41) | | | (1.65) | (0.29) |
| Social capital | | −0.067 | | | −2.589 | −0.155 |
| | | (2.29) | | | (1.96) | (0.30) |
| Civil service efficiency | | 0.229* | | | 0.700*** | −0.114*** |
| | | (0.16) | | | (0.24) | (0.03) |
| N | 902 | 901 | 902 | 902 | 901 | 901 |
| Within $R^2$ | 0.30 | 0.48 | | | | |
| Controls | N | Y | N | N | Y | Y |
| Fixed effects | Prov., time | Prov., time | Prov., time | Prov., time | Prov., time | Prov., time |
| Underid test | | | 24.97 | | 25.52 | |
| Weak Id test | | | 37.31 | | 37.59 | |

Abbreviations: 2SLS, two-stage least square; OLS, ordinary least squares. Standard errors in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

*Shadow3* (ISTAT) of 0.076 percentage points (column 2), equivalent to an increase of 1.32 (0.58) percentage points if immigration grew at its average growth rate of 19% (8%). The effect of the immigration variable on *Shadow4*(SHIW) is slightly smaller and almost equal to 0.07 (column 5), equivalent to an increase of 1.17 (0.52) percentage points if immigration grew at its average growth rate of 19% (8%).[27]

To summarize, according to our estimates the relationship between immigration and informal economic activity in Italy is positive and strongly significant. This result is robust to the use of an IV analysis and different measures of unobserved economic activity defined at the province, individual and regional level, respectively. This finding suggests that immigration should be therefore added to the list of potential determinants of the Italian shadow economy. The focus on the link between immigration and informal economic activity should be particularly relevant during years of intense immigration inflows. As discussed above, this might be explained by the fact that immigrants in Italy tend to be exposed to worse labor market outcomes than natives with analogous (observable) individual characteristics (see Del Boca & Venturini, 2003). They may lack language skills, or be subject to outright discrimination. They are also often employed in low-skilled jobs, where the rate of informality tends to be higher.

[27] With respect to the microeconomic controls, we expect that women, younger individuals, individuals with lower levels of education and who are not married, unemployed, and self-employed workers are more likely to operate irregularly. At the same time, we expect a negative relationship between disposable income and the probability of working in the informal sector. All the individual-based controls (but age) have the expected signs in the microeconomic estimates.

**TABLE 5** Effect of immigration on the shadow economy (*Shadow3 – ISTAT, Shadow4 – SHIW*), OLS and IV estimate

| | OLS | 2SLS | | OLS | 2SLS | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Shadow3 | Shadow3 | 1st Stage | Shadow4 | Shadow4 | 1st Stage |
| Immigration | 2.051*** | 7.593*** | | 1.887* | 6.768*** | |
| | (0.711) | (2.555) | | (1.077) | (2.293) | |
| Immigration (instrumental variable) | | | 0.851*** | | | 0.293*** |
| | | | (0.170) | | | (0.006) |
| *N* | 220 | 220 | 220 | 32133 | 32133 | 32133 |
| Within $R^2$ | 0.62 | | | 0.224 | | |
| Controls | Regional | Regional | Regional | Regional, Demographic | Regional, Demograhic | Regional, Demographic |
| Fixed effects | Region, time | Region, time | Region, time | Area, time | Area, time | Area, time |
| Underid test | | 15.86 | | | 1700.78 | |
| Weak Id test | | 24.95 | | | 2653.37 | |

Abbreviations: 2SLS, two-stage least square; ISTAT, Italian National Statistical Institute; OLS, ordinary least squares; SHIW, Italian Survey of Household Income and Wealth. Standard errors in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

**TABLE 6** Amnestied immigrants and pre-amnesty documented immigrants

| Bill | Year | Amnesty | Preamnesty "stock" |
|---|---|---|---|
| Scalfaro | 1986 | 105,000 | Not available |
| Martelli | 1990 | 217,626 | Not available |
| Dini | 1995 | 244,492 | 729,159 |
| Turco-Napolitano | 1998 | 217,124 | 1,090,820 |
| Bossi-Fini | 2002 | 704,350 | 1,503,286 |

Nevertheless, despite significantly linked to the Italian underground economy, immigration seems to play a substantially less relevant role in comparison with other variables, particularly the per capita GDP. This suggests that growth-enhancing policies aimed at raising the quality of the public goods accessible to official firms and, consequently, improving the performance of the local economies could be particularly effective against inefficient informal activities (see La Porta & Shleifer, 2008, 2014).

### 4.2.2 | The role of immigration amnesties

The second part of the empirical analysis focuses on the effects of amnesties on both the level of informal economic activity and the relationship between immigration and the size of the shadow economy. In particular, our purpose is to exploit the strong discontinuity shown by the Italian immigration data generated by the 2002 Bossi-Fini reform (Figure 4).

As already mentioned, amnesties have been a regular fixture in the legislation of immigration in Italy. As one can see from Table 6, roughly every 5 years, in correspondence with major or minor immigration reforms, an amnesty has been issued. The peculiarity of the 2002 amnesty lies in the fact that the take-up was much larger than anticipated, and much larger than in any previous amnesty (actually: larger than all previous amnesties put together). The applications equaled almost 50% of the stock of documented immigrants, together with an acceptance rate of over 90%. Also the processing time was—compared with previous amnesties—relatively quick: the quasi-totality of applications was processed within the following year. The details on the eligibility criteria were very similar to the previous (1998) and following (2009, 2012) amnesties, but the specific deadlines and cutoffs were largely unpredictable: the bill was passed in September, and the main eligibility criterion hinged on the undocumented immigrants being able to prove to be in work 90 days before the bill was passed. Moreover, in contrast with previous amnesties, applications had to be filed by employers and not by the applicant themselves.[28]

Since the 2002 regularization has been implemented simultaneously in the whole country, we cannot exploit any time variation across provinces. Nevertheless, we can exploit the different intensity of the treatment, that is, the different levels of the take-up of the amnesty in each province. Figure 5 shows three maps of Italy, at the provincial level, and it highlights the quartiles of the weight of the shadow economy from the Revenue Agency calculation (year 2000, left), preamnesty immigration (center), and amnesty take-up (right). One can observe how these three—unconditional—geographic distributions differ. Specifically, the shadow economy prevails in the center-south, but with peaks of noncompliance in the northwest, and of compliance in the south. The documented immigration is mostly concentrated in the more productive areas of the

[28] Only domestic-service workers were required to file their own applications.

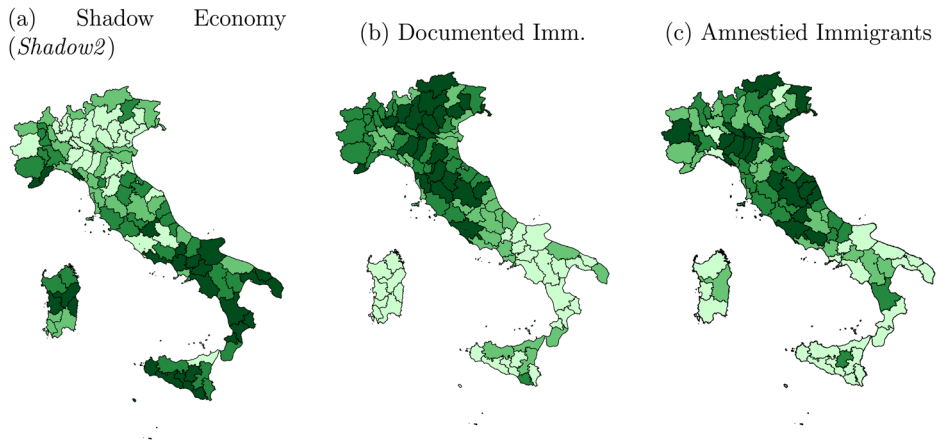


**FIGURE 5** Quartile distribution at the province level: (a) Shadow economy (*Shadow2*), (b) documented immigrants, and (c) amnestied immigrants, three maps of Italy. [Colour figure can be viewed at wileyonlinelibrary.com]

north and center-north, and the amnestied immigrants follow a similar distribution, but with visible local differences, thus supporting the use of amnesty take-up as additional source of variation.

We start examining the role of the 2002 Italian amnesty by estimating, with both OLS and 2SLS techniques, the following equation:

$$sh_{p,t} = \alpha + \beta M_{p,t} + \gamma P_t + \lambda P_t * M_{p,t} + \gamma Z_{p,t} + u_p + t + \varepsilon_{p,t} \quad (4)$$

where $sh_{p,t}$ is the proxy for the size of the shadow economy in province $p$ at time $t$, $M_{p,t}$ is the log of immigrants per 100,000 inhabitants in province $p$ at time $t$, $P$ is the policy dummy variable, which takes value 1 for observations after the amnesty ($year \geq 2003$), and $Z$ is the set of controls. We also add the interaction between immigration and the policy variable. The overall effect of immigration on the shadow economy is $\beta + \lambda$, while the effect of the amnesty on the shadow economy is $\gamma + \lambda\bar{M}$, where $\bar{M}$ is the average immigration level from the policy year onwards. We are aware that these estimates' precision is negatively affected by the presence of two other smaller amnesties in the pre-2002 period; we still believe that the uniqueness of the 2002 amnesty in terms of take-up (also with respect to the policy maker's expectation), and processing speed of applications makes our exercise reasonable. One would also expect that if these smaller amnesties were to affect our results, they would introduce a downward bias to the estimated policy effect. Excluding from our sample the years affected by previous amnestied (1995–1998) do not substantially affect our results.[29]

For the 2SLS estimation, as in Aghion et al. (2005), we instrument both the immigration variable and interaction term. The instrument for the former variable is the same as already discussed, while the instrument for the latter variable is the product between $m^{IV}$ and $P$. As the policy is perfectly collinear with the year fixed effects, we modify our strategy by including a linear time

[29] Detailed tables are available upon request.

**TABLE 7** Amnesty effect (*Shadow1*): OLS and IV estimates

| | OLS | 2SLS | |
|---|---|---|---|
| | (1) | (2) | (3) |
| | Shadow1 | Shadow1 | First stage |
| Amnesty ($\gamma$) | −0.108 | −0.039 | 0.359 |
| | (2.10) | (2.38) | (0.23) |
| Immigration ($\beta$) | 1.634*** | 2.156*** | |
| | (0.50) | (0.70) | |
| Amnesty*Immigration ($\lambda$) | −0.042 | −0.063 | |
| | (0.27) | (0.29) | |
| Immigration (instrumental variable) | | | 0.764*** |
| | | | (0.08) |
| Amnesty*Immigration (instrumental variable) | | | −0.039 |
| | | | (0.03) |
| log real GDP | −17.087*** | −17.187*** | 0.502* |
| | (2.97) | (1.53) | (0.28) |
| Social capital | −4.339 | −4.277*** | −0.296 |
| | (2.78) | (1.53) | (0.25) |
| Civil Service efficiency | 0.277 | 0.325** | −0.099*** |
| | (0.19) | (0.16) | (0.027) |
| $N$ | 901 | 901 | 901 |
| Within $R^2$ | 0.40 | | |
| Overall Immigration ($\beta + \lambda$) | 1.59*** | 2.09** | |
| Amnesty ($\gamma + \lambda\bar{M}$) | −0.44** | −0.55** | |
| Underid test | | 41.64 | |
| Weak Id test | | 26.80 | |

Abbreviations: 2SLS, two-stage least square; OLS, ordinary least squares. Standard errors in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

trend $t$[30] instead of year dummies, in order to make the interpretation of regression coefficient more directly interpretable.

For this estimation, we focus on our main measurements of the shadow economy, namely the ones obtained through the EC method. The SHIW survey does not take place every year, and hence it does not reflect a continuous-time dimension. We also decide not to use the official ISTAT measure of irregular jobs for two reasons. First, the sample size is quite small, with only 20 observations per year; second—and most importantly—the amnesty falls very close to the time in which ISTAT revised the way it measured this rate, making the outcome of this analysis unreliable. We, therefore, concentrate on the aggregate province-level dataset with the *Shadow1* and *Shadow2* series.

The OLS and 2SLS estimation results are shown in Table 7 (*Shadow1*) and Table 8 (*Shadow2*). Both tables have the same format; column 1 shows the OLS results, column 2 the 2SLS results,

[30] The results are unaffected if we alternatively include a square or logged year trend. Moreover, the results shown in Tables 7 and 8 are not affected by the use of a year trend rather than of year dummies. These results are available upon request.

**TABLE 8** Amnesty effect (*Shadow2*): OLS and IV estimates

| | OLS | 2SLS | |
|---|---|---|---|
| | (1) | (2) | (3) |
| | Shadow2 | Shadow2 | First stage |
| Amnesty ($\gamma$) | 5.676*** | 4.553*** | 0.359 |
| | (2.03) | (1.42) | (0.23) |
| Immigration ($\beta$) | 1.373*** | 2.800*** | |
| | (0.37) | (0.71) | |
| Amnesty*Immigration ($\lambda$) | −0.753*** | −0.651*** | |
| | (0.25) | (0.16) | |
| Immigration (instrumental variable) | | | 0.764*** |
| | | | (0.08) |
| Amnesty*Immigration (instrumental variable) | | | −0.039 |
| | | | (0.03) |
| log real GDP | −14.743*** | −15.250*** | 0.502* |
| | (2.13) | (1.24) | (0.28) |
| Social capital | −1.820 | −1.377 | −0.296 |
| | (1.77) | (1.21) | (0.25) |
| Civil Service efficiency | 0.369** | 0.491** | −0.099*** |
| | (0.14) | (0.14) | (0.027) |
| *N* | 901 | 901 | 901 |
| Within $R^2$ | 0.52 | | |
| Overall Immigration ($\beta + \lambda$) | 0.62* | 2.15** | |
| Amnesty ($\gamma + \lambda\bar{M}$) | −0.33** | −0.64*** | |
| Underid test | | 41.64 | |
| Weak Id test | | 26.80 | |

Abbreviations: 2SLS, two-stage least square; OLS, ordinary least squares. Standard errors in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

and column 3 the related first-stage coefficients. The *F*-tests on the magnitude and statistical significance of the postamnesty effect of immigration ($\beta + \lambda$) and the amnesty effect ($\gamma + \lambda\bar{M}$) are reported at the bottom of columns 1 and 2, respectively.

According to these results, we have suggestive evidence that the immigration policy only slightly weakens the link between immigration and the share of unobserved economic activity. This link remains positive and strongly significant even after the amnesty. In particular, focusing on the 2SLS results, the immigration coefficient passes from 2.2 ($\beta$, before the amnesty) to 2.1 ($\beta + \lambda$, after the amnesty) for our first measure of shadow economy *Shadow1* and from 2.8 to 2.2 for our second measure of shadow economy *Shadow2*. This means that—controlling for the 2002 regularization, per capita GDP, social capital and civil service efficiency—an increase of 1% in the relative number of immigrants in a province is associated with a 0.022 increase in *Shadow1* before the amnesty. The immigration effect decreases to 0.021 after the regularization. Analogously, as what concerns the series *Shadow2*, the immigration effect drops from 0.028 to 0.022 because of the amnesty.

We then examine the impact of the immigration policy on the size of informal economic activity, being aware that this effect is subject to measurement error, given the contemporaneous implementation of the reform across the country. Performing the relevant $F$-test, that is, checking whether $\gamma + \lambda\bar{M} = 0$, we find a negative and significant effect equal to $-0.55$ on *Shadow1* (Table 7, column 2) and of $-0.64$ on *Shadow2* (Table 8, column 2).

To summarize, according to the OLS and 2SLS results, the immigration policy is negatively related to the size of the informal sector but does not substantially affect the link between immigration and shadow economy, which decreases, but remains positive and strongly significant even after the amnesty. These results may suggest that although gaining legal status clearly improves the employment conditions of the amnestied immigrants, the concentration of documented and undocumented immigrants in the nonskilled sectors makes immigration figures significantly correlated with the share of the shadow economy. Furthermore, the potential measurement error bias reduced by shrinking the number of undocumented immigrants seems to only marginally impact the relationship between immigration and the size of the informal economic activity. In fact, controlling for the 2002 regularization and the large increase in the number of documented immigrants does not substantially change our original results. Also the coefficients of the per capita GDP, civil service efficiency, and social capital are very close to those reported in Tables 3 and 4. In particular, the impact of the per capita GDP still remains significantly larger (in absolute value) than the immigration effects on the relative size of the shadow economy.

Our further attempt to control for the role of the undocumented immigrants exploits a similar idea to the one built in the instrumental variable approach.

Official data on residence permits provided by ISTAT are quite detailed, as we know the number of immigrants divided by the province of residence, gender, type of permit, and country of origin. Moreover, over 95% of the variation in the stock of immigrants between 2002 and 2003 is due to amnestied immigrants. This provides information about the population of amnestied immigrants in 2003, which is also an important share of the undocumented immigrant population in 2002.

By exploiting the gap between documented immigrants in 2002 and 2003, we calculate the so-called "propensity to be undocumented" variable for each category of immigrants (gender, nationality, and province) in 2002.[31] These "propensities" are then used to estimate the number of undocumented immigrants in each province for the period preceding the amnesty. Subsequently, we create an overall measure of (imputed) immigration comprising both the official number of immigrants and the estimated undocumented immigrants.

In Figure 6, we show the correlation between the "total" number of immigrants and the share of unobserved economic activity (*Shadow1*) through an added-variable plot. This is still positive and highly significant. Figure 7 reports an analogous result by using the series *Shadow2*. [32] Hence, attempts to further minimize the potential omitted variable bias caused by the presence of undocumented immigrants do not seem to affect or weaken the link between the size of the shadow economy and share of immigrants.

[31] One can imagine that for the characteristics of the local labor market—for example, the relevance of construction sector, the number of elderly people in need of carers, the average income—and of immigrant communities—in terms of size, how long it has been established in a locality, how far is the home country from Italy—different immigrant groups could be more or less likely to have a large share of undocumented people.

[32] The correlation coefficient is obtained by re-estimating our main regression (represented by Equation 2). Because of the extreme difficulty in finding an instrument for the additional measure of "total" immigration, we only perform an OLS analysis.

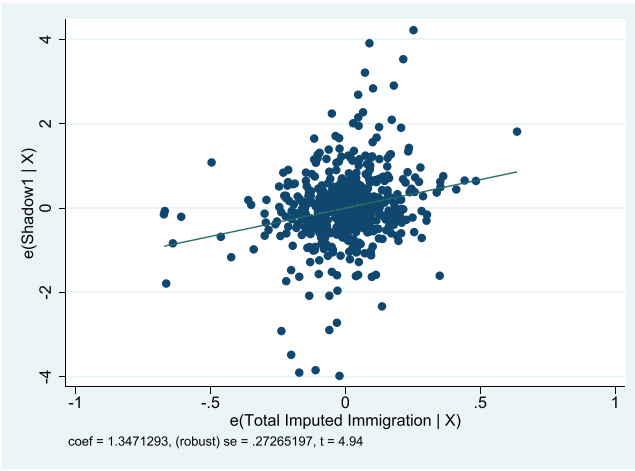


**FIGURE 6** Added variable plot: Impact of imputed total immigration on *Shadow1* [Colour figure can be viewed at wileyonlinelibrary.com]

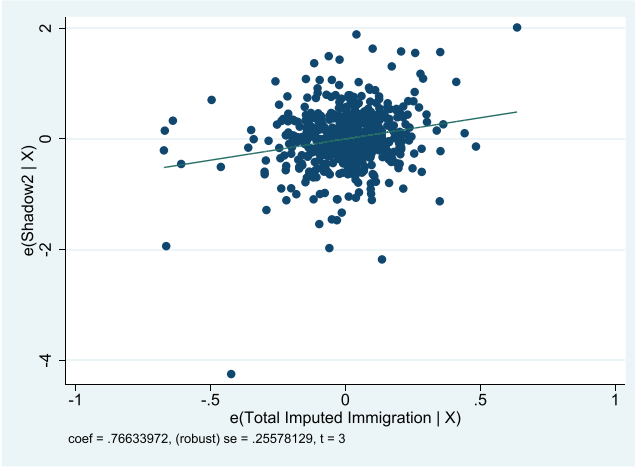


**FIGURE 7** Added variable plot: Impact of imputed total immigration on *Shadow2* [Colour figure can be viewed at wileyonlinelibrary.com]

## 5 | CONCLUSIONS

This paper explores for the first time the relationship between the share of immigrants and the size of the shadow economy, and the effects of immigration amnesties on this link. We investigate the case of Italy over the period 1996–2006 focusing on the 2002 Bossi-Fini immigration reform.

According to our estimates, the relationship between the share of immigrants and the extent of unobserved economic activity in Italy is positive and highly significant. Nevertheless, the immigration coefficient is very small and immigration seems to play a significantly less relevant role in comparison to other determinants of the shadow economy, particularly the per capita GDP. This result is consistent across a number of measures of the shadow economy, relying on a wide array of data sources: physical input estimates pegged first to cash-demand figures and then to Finance Ministry estimates of a corporate revenue tax; survey-based measures of propensity to social security evasion, official ISTAT estimates on the share of irregular jobs.

Our analysis also shows that the 2002 amnesty is negatively related to the size of the informal sector, but does not significantly influence the relationship between the share of immigrants and the size of the shadow economy, which remains positive and strongly significant even after the

amnesty. Furthermore, the link between immigrants and unobserved economic activity does not seem to be substantially altered by the measurement error in the official immigration data caused by the presence of undocumented immigrants. The results are robust to the use of different measures of the shadow economy, instrumental variable analysis, and several additional checks.

The positive link between immigration and shadow economy can be explained by the fact the immigrants in Italy tend to experience worse labor market outcomes than natives with similar individual characteristics—possibly because of discrimination or lack of social networks—and may therefore have a higher propensity to accept (or be offered) irregular jobs. However, according to our results, despite the fact that amnesties allow immigrants without a regular residence permit to gain legal status, they do not seem to improve the employment conditions of the "nonamnestied" documented immigrants employed in the shadow economy. On the contrary, differentials in the relative size of the shadow economy seem to be mainly related to different stages of economic development. As what concerns the Italian case, we therefore believe that, in line with La Porta and Shleifer (2008, 2014), growth-enhancing policies aimed at improving the performance of the local economies could be particularly effective against inefficient informal activities.

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