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# Migration Restrictions and Criminal Behavior: Evidence from a Natural Experiment

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# Migration Restrictions and Criminal Behavior: Evidence from a Natural Experiment\*

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## Abstract

We estimate the causal effect of immigrants' legal status on criminal behavior exploiting exogenous variation in migration restrictions across nationalities driven by the last round of the European Union enlargement. Unique individual-level data on a collective clemency bill enacted in Italy five months before the enlargement allow us to compare the post-release criminal record of immigrants from newly admitted countries with a control group of pardoned inmates from other countries. Difference-in-differences in the hazard rate of rearrest between members of the two groups before and after the enlargement show that obtaining legal status lowers recidivism, particularly so for non-violent offenders and in areas that provide relatively better labor market opportunities to legal immigrants. We conclude that legal status reduces crime by raising its opportunity cost.

**Keywords:** immigration, crime, legal status

**JEL codes:** F22, K42, C41

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# 1 Introduction

Concerns about the effect of immigration on crime are widespread. As a matter of fact, foreigners are heavily over-represented among the prison population of all developed countries. While their share over official residents barely reaches 10% in the US (and remains significantly lower in all other countries), their incidence over incarcerated individuals is many times larger (Figure 1). Such numbers aliment crime concerns among natives, which in turn increase support for migration restrictions (Bauer et al., 2000).

Tighter quotas on legal migration, however, prevent an increasing number of (undocumented) immigrants from accessing legitimate earning opportunities, which in turn lowers the opportunity cost of crime. Therefore, the overall effect on immigrants' crime rate is ambiguous. Empirically identifying such effect is hampered by immigrants' self-selection into legal status. The decision about whether to reside legally or illegally into the destination country may in fact respond to several (possibly unobserved) individual characteristics that are also correlated with criminal behavior. In addition to this problem, the size of the illegal immigrant population is not reported in official statistics, so their crime rate remains also unobserved.

Exogenous variation in legal status provided by the last round of the European Union (EU) enlargement, coupled with detailed longitudinal information on a sample of undocumented immigrants in Italy, allows us to address these issues. After August 1, 2006, more than 9,000 foreigners were released from Italian prisons upon approval of a Collective Clemency Bill passed by the Italian Parliament; five months later, on January 1, 2007, about 800 of them acquired the right to legally stay in Italy as their origin countries, namely Romania and Bulgaria, entered the EU. We thus exploit the asymmetric (across nationalities) effect of the EU enlargement on immigrants' legal status to estimate the effect of the latter on criminal behavior, as measured by the post-release criminal record of pardoned foreign individuals.

The empirical strategy is grounded on a theoretical model delivering an estimating equation for the hazard rate of rearrest, conditional on legal status and other individual characteristics. Difference-in-differences estimates show that the hazard rate of rearrest of immigrants from Newly admitted EU countries (NEU) experiences a significant reduction after the EU enlargement relative to several control groups of immigrants from other countries. The reduction is stronger among individuals that were formerly incarcerated for property and other economically-motivated crimes (as opposed to violent ones) and in regions characterized by relatively better labor market opportunities for legal (as opposed to illegal) immigrants.

These findings suggest that, indeed, legal status has a causal, positive effect on the opportunity cost of crime through better access to alternative (legitimate) earning opportunities in official markets, which in turn lower immigrants' propensity to engage in criminal activities. Several robustness checks exclude that the effect is due to confounding factors and/or other events occurring within our sample period. In particular, a structural

break test indicates that the (most likely) moment in which NEU immigrants change their behavior relative to other immigrants anticipates by less than one month the date of the enlargement.

We contribute to a burgeoning literature on the effects of immigration on crime. In particular, a few previous papers have investigated the existence of this relationship in the United States. At the aggregate level, Butcher and Piehl (1998a) conclude that new immigrants' inflows had no significant impact on aggregate crime rates across US metropolitan areas during the 1980s, while Borjas et al. (2006, 2009) argue that migration has indeed an effect (even though an indirect one) by displacing black males from the labor market, which in turn increases the criminal activity of this latter group. At the individual level, Butcher and Piehl (1998b, 2007) use Census data to show that, keeping constant other individual characteristics, current immigrants have lower incarceration rates than natives (while the pattern was reversed for former immigrants at the beginning of the 20<sup>th</sup> century Moehling and Piehl, 2007). Outside the US, Bianchi et al. (2008) find that immigration and crime rates are strongly correlated across Italian provinces; however, after taking endogeneity into account, the causal effect is significant only for a subset of property crimes, namely robberies. Yet, no previous work has investigated the role of immigrants' legal status; this is precisely the contribution of the present paper.

In the next section we summarize the main features of immigration in Italy. In Section 3 we describe the natural experiment and report some preliminary evidence on the effect of legal status on criminal activity. Then, Section 4 lays down a theoretical model that is consistent with such evidence and delivers the estimating equation presented in Section 5. Finally, in Section 6 we discuss the empirical results and Section 7 concludes.

## 2 Immigration in Italy

After centuries of massive emigration, Italy became destination of positive net migration flows only in the late 1980s. As a consequence, the legislative framework in this respect is also very recent, the first migration law being enacted in 1990 and amended in 1995 and 2002. Throughout these changes, Italian migration policy remained firmly grounded on the residence permit, which allows the holder to legally reside in the country. The number of new residence permits issued each year is determined on the basis of migration quotas decided by government decree (in accordance with provincial authorities). The main condition required to apply is having a job in Italy and the sanction for illegal migration is the expulsion from the country.

Over the last two decades, the number of valid residence permits rose from less than 1 million at the beginning of the 1990s to more than 2 million in 2005, slightly declining thereafter. The number of foreign (official) residents increased even more steeply, from less than 600 thousands to almost 4 million (in the face of an otherwise constant or even declining population), bringing their share over total residents up from 1 to 6.5 percent; see Figure 2. Official residents include immigrants holding a valid residence permit and,

possibly, their close relatives, as well as foreigners enjoying legal status in Italy for reasons other than a working permit (e.g. continuous presence in the country for more than 5 years and/or marriage with an Italian citizen). The difference between the two measures (permits and residents) toward the end of the period is mostly explained by the EU enlargement, which starting in 2004 relieved an increasing number of Eastern European citizens from the need of residence permits to legally reside in Italy.

Notwithstanding the spectacular growth of the official immigrant population, the number of newly issued residence permits fell systematically short of total demand over the years, often by a large extent. For instance, 170,000 permits were issued in 2007 in front of more than 740,000 demands. The following year, the number of new residence permits even decreased to 150,000, to be primarily assigned to applications left pending the year before (thus increasing the gap between current demand and supply of permits). In addition to that, the 2002 reform of migration policy requires prospective immigrants to find a job contract before entering the country, thus hampering further the match of foreign workers and Italian employers. Stringent requirements on permit eligibility and tight rationing of migration quotas, coupled with weak border enforcement (also due to the geographic configuration and location of the Italian peninsula), resulted in an increasing number of undocumented immigrants illegally crossing the border or overstaying tourist visas.

While the very nature of unofficial migration prevents accurate estimates of its size, amnesties of formerly undocumented immigrants provide some information in this respect. During these episodes, in fact, immigrants illegally present in Italy can apply for a valid residence permit under very mild conditions, so they have clear incentives to report their illegal status.<sup>1</sup> The last three regularizations took place in 1995, 1998 and 2002, and involved about 246, 217 and 700 thousand individuals, respectively, suggesting that the upshift in official migration observed during the last few years was accompanied by an analogous one in unofficial inflows. A similar picture emerges by considering an alternative measure of illegal migration, namely the number of foreigners apprehended and deported by the police (see Figure 3).

The relative distribution of legal and illegal immigrants across Italian regions reflects more general differences in economic and social conditions. In fact, distinguishing between Northern and Southern regions according to the classification provided by the Italian Statistical Office, we obtain two areas that are very similar as of size and population but profoundly different along any other dimension. As shown in the first columns of Table 1, the Northern part of the country is characterized by higher income and better labor market opportunities in the official sector, while many people in the South resort to a relatively large unofficial sector.<sup>2</sup> The relative size of the official and unofficial economy determines

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<sup>1</sup>Bianchi et al. (2008) and Fasani (2009) also use applications for amnesty to estimate the size of the illegal population in Italy, while several studies adopted the same methodology to count the number of undocumented immigrants in the United States after the amnesty passed in 1986 with the Immigration Reform and Control Act (see, e.g., Winegarden and Khor, 1991).

<sup>2</sup>Actually, two thirds of Southern regions belong to the “Objective 1” areas according to the EU

in turn the labor market opportunities of legal and illegal immigrants, respectively. It is therefore unsurprising that official immigrants tend to reside in the North while the undocumented ones are more concentrated in the South, representing in some regions the majority of total foreigners; see the last columns of Table 1.

Finally, immigration to Italy did also mean a high and growing incidence of foreigners in criminal statistics. The number of foreign inmates more than doubled since the early 1990s, from less than 10 thousand to more than 20 thousand in 2008, in the face of just a slight increase of total prison population. As a result, toward the end of the period about one third of all people in jail were foreign immigrants, see Figure 4.

Yet, an important distinction need to be made between official and unofficial immigrants. Even though statistics on convicted foreigners disaggregated by legal status are not publicly available, the Italian Ministry of Internal Affairs (2007) claims that only 6% of legal immigrants were reported by the police to the judiciary authority in year 2006, which is in line with their share over total population. Therefore, the disproportionate incidence of foreigners in prison population is entirely due to undocumented immigrants, who account indeed for 70% and 80% of the foreigners reported for violent and property crimes, respectively, while representing a much lower share of immigrant population.

Such data suggest that the legal and illegal immigrants are involved to a very different extent into criminal activities. This is due both to the effect of individual characteristics (among which the propensity to engage in crime) on immigrants' decision to apply for a residence permit and to that of legal status on access to better (legitimate) earning opportunities in official labor markets. To isolate this latter effect from self-selection into legal status, we focus on differences in legal status due to an (exogenous) change in migration restrictions.

## 3 The natural experiment

### 3.1 The EU enlargement

With the fall of the Eastern Bloc and the EU enlargement toward the east, immigrants from central and eastern Europe became a large and ever growing share of total inflows. In particular, a first round of the enlargement took place in 2004 with the admission of Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Slovenia and Slovakia; then, on January 1, 2007, Bulgaria and Romania also joined the EU.<sup>4</sup>

Article 39 of the European Commission Treaty would in principle allow their citizens to i) look for a job in any other country within the EU, ii) work there without needing any permit, iii) live there for that purpose, iv) stay until the end of the employment relationship, v) enjoy equal treatment with natives in access to employment, working conditions and all other social and tax advantages that may help to integrate in the host country.

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classification, meaning among other things that their GDP per capita falls below the 75 percent of the European average.<sup>3</sup>

<sup>4</sup>See <http://ec.europa.eu/enlargement/>.

In practice, however, several countries in Europe maintained significant restrictions to the free movement of immigrants from NEU countries. This was not the case for Italy, which completely liberalized access to the following sectors: agriculture, hotel and tourism, managerial and highly skilled work, domestic work, care services, construction, engineering and seasonal work. These sectors account indeed for the bulk of foreign employment in the official economy, both before and after the enlargement.

The asymmetric removal of migration restrictions led to a sharp increase in the share of NEU citizens relative to other immigrants. This was particularly true for Romanians, who already before the enlargement were the third largest foreign community in Italy after Albanians and Moroccans. In 2006 the three groups were of similar size and accounted together for more than one third of the total immigrant population. Then, in the wake of admission to the EU, the number of Romanian citizens officially residing in Italy nearly doubled, becoming by far the most numerous community (Figures 5).

A similar pattern arises among prison inmates, with Romanians overtaking Albanians between 2006 and 2007 (Figure 6). In this case, however, the trend was quite similar for the two groups, suggesting at a first sight a decline in the crime rate of Romanians relative to that of Albanians. Yet, no such conclusion can be drawn, because the increase in Romanians includes both inflows of new immigrants from abroad and movements into legal status of (formerly unofficial) immigrants already in Italy, the two components being hardly distinguishable.

For this reason, we focus on a sample of immigrants already present in Italy before the enlargement, namely prison inmates pardoned a few months earlier.

### 3.2 The July 2006 Collective Pardon

Italian collective pardons generate sudden releases of large numbers of inmates. Pardons eliminate part of the sentence, typically 2 or 3 years, and all inmates whose residual sentence is below such length are immediately released. The only exempted inmates are usually Mafia members, terrorists, kidnappers, and sexual offenders. But even violent criminals, like murderers and robbers can be pardoned. Whenever a pardoned prisoner recommit a crime within five years, the commuted prison term gets added to the new term.

Pardons are deeply rooted in Italian history. Over the last 40 years there has been on average one pardon every 5 years and the last collective pardon was voted by the Italian Parliament in July 2006 and enacted just one month later.<sup>5</sup> Within a few days 22,000 inmates (corresponding to more than one third of the whole prison population) were freed, including more than 800 Romanians and Bulgarians along with foreigners from several other countries, see Figure 7.

By the end of 2007 more than 20 percent of all inmates that were pardoned have been rearrested. In the next sections we compare the recidivism rate of pardoned foreigners

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<sup>5</sup>Barbarino and Mastrobuoni (2007) provide an historical analysis of pardons, while a report by the Italian Department of Penitentiary Administration (DAP, 2006) focuses on the last one.

from NEU countries, receiving legal status five months after release as a consequence of the EU enlargement, with that of immigrants from other countries.

### 3.3 Data and preliminary evidence

Unique data allow us to evaluate whether the removal of migration restrictions reduces criminal behavior. For all prison inmates released after the July 2006 collective pardon, we were granted access to their criminal records until December 2007. The most important piece of information is the date of rearrest (if any) of all individuals in the sample, which allows us to study their recidivism after the pardon. Each record also reports the type of crime committed before the pardon and the prison from which they were released, along with some individual characteristics, namely age, gender and marital status.

Among all 22,000 individuals that were pardoned, almost half are foreign born, including both NEU immigrants and immigrants from other countries that experienced no change in migration restrictions between 2006 and 2007. Within this latter group, Albanians represent an adequate control group for Romanians in several respects. First, the size of the two communities was approximately the same until 2006 and even thereafter Albanians remained the second most numerous community after Romanians. Second, the size of the prison population is also similar between the two groups, 1,834 Albanians and 1,650 Romanians being in jail right before January 2007, which points at a similar attitude toward criminal activities. Third, Albania is a candidate EU country, its entry being expected for 2015, which suggests comparable political and economic conditions (as defined by the EU admission criteria). Finally, Albania and Romania share in general a great deal of linguistic, cultural and historical heritage. About 300 words found only in the Romanian and in the Albanian language may be in fact inherited from Dacian. Based on this and other elements, some linguistics believe then that Albanians were Dacians who migrated to the South, while others think that the linguistic similarities derive from Romance-speaking shepherds migrating north from Albania. Whatever the reason might be, Romanians and Albanians seem to share several ethnolinguistic traits (Mallory and Adams, 1997).

The summary statistics reported in Table 2 confirm that, indeed, the two communities display similar individual characteristics also within our sample, the only significant difference being with respect to sentence length (both total and residual). This is likely due to the fact that, even though the two communities have similar size during the last few years, the migration wave from Albania dates back to the early 1990s, preceding by some years that from Romania. Therefore, higher sentence length could be due to a higher incidence of recidivism among incarcerated Albanians. For the purposes of our analysis, it will then be important to control for residual sentence length among the right hand side variables as we move to the multivariate analysis.<sup>6</sup>

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<sup>6</sup>Notice that the information about schooling is available only for a very restricted sub-sample (especially among the treatment group). For this reason, it will not be used in the rest of the empirical analysis.

We now compare the recidivism of Romanians and Albanians around the time of the EU enlargement in order to detect any significant change in the (relative) crime rate of the former after the acquisition of legal status. Figure 8 shows non-parametric estimates of the hazard rates of rearrest for Romanians (solid line) and Albanians (dashed line) released within the first week of August before and after the date of the enlargement.<sup>7</sup> Since we expect legal status to affect criminal behavior by favoring access to legitimate earning opportunities, we focus on individuals committing crimes for economic reasons, namely those arrested for property crimes. Indeed, while Romanians display greater recidivism in the first months after the pardon, their hazard rate of rearrest starts declining toward the end of 2006 (as the removal of migration restrictions is approaching) and continues to do so in 2007, after they obtained legal status.

In the next sections we will adopt multivariate regression analysis to address the statistical significance of these findings as well as to check them against different control groups. Before doing that, we develop a model that clarifies the theoretical and empirical issues behind the relationship between legal status and crime.

## 4 Theoretical framework

In this section we present a simple model that is consistent with the preliminary evidence above, clarifies which are the main threats to identification and serves as a basis for the econometric analysis presented in the next section.<sup>8</sup>

### 4.1 Individual problem

Immigrant population comprises both legal ( $L$ ) and illegal ( $I$ ) aliens. The former enter the country by complying with migration policy, which imposes an upfront cost  $B$  on the prospective (official) immigrant; such cost may include, for instance, head taxes, paperwork, health certifications and so on. Once in the host country immigrants may engage in criminal activities whose payoffs depend on the value  $z$  of the crime opportunities available in each period, which is randomly distributed according to the cumulative density  $F(z)$ . After an offense, criminals are arrested and sent to jail in the following period with positive probability  $\pi$ .

In addition, immigrants have also access to other sources of (legitimate) income, summarized by a residual term  $\varepsilon$ . The latter includes, for instance, labor earnings and welfare benefits, which may vary across individuals as a consequence of heterogeneity in ability, human capital and so on. More broadly,  $\varepsilon$  may be interpreted as the ratio of legitimate over illegitimate income opportunities, in which case it may also depend on other individual characteristics such as moral values and risk aversion.

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<sup>7</sup>The graphs are weighted kernel smooth of the estimated differences in the Neslon-Aalen cumulative hazard functions.

<sup>8</sup>Similar models of criminal activity have been recently proposed, among others, by Burdett et al. (2003) and Lochner and Moretti (2004).

Assuming that agents are infinitely lived and discount the future at the rate  $\rho < 1$ , the lifetime utility of legal immigrants can be represented by the Bellman equation

$$V_L = \max \{C_L(z); \rho E_z V_L\} + \varepsilon, \quad (1)$$

where  $E_z$  denotes expectations with respect to  $z$ . The first term in parentheses are the net (expected) payoffs from seizing a crime opportunity worth  $z$ ,

$$C_L(z) = z + \rho [\pi P + (1 - \pi) E_z V_L] \quad (2)$$

where  $P$  is the utility of being caught and sent to prison, which is standardized to 0; the other term in parenthesis,  $\rho E_z V_L$ , is instead the expected utility of keeping off crime or, alternatively, its opportunity cost.

Turning to illegal immigrants, they avoid the cost  $B$  imposed by migration policy by crossing the border unofficially, but face the risk of being apprehended and deported back to their origin country (with positive probability  $\delta$ ) at the beginning of any subsequent period. Their expected utility is thus

$$V_I = \delta V_O + (1 - \delta) [\max \{C_I(z); \rho E_z V_I\} + \varepsilon] \quad (3)$$

where  $V_O$  is the utility of living in the origin country and  $C_I(z)$  is defined analogously to  $C_L(z)$  in (2).

Immigrants face three decisions: whether to actually migrate or not; in case they do, whether to enter legally or illegally; finally, once in the host country, whether to engage in crime or not. We solve the problem backward, starting from the choice about accepting or rejecting the crime opportunities available in each period.

## 4.2 Criminal behavior in the destination country

Since payoffs from criminal activity depend positively on the value  $z$  of the opportunities available in each period (while the opportunity cost does not), the decision about whether to commit a crime or not is defined by the reservation value  $z^*$  making the individual indifferent between these two options. Imposing the expected payoffs from crime equal to its opportunity cost and substituting into (2) delivers the reservation values for legal and illegal immigrants

$$z_k^* = \rho \pi E_z V_k, \quad (4)$$

with  $k = I, L$ .

Conditional on legal status and individual characteristics, the reservation value does fully characterize individuals' criminal behavior. In particular, the hazard rate of committing a crime for legal immigrants in any given period simply equals the probability of

receiving a crime opportunity worth more than the reservation value,

$$c_L = 1 - F(z_L^*); \quad (5)$$

for illegal immigrants such hazard rate incorporates also a positive risk of deportation,

$$c_I = (1 - \delta) [1 - F(z_I^*)]. \quad (6)$$

One useful property is immediately derived from condition (4): since individual utility increases with legitimate income  $\varepsilon$  (regardless of legal status), so does the opportunity cost of crime on the right hand side of (4) and, as a consequence, the reservation value above which individuals decide to engage in it. Therefore, regardless of legal status, the hazard rate of crime decreases with legitimate income, i.e.

$$\frac{\partial c_k}{\partial \varepsilon} < 0,$$

for  $k = I, L$ . This result is crucial for immigrants' self-selection into legal status and for the relationship between legal status and crime, which we examine next.

### 4.3 Immigrants' self-selection at the frontier

Prospective immigrants must choose whether to migrate or not and, in case they do, whether to cross the border officially or unofficially. Starting with the former decision, notice that the utility of migrating (either legally or illegally) increases with legitimate income in the destination country while the utility  $V_O$  of remaining at home is independent of it; therefore, each individual migrates if and only if his/her legitimate income in the host country exceeds some threshold  $\varepsilon_I$ .<sup>9</sup>

Within this group of individuals that choose to migrate (and thus prefer to live in the destination country as opposed to the origin one), utility after arrival is always lower for illegal aliens, due to the risk of being deported back to their home country; denoting by  $\Delta x = x_L - x_I$  differences by legal status for any  $x$ -variable,

$$E_z \Delta V > 0. \quad (7)$$

The effect of legal status on expected utility varies across immigrants according to individual characteristics. Therefore, only those for whom  $E_z \Delta V$  is higher than  $B$  are better off by complying with migration policy, while the others will prefer to enter illegally. In particular, it is immediate to prove that

$$\frac{\partial E_z \Delta V}{\partial \varepsilon} > 0, \quad (8)$$

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<sup>9</sup>Of course, income opportunities in the home and destination country could well be correlated with each other. In this case,  $\varepsilon$  would be better interpreted as relative legitimate income in the host and origin country. If, for instance, the skill premium is greater in the destination country (because of better technology and/or capital-skill complementarities),  $\varepsilon$  could be interpreted as human capital.

i.e. the relative gains of being legal increase with legitimate income  $\varepsilon$ . Intuitively, higher relative income in the destination country means a greater utility loss in case of deportation, which represents a risk only for illegal immigrants. We may thus define a second threshold  $\varepsilon_L$  above (below) which migrants decide to enter legally (illegally).

Therefore, legitimate income possibilities in the destination country sort out immigrants from non-immigrants and, among the first group, legal from illegal entrants; this is shown in the bottom graph of Figure 9. For  $\varepsilon < \varepsilon_I$  individuals are better off in their home country; therefore, letting  $G(\varepsilon)$  denote the c.d.f. of  $\varepsilon$  in the origin country, its cumulative distribution among immigrants in the destination country will be

$$\Gamma(\varepsilon) = G(\varepsilon)/[1 - G(\varepsilon_I)] \Leftrightarrow \varepsilon \geq \varepsilon_I$$

and  $\Gamma(\varepsilon) = 0$  otherwise. As  $\varepsilon$  increases, so does the relative utility of living in the destination (as opposed to the origin) country, the more so for legal (as opposed to illegal) immigrants. However, within the interval  $\Omega_I \equiv \{\varepsilon : \varepsilon_I \leq \varepsilon < \varepsilon_L\}$  the expected gains of being legal are lower than the upfront cost  $B$  of complying with regulatory policy, so immigrants still prefer to enter illegally; the opposite is true as  $\varepsilon$  increases even further, reaching the interval  $\Omega_L \equiv \{\varepsilon : \varepsilon_L \leq \varepsilon\}$ .

Therefore, legal status is not randomly distributed across immigrants, varying with individual characteristics summarized by the residual term  $\varepsilon$ . We next examine how this relationship confounds inference about the causal effect of legal status.

#### 4.4 Legal status and criminal behavior

The log hazard rate of committing a crime for each individual may be written compactly as

$$\ln c(\varepsilon) = \ln c_I(\varepsilon) + [\ln c_L(\varepsilon) - \ln c_I(\varepsilon)] L,$$

where  $L = 1$  if the immigrant is legal and  $L = 0$  otherwise. The term in brackets,  $\Delta \ln c(\varepsilon)$ , is the causal, or treatment, percentage effect of legal status on the individual hazard rate of committing a crime, which depends on two opposite forces; first, legal status raises the opportunity cost of crime and thus the reservation value above which individuals engage in it, which in turn lowers the hazard rate of crime; second, legal status prevents the deportation (and thus incapacitation) of potential offenders, which in turn raises the probability that they actually commit a crime in the host country. Both effects can be seen by plugging equations (5) and (6) into the treatment effect,

$$\Delta \ln c(\varepsilon) \approx \delta - [F(z_L^*) - F(z_I^*)]; \quad (9)$$

therefore, legal status lowers the hazard rate of crime if and only if the increase in its opportunity cost outweighs the incapacitating role of deportation. The purpose of our empirical analysis is to estimate  $\Delta \ln c(\varepsilon)$  in (9).

## 4.5 Identification

The main threat to identifying the causal effect of legal status is that its sign and magnitude depend on the individual characteristics summarized by the residual term  $\varepsilon$ , whose distribution differs between legal and illegal immigrants because they self-select into legal status on the basis of relative legitimate income opportunities.

This is shown in the top graph of Figure 9, which compares the hazard rates of committing a crime for legal and illegal immigrants. These are just inverse functions of the reservation values in the bottom graph. Equation (7) implies  $\Delta z^* > 0$  so that, conditional on individual characteristics, the hazard rate of legal immigrants is lower than that of the illegals that have not (yet) been deported, i.e.  $c_L(\varepsilon) = 1 - F(z_L^*) < 1 - F(z_I^*)$ . On the other hand, deportations lower the hazard rate of the total illegal population (both deported and non-deported) by preventing part of the crimes possibly committed by illegal (potential) offenders, which shifts the hazard rate  $c_I(\varepsilon)$  of the total immigrant population (deported and non-deported) below  $1 - F(z_I^*)$ .

The relative position of the curves  $c_L(\varepsilon)$  and  $c_I(\varepsilon)$  determines the average (treatment on the treated) effect of legal status on crime for the whole immigrant population,

$$\beta = E[\Delta \ln c(\varepsilon) | \Omega_I]. \quad (10)$$

From a theoretical point of view, the sign of  $\beta$  is ambiguous. Apart from a single-crossing property following from (8), in fact, nothing can be said about the relative position of  $c_L(\varepsilon)$  and  $c_I(\varepsilon)$  over the interval  $\Omega_I$ . Therefore, identifying the sign and magnitude of  $\beta$  is ultimately an empirical issue. The main difficulty in estimating (10) is that  $c_L$  is observed only over the interval  $\Omega_L$ . Since  $E[\ln c_L(\varepsilon) | \Omega_L] < E[\ln c_L(\varepsilon) | \Omega_I]$  (because crime decreases with  $\varepsilon$ ) a naive comparison between the hazard rates of legal and illegal immigrants would bias the estimated effect of legal status downward:

$$E[\ln c(\varepsilon) | \Omega_L] - E[\ln c(\varepsilon) | \Omega_I] = \beta + \underbrace{E[\ln c_L(\varepsilon) | \Omega_L] - E[\ln c_L(\varepsilon) | \Omega_I]}_{\text{SELECTION BIAS}} < \beta.$$

We next turn to illustrate our strategy to address the empirical issues involved in the estimation of  $\beta$ .

## 5 Empirical strategy

In this section we devise a difference-in-differences estimator that exploits the unique characteristics of our sample to estimate the average effect of legal status on the hazard rate of committing a crime. Besides the self-selection issue discussed at length in the previous section, identification of (10) is hampered by measurement error.

## 5.1 Measurement

The first source of measurement error lies in the fact that criminal offenders remain partly unobserved. This happens either because of under-reporting of criminal offenses or because, even for the recorded ones, the identity of the offender can not always be determined. One observes incarceration, though, which is often used as a proxy for unobserved criminal activity (see, e.g. Ehrlich, 1996; Levitt, 1996). Consistently with this approach, our model maintains that the probability of being arrested after a crime is constant and equal to  $\pi$ , which implies that  $\frac{\pi c_L(\varepsilon)}{\pi c_I(\varepsilon)} = \frac{c_L(\varepsilon)}{c_I(\varepsilon)}$ . It follows that the relative log hazard rate of incarceration for legal and illegal immigrants is exactly equal to their relative log hazard rate of committing a crime,  $\Delta \ln c(\varepsilon)$ , which remains unobserved; since the former is instead observable, we will use it as our main dependent variable. The confounding effect of departures from this assumption will be discussed as we present the empirical results.

The second measurement issue concerns the size of the unofficial immigrant population, which is essential for computing the hazard rate of incarceration for illegal immigrants. However, unofficial population is usually not reported in official statistics. Our dataset provides two important advantages in this respect. First, as we discussed in previous sections, the share of illegals is very high among formerly incarcerated immigrants (close to 90 percent at the beginning of the period, this figure being even higher for immigrants incarcerated for property crimes). Second, such share drops down to zero for a nationality-defined subsample of immigrants at some point in time, namely for NEU immigrants after January 1st, 2007. Therefore, available information on immigrants' nationality and on the date of re-arrest may to a large extent serve the purpose of (missing) information on the size of the unofficial population and the legal status of arrested offenders. For this reason, as well as to address the selection bias, we compare the hazard rate of incarceration between NEU and other immigrants before and after the EU enlargement.

## 5.2 Estimating equation

In period  $t_0$ , before the EU enlargement, the average log hazard rate of incarceration of all NEU immigrants is

$$E[\ln c(\varepsilon)|t_0] = E[\ln c_I(\varepsilon)|t_0, \Omega_I] \Gamma(\varepsilon_L) + E[\ln c_L(\varepsilon)|t_0, \Omega_L] [1 - \Gamma(\varepsilon_L)]; \quad (11)$$

in period  $t_1$ , after the enlargement, they all become legal so the average hazard rate is simply

$$E[\ln c(\varepsilon)|t_1] = E[\ln c_L(\varepsilon)|t_1]. \quad (12)$$

Subtracting (11) from (12) delivers the change in the hazard rate of incarceration after the extension of legal status to all (formerly illegal) NEU immigrants,

$$E[\ln c(\varepsilon)|t_1] - E[\ln c(\varepsilon)|t_0] = \beta \Gamma(\varepsilon_L) + T, \quad (13)$$

where  $T$  is the (unobserved) counterfactual change in the hazard rate between the two periods absent the policy shock,

$$T = \{E[\ln c_I(\varepsilon)|t_1, \Omega_I] - E[\ln c_I(\varepsilon)|t_0, \Omega_I]\} \Gamma(\varepsilon_L) + \quad (14)$$

$$+ \{E[\ln c_L(\varepsilon)|t_1, \Omega_L] - E[\ln c_L(\varepsilon)|t_0, \Omega_L]\} [1 - \Gamma(\varepsilon_L)]. \quad (15)$$

Our difference-in-differences approach estimates  $\beta\Gamma(\varepsilon_L)$  by the means of the difference between the hazard rates of incarceration before and after the policy change for several control groups of immigrants from countries other than the NEU ones,

$$E[\ln c(\varepsilon) - \ln c'(\varepsilon)|t_1] - E[\ln c(\varepsilon) - \ln c'(\varepsilon)|t_0] = \beta\Gamma(\varepsilon_L), \quad (16)$$

where  $E[\ln c'(\varepsilon)|t]$  is the average log hazard rate for the control group.

The last expression constitutes the basis for our empirical analysis. It says that  $\beta$ , the average treatment on the treated effect of legal status, has the same sign as the difference-in-differences in incarceration rates between NEU and other immigrants before and after the EU enlargement. Moreover, the estimator provides a lower bound to the magnitude of  $\beta$  because, due to the fact that we do not have information on legal status, it is computed over all NEU immigrants while the policy change impacts only on the subsample of formerly illegal ones. However, since in our sample of pardoned immigrants the share of formerly legal ones is around 10 percent, the attenuation bias induced by the term  $\Gamma(\varepsilon_L) < 1$  is going to be small. We conclude this section by imposing some additional structure on equation (16), which will prove convenient for its empirical estimation.

### 5.3 Proportional hazard model

Proportional hazard models provide a very tractable framework for estimating the coefficient  $\beta$  in (16). Such models disentangle the effect of time-varying individual covariates from that of time-at-risk. For the purpose of our analysis, it is then possible to estimate the effect of the EU enlargement, affecting (differentially) all immigrants in a given calendar period, from that of the period at risk of being rearrested (i.e. the number of days elapsed since the individual was pardoned). Notice that keeping time-at-risk constant also allows to include in the sample all individuals pardoned during the whole sample period (from August 1<sup>st</sup>, 2006, to December 31<sup>st</sup>, 2007).

The price paid to analytical tractability is the proportionality assumption, imposing the log-separability of covariates and time-at-risk in the hazard function,

$$E[\ln c(\varepsilon)|\tau, x(t)] = \ln c_0(\tau) + x(t)'\gamma, \quad (17)$$

where  $c_0(\tau)$  is a baseline hazard rate common to all individuals released  $\tau$  days before and  $x(t)$  is a vector of possibly time-varying covariates. Consistent estimates of (17) are obtained by maximizing the corresponding likelihood function with respect to  $\gamma$ , alternative

models differing in the way they treat the baseline hazard  $c_0$ .

Difference-in-differences estimates of the effect of legal status are easily obtained in this framework by including into the vector of covariates indicator variables for *NEU* immigrants and the period after the policy change (*POST*):  $\beta$  is then the coefficient of their interaction,  $NEU \times POST$ .

## 6 Results

This section presents estimates of equation (17) obtained using alternative methods and samples, along with several robustness exercises and specification tests.

### 6.1 Baseline estimates

In Tables 3 we compare the hazard rates of rearrest of pardoned Romanians (the treatment group) and Albanians (the control group). In the first two columns we estimate the proportional hazard model (17) in its exponential form (i.e. assuming that the baseline hazard function  $c_0$  is constant). The estimated coefficients in column (1) show that, while the average hazard rate does not significantly vary between treatment and control group, both groups show a significant reduction in the post enlargement period. But the coefficient of the interaction between the post variable and the treatment variable is negative and statistically significant at the 10 percent confidence level, indicating that Romanians show a larger reduction in the hazard rate. According to this estimate, the hazard rate of rearrest of NEU immigrants drops by almost 40 percent after obtaining legal status relative to that of the control group. In column (2) we include in the specification the individual characteristics reported in our dataset, namely age, age squared, marital status and residual sentence length. According to these results, the hazard rate of rearrest increases with age (at a decreasing rate), while residual sentence plays a deterrence role, in line with the results of Drago et al. (2009); marital status, instead, does not seem to exert a significant effect. Overall, the inclusion of control variables does not affect the coefficient of main interest.

In the remaining columns of the table, we adopt a more flexible specification allowing the baseline hazard rate to vary over time. Following the semi-parametric approach pioneered by Cox (1972), the “partial-likelihood” is maximized only with respect to the regressors’ coefficients, leaving the baseline hazard completely unrestricted. The results obtained using this more flexible specification are however remarkably close to those of the exponential model.

Finally, in the last two columns of the table we distinguish between individuals that were in prison (before the pardon) for having committed economically-motivated and violent crimes, respectively. The former include property crimes, illegal-drug sales and production, prostitution-related crimes and frauds. We thus distinguish between economically-motivated and violent criminals on the basis of the offense for which the individual was

first arrested.<sup>10</sup> Consistently with the explanation proposed in this paper, the effect of legal status goes entirely through the economic channel, while the effect is not different from zero for violent criminals. The next tables dig deeper into this channel.

## 6.2 The role of labor market opportunities

As we discussed in Section 2, the relative size of the official and unofficial economy vary widely between Northern and Southern regions in Italy, affecting in turn the relative earning opportunities of legal and illegal immigrants in the two areas. Even though information on the illegal immigrant population is not easily available, Fasani (2008) shows that, actually, official immigrants earn a higher wage premium for legal status in Northern regions.

Therefore, if the effect of legal status goes through better access to labor market opportunities in the official sector, such effect should be greater in the North. Column (1) of Table 4 shows that, indeed, the estimated coefficient of the interaction term is strongly statistically significant (at the 99 percent confidence level) for the subsample of immigrants living in northern regions. Its magnitude is also significantly greater than the average effect (over all Italian regions) reported in Table 3 and particularly high for economically-motivated offenders (while the effect is again non-statistically significant for violent offenders). At the opposite, for immigrants living in the South there seem to be no significant change in criminal behavior after the acquisition of legal status (columns 4-6).

Such results are consistent with the mechanism proposed in this paper, namely better labor market opportunities for immigrants after legalization raising their opportunity cost of crime. Yet, northern and southern regions in Italy differ along many other dimensions. A more severe test of the labor market opportunities channel consists then in comparing more homogeneous areas that differ only with respect to the economic importance of sectors to which NEU immigrants got free access after the enlargement.<sup>11</sup> Therefore, in Table 5 we restrict the comparison to the regions in the North in which employment in such sectors has a higher and lower incidence over total employment, respectively. The estimated coefficients are approximately three times larger when we restrict the analysis to the Northern regions, both for all offenders and for the sub-sample of the economically motivated ones.

## 6.3 Structural break test

The estimates presented so far detect a statistically significant decrease in the hazard rate of NEU immigrants (relative to the control group) after the EU enlargement. One question is whether such estimates are really capturing the effect of this policy change as opposed to other events affecting the relative hazard rate of the two groups before and/or after that moment.

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<sup>10</sup>The sample size in the first four columns is lower than the sum of those in columns (5) and (6) because multiple offenses are recorded for some individuals.

<sup>11</sup>The sectors are listed above in Section 3.1.

In order to exclude this possibility we follow the methodology of Andrews (1993) for identifying structural changes with unknown break point, which delivers among other things the likelihood of any potential break point. If the most likely period is close to (distant from) the date of the EU enlargement, this would be evidence against (in favor of) spurious effects driving the results.

In practice, we define  $POST_T = 1 \Leftrightarrow t \geq T$  ( $POST_T = 0$  otherwise) and compute the Likelihood Ratio (LR) between the following two specifications of the hazard rate model

$$\begin{aligned} H_O : E[\ln c(\varepsilon)|\tau, x(t)] &= \ln c_0(\tau) + \alpha POST_T + x_0(t)' \gamma_0 \\ H_A : E[\ln c(\varepsilon)|\tau, x(t)] &= \ln c_0(\tau) + \alpha POST_T + \beta NEU \times POST_T + x_0(t)' \gamma_0 \end{aligned} \quad (18)$$

for any value of  $T$  within our sample period. The LR test statistic is distributed as a  $\chi^2$  with 1 degree of freedom and signals the likelihood that the additional regressor in  $H_A$ , namely the difference-in-differences effect of being NEU, is different from zero after  $T$  periods (controlling for other events occurring at the same moment in time).<sup>12</sup>

In Figure 10 we plot the test statistics for the two subsamples of immigrants for whom the difference-in-differences effect was precisely estimated in the first place, namely the economically-motivated offenders living in the North. The most likely break point occurs in the first week of December 2006, which is close enough to the date of the enlargement and consistent with immigrants rationally anticipating the policy change and modifying their behavior as the latter gets closer and information about it gradually unravels.

## 6.4 Robustness checks

So far the results suggest that the hazard rate of crime experienced a sudden drop for Romanian immigrants in Italy (relative to that of a control group of Albanians) after they obtained legal status as a consequence of the EU enlargement and that such drop was larger where the differential access to labor market opportunities granted by legal status was also larger. A structural break test shows that the difference-in-differences effect observed in the data was most likely due to the EU enlargement, as the change happens in proximity of the enlargement. In the remaining part of this section we perform a series of empirical exercises aimed at assessing the robustness of such results and excluding possible alternative explanations.

The first such robustness check consists in enlarging the sample to broader treatment and control groups. In Table 6 we replicate the analysis including also Bulgarians along with Romanians into the NEU (treated) group and comparing them to foreigners from all EU candidate countries other than Albania, namely Croatia, Macedonia and Turkey; in Table 7 we further extend the control group to include all remaining countries in Central Europe that are not already EU members, namely Belarus, Bosnia and Herzegovina, Moldova, Serbia, Montenegro and Ukraine. The two tables show that all main results

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<sup>12</sup>See Ichino and Riphahn (2005) for a similar exercise.

hold when we enlarge the treated and control groups, though with more noise. NEU immigrants still display a decrease in the hazard rate of rearrest after obtaining legal status. Moreover, the effect is again stronger and statistically significant for economically-motivated offenders living in the North, particularly so in regions where the share of sectors opened to NEU immigrants was greater.

Another concern is that, even within our narrowly defined sample of immigrants, differential access to legal status may induce measurement error in the relative size of the legal and illegal population. Notice that, in computing the (relative) hazard rates of the treatment and control groups, we considered at risk all immigrants released as a consequence of the pardon. On the other hand, legal immigrants may be more willing to travel back to the origin country from time to time (because they retain the right to return to the destination country). Spending less time in the host country would then decrease their crime rate there (independently of access to labor market opportunities). But this should be the case for both violent and non-violent offenders, while legal status is not associated to significant changes in crime rates for the former group.

Legal status could also affect the probability of being arrested conditional on having committed an offense. For instance, immigrants found without a valid residence permit may be carefully scrutinized, evidence about additional crimes becoming available at closer inspection. In this case too, however, the bias should affect all individuals in the treatment and control group, irrespective of the type of offense they committed before and the region they live in, which does not seem to be the case.

## 7 Conclusions

We use a natural experiment, namely, the EU enlargement occurring five months after Italy's collective pardon to identify the effect of immigrants' legal status on their propensity to commit crimes. A search-theoretic model predicts that individuals reduce their illegal activity upon obtaining legal status. The evidence is consistent with this prediction.

Granting legal status, either through EU enlargements or through amnesties is also likely to attract new immigrants. Indeed, thousands of Romanians and Bulgarians were standing along the European borders on New Year's Eve of 2007. Policy makers would need an estimate of the cost and benefits of these migratory flows as well, but this goes beyond the aim of this paper.

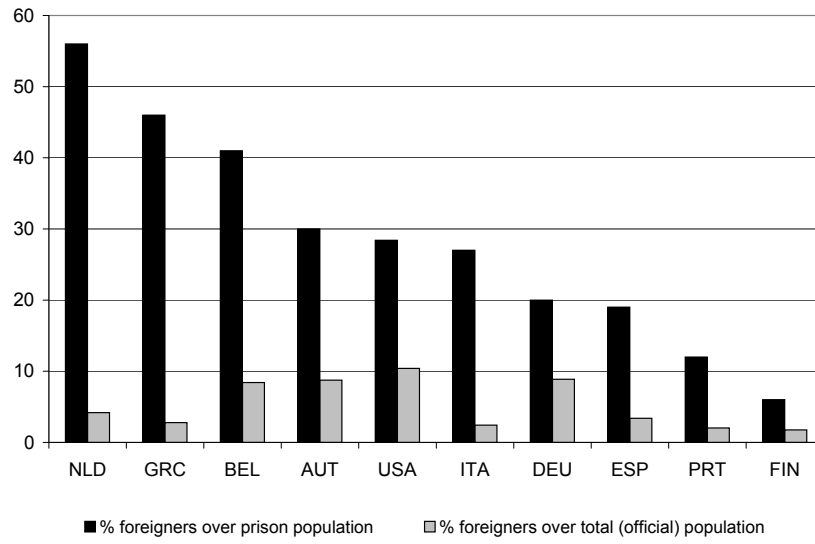
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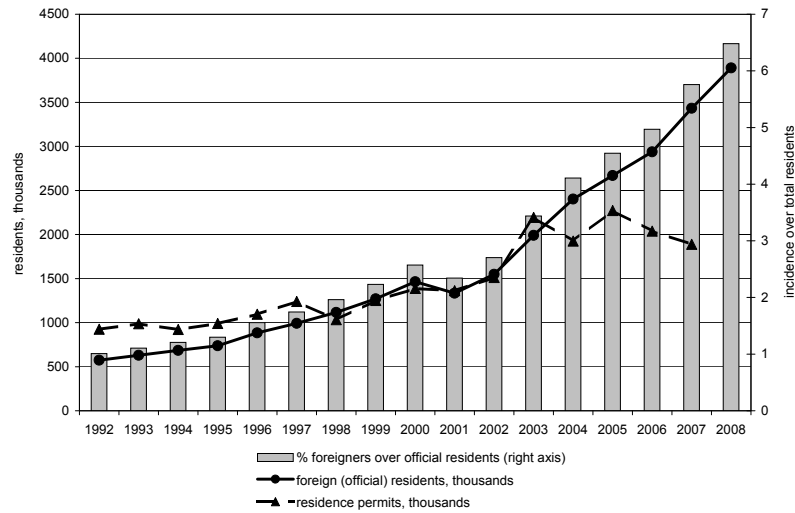
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Figure 1: share of foreigners over total and prison population



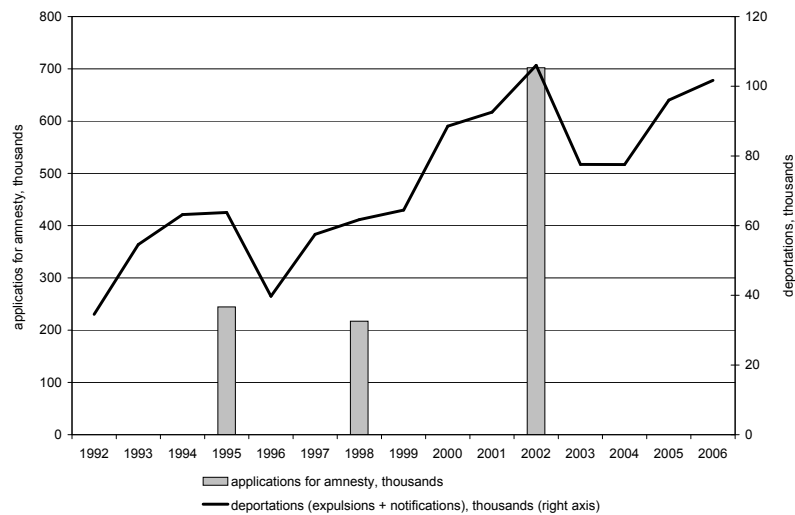
*Note:* The figure shows the incidence of foreigners over the total and prison population in some OECD countries in year 2000. Source: OECD and US CENSUS.

Figure 2: legal immigrants



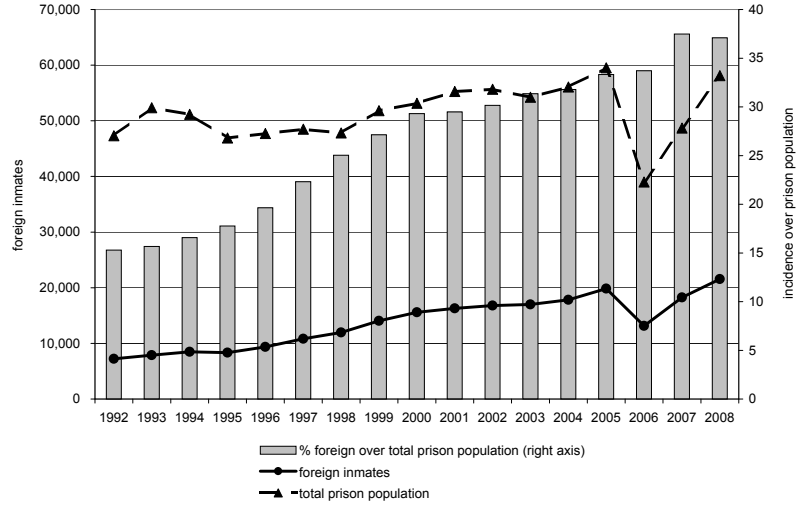
*Note:* The figure plots the number of valid residence permits and foreign official residents (as well as the share of the latter over total residents) in Italy during the period 1992-2008. Source: Italian Statistical Office and Ministry of Internal Affairs.

Figure 3: illegal immigrants



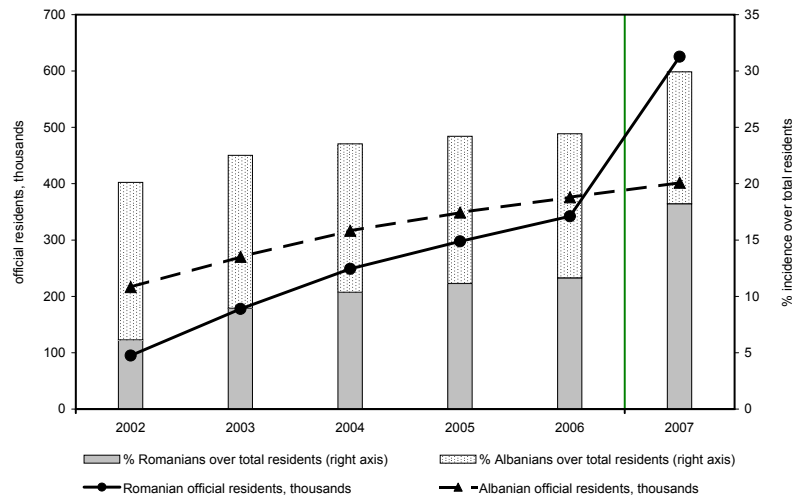
*Note:* The figure shows the number of applications for regularization of formerly unofficial immigrants during the last three amnesties (1995, 1998, 2002) and the number of deportations of undocumented immigrants. Source: Ministry of Internal Affairs.

Figure 4: prison inmates



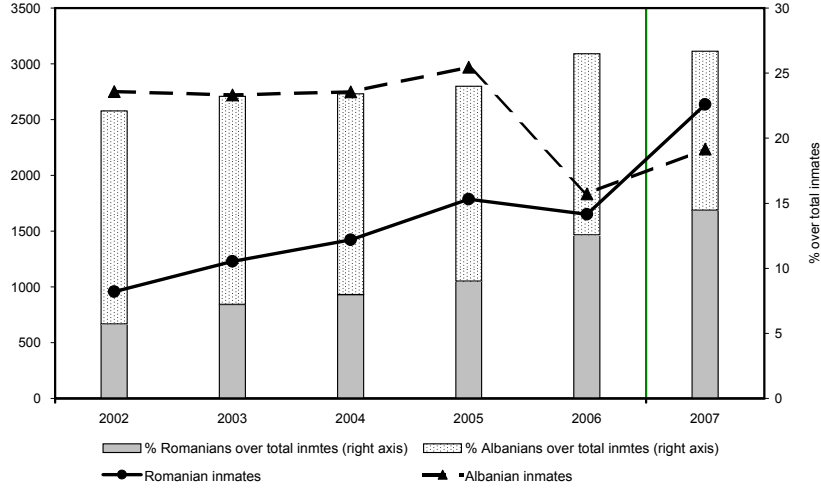
Note: The figure plots the number of native and foreign prison inmates in Italy during the period 1992-2008, as well as the incidence of the latter over total prison population. Source: Ministry of Justice.

Figure 5: official residents (Romanians and Albanians)



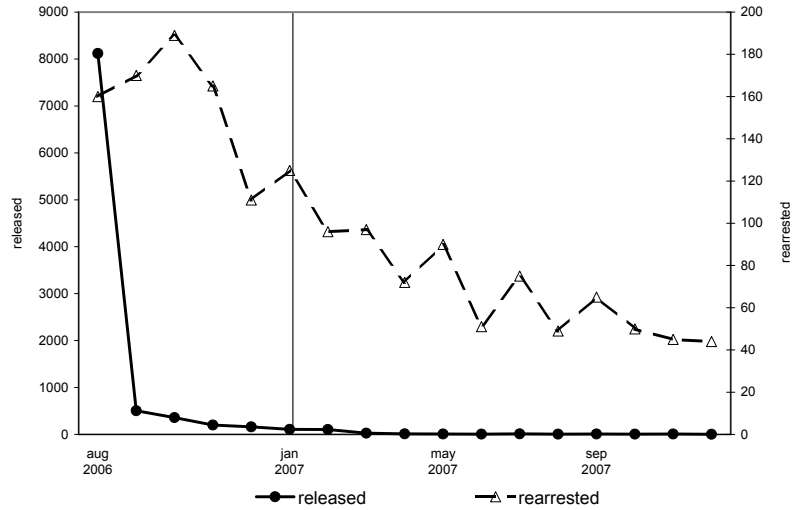
Note: The figure plots the number of Romanian and Albanian official residents in Italy during the period 2002-2007, as well as their incidence over total residents. The vertical line refers to the moment of the EU enlargement. Source: Italian Statistical Office.

Figure 6: prison inmates (Romanians and Albanians)



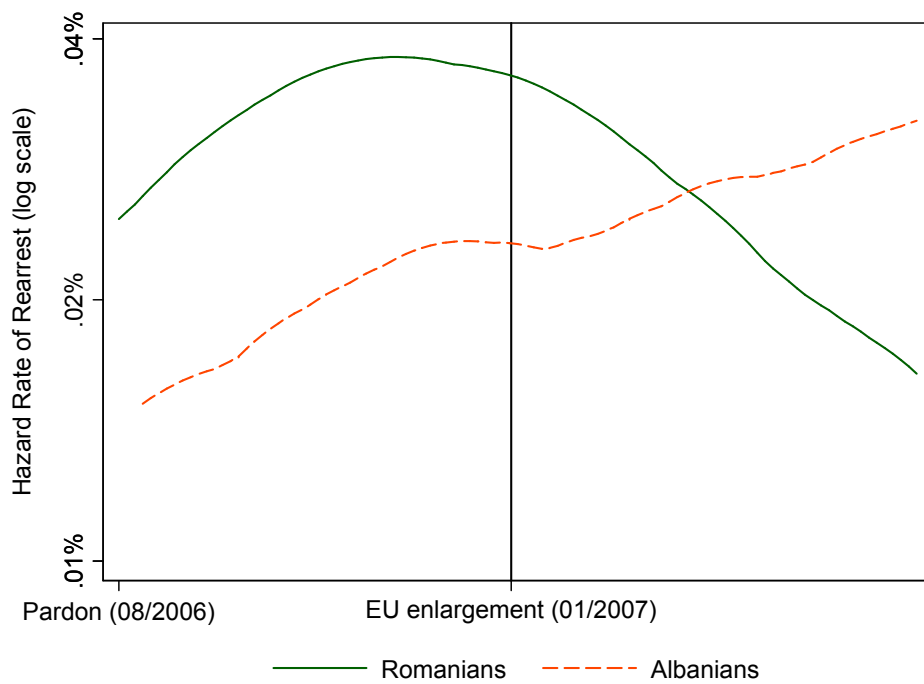
*Note:* The figure plots the number of Romanian and Albanian incarcerated in Italy during the period 2002-2007, as well as their incidence over total prison population. The vertical line refers to the moment of the EU enlargement. Source: Ministry of Justice.

Figure 7: the Collective Clemency Bill



*Note:* The figure plots the number of foreign prison inmates released after the Collective Clemency Bill in August 2006, as well as those rearrested until December 2007. The vertical line refers to the moment of the EU enlargement. Source: Ministry of Justice.

Figure 8: hazard rates of rearrest (Romanians and Albanians)



*Note:* The figure plots the non-parametric (Nelson-Aalen) estimates of daily log hazard rates of rearrest between August 2006 and May 2007 for Romanians (solid line) and Albanians (dashed line) previously incarcerated for a property crime and released after the Collective Clemency Bill. The labels on the vertical axis refer to the value of the (estimated) hazard rate of rearrest in each day. Source: authors' calculations on data from the Ministry of Justice.

Figure 9: theoretical model

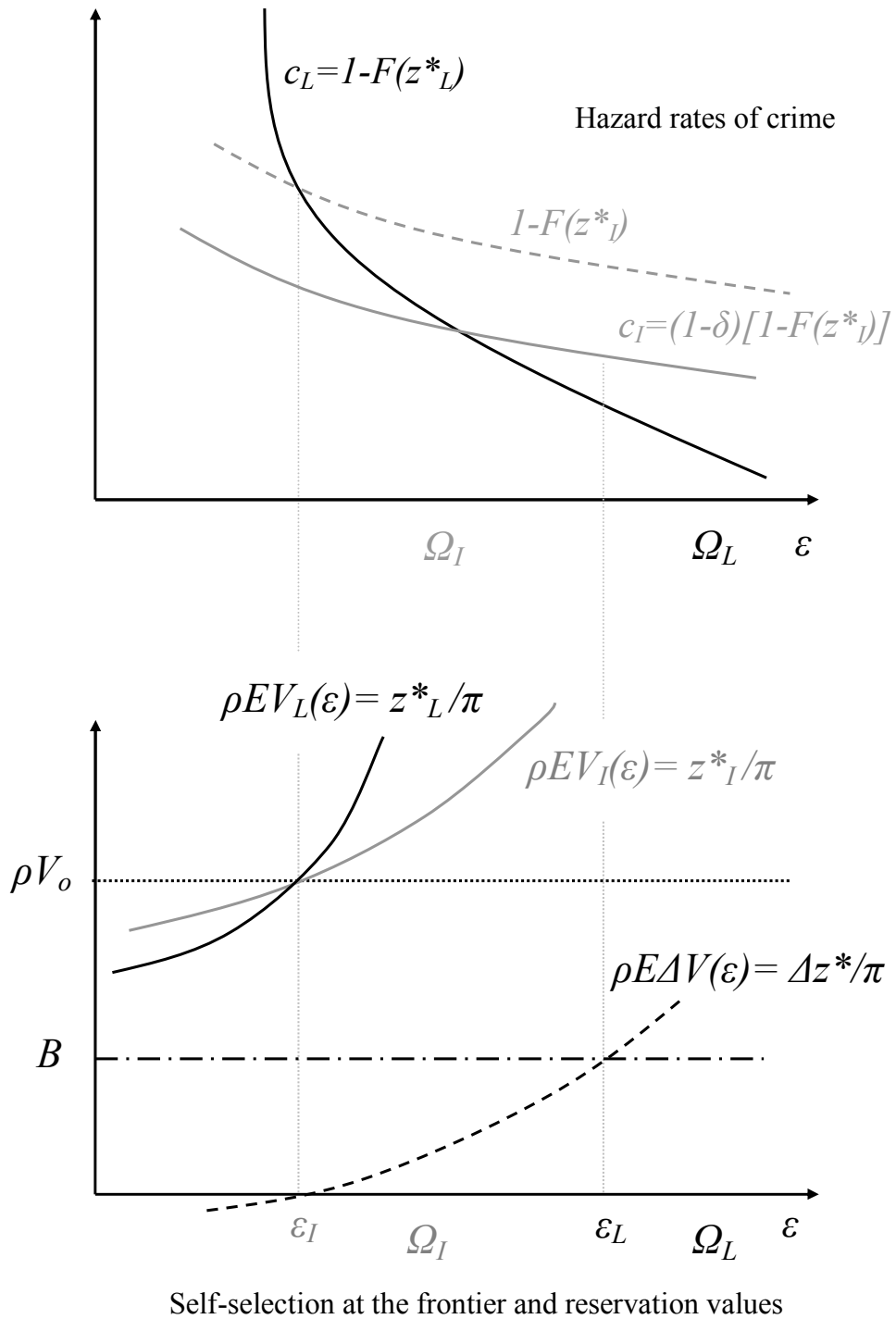
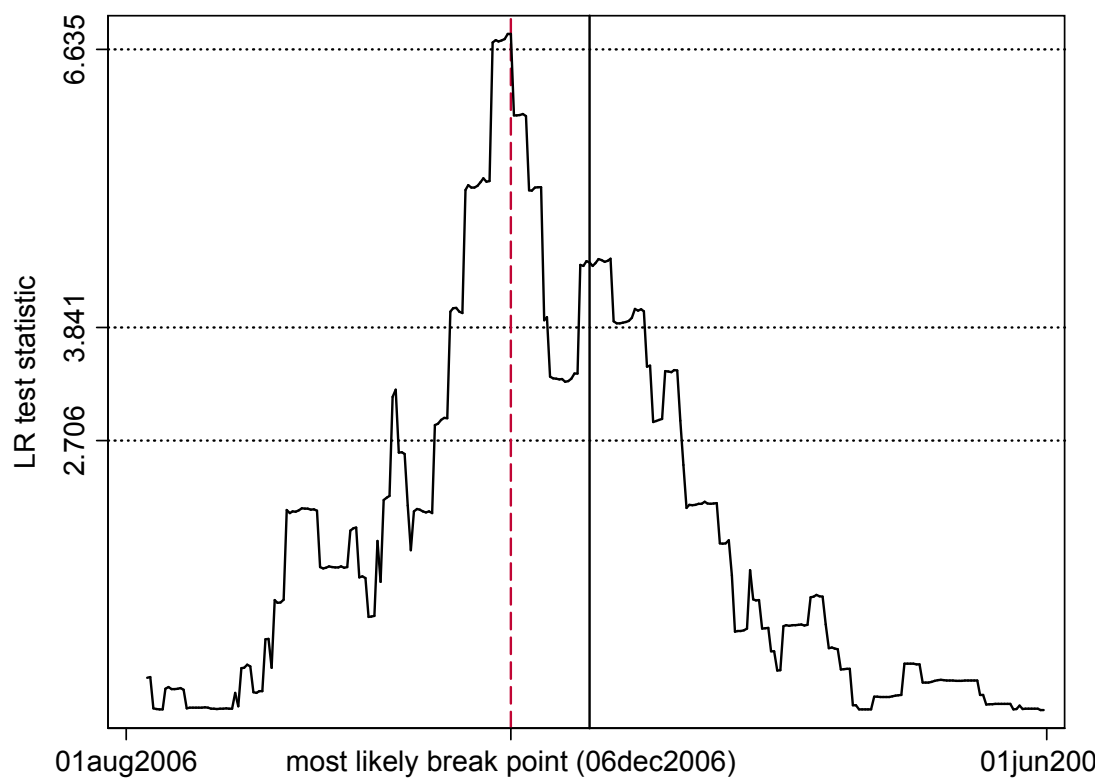


Figure 10: structural break test



*Note:* This graph shows the value of the Likelihood Ratio test statistics between models  $H_0$  and  $H_A$  in (18) computed for all possible values of  $T$ . The vertical dashed line corresponds to the maximum of the test statistics (i.e. the most likely break point) while the horizontal dotted lines indicate the 90%, 95% and 99% significance thresholds.

Table 1: the north/south divide

	POPULATION <i>ths.</i>	GDP PER CAP. <i>ths. €</i>	EMPL. <i>rate</i>	SHADOW <i>% GDP</i>	FOREIGN RESIDENTS <i>ths.</i>	<i>% over pop.</i>	ILLEGALS <i>ths.</i>	PERMITS <i>ths.</i>	ILLEGALITY <i>rate</i>
Piemonte	4,347	27,583	46.4%	9.2%	252	5.8%	57	101	36.1%
Valle d'Aosta	124	32,776	47.0%	14.7%	6	4.4%	1	3	19.0%
Liguria	1,609	25,483	41.2%	11.5%	81	5.0%	18	33	34.8%
Lombardia	9,510	32,269	48.8%	7.3%	729	7.7%	158	331	32.3%
Trentino Alto Adige	990	31,282	49.0%	10.9%	62	6.2%	6	36	13.2%
Veneto	4,756	29,099	48.0%	8.7%	350	7.4%	61	143	30.0%
Friuli Venezia Giulia	1,210	28,059	48.0%	12.8%	72	6.0%	8	44	15.9%
Emilia Romagna	4,205	30,713	50.2%	8.6%	318	7.6%	57	140	28.9%
<b>North</b>	<b>26,753</b>	<b>30,066</b>	<b>48.0%</b>	<b>8.7%</b>	<b>1869</b>	<b>7.0%</b>	<b>366</b>	<b>832</b>	<b>30.6%</b>
Marche	1,533	25,357	47.1%	10.7%	99	6.5%	15	45	24.9%
Toscana	3,629	27,470	46.5%	9.8%	234	6.5%	51	104	32.9%
Umbria	870	23,575	43.8%	12.8%	64	7.3%	14	29	32.3%
Lazio	5,399	29,621	45.6%	14.4%	330	6.1%	124	242	33.9%
Campania	5,791	16,312	31.6%	23.2%	98	1.7%	68	62	52.2%
Abruzzo	1,308	20,789	38.8%	12.6%	48	3.7%	10	20	34.5%
Molise	321	18,974	37.2%	19.2%	5	1.5%	1	2	32.7%
Puglia	4,071	16,616	32.3%	20.9%	51	1.3%	14	30	31.7%
Basilicata	593	17,856	35.9%	20.8%	7	1.1%	2	3	42.4%
Calabria	2,001	16,507	32.4%	31.0%	35	1.8%	16	15	51.4%
Sicilia	5,017	16,685	30.5%	26.0%	78	1.6%	18	52	25.3%
Sardegna	1,658	19,659	37.0%	18.3%	19	1.2%	3	12	21.0%
<b>South</b>	<b>32,189</b>	<b>20,947</b>	<b>37.4%</b>	<b>17.9%</b>	<b>1069</b>	<b>3.3%</b>	<b>336</b>	<b>616</b>	<b>35.3%</b>
<b>Italy</b>	<b>58,942</b>	<b>25,086</b>	<b>42.2%</b>	<b>13.6%</b>	<b>2939</b>	<b>5.0%</b>	<b>702</b>	<b>1448</b>	<b>32.7%</b>

*Note:* This table reports descriptive statistics for all Italian regions, distinguishing them between the Northern and Southern ones. The size of the shadow economy is estimated by the Italian Statistical Office; the number of illegal immigrants is measured by applications for amnesty presented during the 2002 regularization. The data for all variables refer to year 2006, except for the size of the shadow economy (2003), illegal migration and residence permits (2002). Sources: Italian Statistical Office and Ministry of Internal Affairs.

Table 2: summary statistics

	<i>mean</i>	<i>st. dev.</i>	<i>obs</i>	<i>mean</i>	<i>st. dev.</i>	<i>obs</i>
	NEU COUNTRIES			NON-NEU COUNTRIES		
	<b>Romania</b>			<b>Albania</b>		
Age	31	7	683	31	6	1040
Sentence	25	20	532	50	29	898
Economic crimes	0.85	0.36	683	0.90	0.30	1040
Violent crime	0.30	0.46	683	0.25	0.43	1040
Schooling	1.81	0.40	309	1.83	0.37	644
Married	0.26	0.44	683	0.24	0.43	1040
Residual sent.	9	10	683	17	14	1040
	<b>Romania and Bulgaria</b>			<b>all EU candidate countries</b>		
Age	31	8	725	32	7	1206
Sentence	26	20	564	48	29	1049
Economic crimes	0.84	0.37	725	0.89	0.31	1206
Violent crime	0.30	0.46	725	0.25	0.43	1206
Schooling	1.80	0.40	334	1.81	0.39	746
Married	0.26	0.44	725	0.26	0.44	1206
Residual sent.	9	11	725	17	14	1206
				<b>all central Europe</b>		
Age				33	8	1789
Sentence				43	30	1545
Economic crimes				0.89	0.32	1789
Violent crime				0.24	0.43	1789
Schooling				1.78	0.41	1054
Married				0.28	0.45	1789
Residual sent.				15	15	1789

Table 3: baseline estimates

	(1)	(2)	(3)	(4)	(5)	(6)
	ALL TYPES OF CRIME				ECON	VIOL
<i>NEU</i>	.296 (.189)	.192 (.193)	.293 (.189)	.193 (.193)	.240 (.201)	.353 (.508)
<i>POST</i>	-.286** (.133)	-.290** (.134)	.198 (.334)	.143 (.334)	-.040 (.405)	-.053 (.762)
<i>NEU</i> × <i>POST</i>	-.365* (.213)	-.364* (.212)	-.366* (.213)	-.363* (.212)	-.468* (.259)	1.00e-05 (.628)
<i>AGE</i>		.098* (.055)		.098* (.055)	.104* (.062)	.413** (.180)
<i>AGE</i> <sup>2</sup>		-.002* (.0008)		-.002* (.0008)	-.002* (.0009)	-.006** (.003)
<i>MARRIED</i>		-.143 (.186)		-.144 (.184)	-.106 (.184)	-.343 (.406)
<i>RESID. SENT.</i>		-.016** (.007)		-.016** (.007)	-.018** (.007)	-.031** (.013)
Model	exp	exp	cox	cox	cox	cox
Obs.	3279	3279	3279	3279	2880	895
Log-Likelihood	-863.641	-858.723	-1461.874	-1457.205	-1301.125	-242.602

*Note:* The dependent variable is the daily hazard rate of rearrest. A proportional hazard specification is assumed, both in an exponential form, i.e. constant baseline hazard (in the first two columns) and Cox semi-parametric form (in the remaining columns). The sample includes all the Romanians and Albanians released after the collective pardon in July 2006 (in columns 1-4) and the subsamples of those arrested for economically motivated or violent crimes (columns 5 and 6, respectively). This table reports the coefficients and robust standard errors in parenthesis (clustered by Italian region and country of origin). \*, \*\* and \*\*\* denote coefficients significantly different from zero at the 90% confidence, 95% confidence and 99% confidence, respectively.

Table 4: labor market opportunities (North *v.s.* South)

	(1)	(2)	(3)	(4)	(5)	(6)
	northern regions			southern regions		
	ALL	ECON	VIOL	ALL	ECON	VIOL
<i>NEU</i>	.288 (.183)	.377* (.227)	.337 (.600)	.131 (.321)	.140 (.305)	.404 (.873)
<i>POST</i>	.191 (.390)	-.027 (.547)	.265 (.584)	-.057 (.643)	-.129 (.648)	-.650 (1.621)
<i>NEU</i> × <i>POST</i>	-.672*** (.232)	-.916*** (.306)	-1.173 (1.270)	.027 (.386)	.055 (.394)	.579 (1.062)
Obs.	1740	1521	416	1539	1359	479
Log-likelihood	-779.863	-677.287	-84.957	-539.161	-496.757	-126.12

*Note:* The dependent variable is the daily hazard rate of rearrest. A proportional hazard Cox semi-parametric specification is assumed. The sample includes the Romanians and Albanians released after the collective pardon in July 2006 distinguishing them by type of offense and Italian region. This table reports the coefficients and robust standard errors in parenthesis (clustered by Italian region and country of origin). \*, \*\* and \*\*\* denote coefficients significantly different from zero at the 90% confidence, 95% confidence and 99% confidence, respectively.

Table 5: labor market opportunities (high *vs.* low occupation in liberalized sectors)

	(1)	(2)	(3)	(4)
	ALL CRIMES		ECONOMIC CRIMES	
	<i>high dep.</i>	<i>low dep.</i>	<i>high dep.</i>	<i>low dep.</i>
<i>NEU</i>	.458*	.216	.701**	.230
	(.246)	(.193)	(.357)	(.243)
<i>POST</i>	.456	.100	-.126	-.025
	(.747)	(.493)	(1.218)	(.627)
<i>NEU</i> × <i>POST</i>	-1.401**	-.449**	-1.759***	-.631*
	(.601)	(.184)	(.555)	(.326)
obs.	395	1345	363	1158
Log-likelihood	-154.825	-556	-134.811	-479.248

*Note:* The dependent variable is the daily hazard rate of rearrest. A proportional hazard Cox semi-parametric specification is assumed. The sample includes the Romanians and Albanians released after the collective pardon in July 2006 distinguishing them by type of offense and Italian region. This table reports the coefficients and robust standard errors in parenthesis (clustered by Italian region and country of origin). \*, \*\* and \*\*\* denote coefficients significantly different from zero at the 90% confidence, 95% confidence and 99% confidence, respectively.

Table 6: robustness (all candidate EU member countries)

	(1)	(2)	(3)	(4)	(5)	(6)
	<b>italy</b>		<b>northern regions</b>			
	ECON	VIOL	ECON	ECON	ECON	ECON
					<i>high dep.</i>	<i>low dep.</i>
<i>NEU</i>	.045	.160	.284	.046	.629*	.128
	(.191)	(.472)	(.210)	(.607)	(.364)	(.220)
<i>POST</i>	-.211	-.043	-.125	.0009	-.350	-.106
	(.405)	(.725)	(.538)	(.596)	(1.137)	(.613)
<i>NEU</i> × <i>POST</i>	-.323	.011	-.794***	-.794	-1.743***	-.461
	(.257)	(.609)	(.305)	(1.281)	(.574)	(.331)
obs.	3203	982	1699	461	420	1279
Log-likelihood	-1473.372	-278.556	-747.982	-96.799	-159.542	-518.728

*Note:* The dependent variable is the daily hazard rate of rearrest. A proportional hazard Cox semi-parametric specification is assumed. The sample includes all Romanians and Bulgarians (*NEU* = 1) as well as foreigners from candidate EU member countries (*NEU* = 0), namely Albania, Croatia, Macedonia and Turkeyns, released after the collective pardon in July 2006, distinguishing them by type of offense and Italian region. This table reports the coefficients and robust standard errors in parenthesis (clustered by Italian region and country of origin). \*, \*\* and \*\*\* denote coefficients significantly different from zero at the 90% confidence, 95% confidence and 99% confidence, respectively.

Table 7: robustness (all central European countries)

	(1)	(2)	(3)	(4)	(5)	(6)
	<b>italy</b>		<b>northern regions</b>			
	ECON	VIOL	ECON	ECON	ECON	ECON
					<i>high dep.</i>	<i>low dep.</i>
<i>NEU</i>	-.083 (.185)	-.255 (.388)	.220 (.179)	-.160 (.563)	.703** (.340)	.028 (.183)
<i>POST</i>	-.268 (.332)	-.471 (.648)	-.258 (.485)	-.338 (.684)	-.418 (1.114)	-.247 (.540)
<i>NEU</i> × <i>POST</i>	-.177 (.245)	.385 (.533)	-.610** (.300)	-.766 (1.245)	-1.649*** (.614)	-.257 (.312)
obs.	4167	1233	2214	576	552	1662
Log-likelihood	-2116.758	-423.537	-1037.972	-154.444	-214.082	-734.973

*Note:* The dependent variable is the daily hazard rate of rearrest. A proportional hazard Cox semi-parametric specification is assumed. The sample includes all Romanians and Bulgarians ( $NEU = 1$ ) as well as foreigners from all other central European countries ( $NEU = 0$ ) released after the collective pardon in July 2006, distinguishing them by type of offense and Italian region. This table reports the coefficients and robust standard errors in parenthesis (clustered by Italian region and country of origin). \*, \*\* and \*\*\* denote coefficients significantly different from zero at the 90% confidence, 95% confidence and 99% confidence, respectively.