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***Fiscal Revenues and Commitment in  
Immigration Amnesties***

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Francesco Magris\* and Giuseppe Russo\*\*

### Abstract

Reasons to grant immigration amnesties include the intention to reduce the weight of the informal sector and the attempt to identify employers of undocumented workers. However, it is incontestable that potential fiscal gains are important: tax revenues are crucial in all kinds of amnesties. Nevertheless, over the last 30 years 24% of applications have been rejected. It is still unexplained why governments accept this loss of fiscal base. We argue that applying for amnesty is basically selfincrimination, and that immigration-averse governments have an incentive to exploit the applications to identify and expel illegal workers. In our Nash equilibrium only applicants with the highest income are granted amnesty, and the poorest immigrants do not apply. In addition, it is not possible to establish a reputation because the players are different every time the game is repeated. Thus, fiscal revenues are sub-optimal and amnesties are an inefficient way to make illegal workers come forward.

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# 1 Introduction

Immigration amnesties are frequent in many countries. Authors such as Levinson (2005) and Krieger and Minter (2007) discuss the legalizations that occurred in the last 30 years. Why should a country grant such amnesties? Epstein and Weiss (2011) provide a comprehensive theoretical framework for understanding immigration amnesties. They stress that clandestine workers do not pay taxes, tend to be free riders and are more involved in illegal activities. Over time, the costs associated to a large stock of illegals grow higher, until it is beneficial to convert some or all of them into legal workers.

There are many possible reasons for announcing an immigration amnesty: Chau (2001) argues that it can be used in an immigration reform in order to incentivize illegal workers to come forward and identify their employers. Gang and Yun (2007) discuss the productivity enhancing effects of a legalization when immigrants are allowed to move from the underground economy to the formal sector. Karlson and Katz (2003) suggest that illegal immigration followed by a probabilistic amnesty can be used as a tool to select high ability immigrants and get rid of less able ones.

This paper looks at immigration amnesties from the point of view of the fiscal revenues for the government. More specifically, our analysis stresses the importance of a tax base enlargement as a major cause of a regularization. Potential fiscal gains are crucial in any kind of amnesty, and governments usually proceed only when the expected revenues are considerable. Different authors - like Epstein and Weiss (2011), and Levinson (2005)- acknowledge the importance of this issue. In addition, immigration amnesties are used to raise supplementary funds by charging application fees and other costs: for example, payments to social security are one of the most frequent requirements<sup>1</sup>.

However, in spite of the fiscal benefits for the government, a large number of applications are rejected. Table 1 summarizes the available data for 19 amnesties over the last 30 years and shows that the average rejection rate exceeds 24%. Why are rejections so common? In principle there should be no ambiguity: either one fulfils the legalization requirements or one does not. The uncertainty concerning the outcome of an application has so far received little attention. Why do governments accept this loss of fiscal base?

It is quite unlikely that rejections are due to inaccurate applications, because applying for an amnesty is a self-incrimination. Immigrants who are not granted the legal status must leave the country where they are residing illegally,<sup>2</sup> and everybody is very careful in verifying his entitlement to legalization. The cost of a rejection can be substantial: illegal workers bear large sunk costs in order to cross the border illegally and, in the case of expulsion, these will be lost<sup>3</sup>.

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<sup>1</sup>Levinson (2005) summarizes the main requirements for 23 amnesties in the UK, the US, Spain, Portugal, France, Italy, Belgium, Greece and Luxembourg over the last 30 years. See also Papademetriou et al. (2004).

<sup>2</sup>By definition, an immigration amnesty is a procedure at the end of which workers are either regularized by being given some type of residence permit, or expelled (Epstein and Weiss, 2011).

<sup>3</sup>The available evidence for immigrants who are not conferred the legal status confirms

In this paper we argue that high rejection rates are due to the moral hazard of governments interested in minimizing the stock of immigrants. Our model includes two basic features: first, once a stock of illegal immigrants exists, there is an incentive to increase the tax base by granting an amnesty. Second, as far as the government is also interested in minimizing the stock of immigrants, there exists a moral hazard to expel some immigrants after their identification (this is even more relevant in the wake of the increasing success of anti-immigration parties).

The role of time-inconsistency is sketched in Epstein and Weiss (2011), and this paper works in the direction suggested by these authors<sup>4</sup>. We stress the importance of the commitment problem in generating uncertainty over the outcome of the application. In addition, we argue that it is not possible to establish a reputation because the players are different each time there is an amnesty. A crucial result is that time-inconsistency is "selective": the government has a stronger incentive to deny amnesty to the poorest immigrants, whose marginal contribution to the tax base is negligible.

In conclusion, the lack of commitment seems inevitable in immigration amnesties: it reduces the fiscal revenues and discourages many immigrants from coming forward<sup>5</sup>. Immigration amnesties turn out to be intrinsically inefficient.

The paper is organised as follows: after the introduction, section 2 presents our model, section 3 discusses the Nash equilibrium, section 4 develops some comparative statics, and section 5 summarizes our conclusions.

## 2 The Model

### 2.1 The immigrant's problem

We partition the population of illegal immigrants into  $n$  groups of workers who earn a wage  $w_i$  ( $i = 1 \dots n$ ). Wages are ranked so that  $w_1 > w_2 > \dots w_n$ . Each group  $i$  includes  $N_i$  individuals.

Consider first the utility of an illegal migrant: we assume that being illegal reduces the utility. Usually, illegal aliens are charged higher rents, their accommodation is problematic and costly, their mobility is restricted and they are constantly under the threat of apprehension and expulsion.

These penalties are intrinsic to living in clandestinity, and they do not depend on personal characteristics. Consequently, we depict them with a fixed cost. On the other hand, illegal workers do not pay income taxes. We normalize the utility of an illegal worker who is detected and apprehended to be zero<sup>6</sup>.

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that they are pushed further underground (Cavounidis, 2006; Phillips and Massey, 1999).

<sup>4</sup>The focus on dynamic inconsistency separates our analysis with respect to Mayr et al. (2011), who instead emphasize the spill-over effects an immigration amnesty may have on a third country.

<sup>5</sup>In what follows we are going to argue that an interesting example is the 2009 amnesty for domestic workers in Italy, for which only half of the expected applications were made.

<sup>6</sup>We assume that apprehension is equivalent to a job loss. In our single-period model jobless immigrants cannot move to another job and repatriate.



We write the expected utility  $E[U_C]$  of an illegal immigrant as follows:

$$E[U_C] = q(w_i - c) \quad (i = 1, \dots, n) \quad (1)$$

where  $0 < q < 1$  is the probability of *not* being detected<sup>7</sup>,  $w_i$  is the wage, and  $0 < c < w_n$  is the cost of clandestinity. Legal immigrants are not subject to the cost of clandestinity, but they pay a flat tax  $0 < t < 1$  on their income. The utility  $U_L$  of a legal immigrant is therefore

$$U_L = w_i(1 - t) \quad (2)$$

If the immigrant were sure to be regularized, the condition to come forward and apply for the amnesty under risk neutrality would be  $U_L \geq E[U_C]$ , i.e.<sup>8</sup>

$$w_i(1 - t) \geq q(w_i - c). \quad (3)$$

However, not all applicants are granted the regularization, and rejected candidates receive an official removal order.

As we have pointed out in the introduction, the existence of high rejection rates is puzzling: immigrants have an incentive to verify accurately their entitlement to legalization. Rejections are possible because regularization procedures are often exposed to large margins of discretion. Candidates must usually provide evidence that they meet several eligibility criteria (see again Levinson, 2005; Papademetriou *et al.*, 2004). For example, the requirements to prove the *continuous* presence in country before a certain date, or the ability to self-support, are fairly arbitrary and can be manipulated *ex post* by the authorities.

For an immigration-averse government, expelling unwanted immigrants may indeed be better than increasing the fiscal base. This undermines the credibility of the amnesty. Epstein and Weiss (2011) catch this point by emphasizing that several variables of concern for the administration can affect the outcome of the application. For instance, immigrants could be involved in illegal activities of some sort, and once identified they can easily be put before a court and then deported.

It is now crucial to remark that the amnesty's credibility will be jeopardized if the removal order for rejected candidates is effective even for a single immigrant -if just one applicant is forced to repatriate, credibility is lost<sup>9</sup>.

A rejection obviously implies serious risks for the immigrants. First of all, authorities must enforce the removal order and shut down the illegal jobs<sup>10</sup>. This is easier after a self-incrimination where the law must be applied to some extent,

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<sup>7</sup>There are empirical and theoretical reasons to think that  $q$  is close to unity. See the detailed discussion in Chau (2001) and the references quoted within. See also Hanson and Spilimbergo (2001), and Hillman and Weiss (2001).

<sup>8</sup>For simplicity we assume that the regularization does not affect  $w_i$ . Allowing for a higher income after the legalization would not change our conclusions.

<sup>9</sup>Alternatively, the government can apprehend and extradite illegal immigrants at a cost. In such a case, credibility is lost if this cost is marginally lower after a self-incrimination. Of course, self-incriminated immigrants can be apprehended effortlessly.

<sup>10</sup>According to most policy makers in Europe, fighting the underground economy is one of the top reasons to regularize (Papademetriou *et al.*, 2004; Levinson, 2005).

at least in the most visible cases. Besides, continuing to work illegally once identified could be difficult even in the absence of stringent controls. Employers may get rid of identified immigrants, which may force other repatriations.

In terms of utility, this means that an immigrant whose application is rejected *is worse off with respect to an immigrant who does not apply*. Illegal immigrants are aware of these incentives, know that their application can be rejected and that by applying the costs of illegal entry would be lost.

In this respect, the failure of the 2009 amnesty in Italy is quite informative: though the government was expecting up to 750,000 applications, only 295,126 were received. The uncertain exoneration of the crimes related to illegal work and residence was crucial in deterring applications<sup>11</sup>. Since the cost of a rejection can be substantial, immigrants have expectations on the probability of legalization. They anticipate that their probability  $p_i$  of being regularized depends on their income  $w_i$ : for the government, the incentive to deviate is higher with the poorest immigrants, whose marginal contribution to the fiscal base is negligible.

We can now write the expected utility of applying for amnesty when a share  $b \in [0, 1)$  of the rejected applicants are able to hold their jobs even after the expulsion order, and a share  $(1 - b)$  must repatriate.

$$E[U_A] = \underbrace{p_i w_i (1 - t)}_{\text{regularized}} + \underbrace{(1 - p_i) b q (w_i - c)}_{\text{rejected}} \quad (4)$$

The incentive constraint becomes  $E[U_A] \geq E[U_C]$ , i.e.

$$p_i w_i (1 - t) + (1 - p_i) b q (w_i - c) \geq q (w_i - c)^{12}, \quad (5)$$

which yields

$$p_i \geq \bar{p}_i \equiv \frac{q (w_i - c) (1 - b)}{w_i (1 - t - b q) + b q c}. \quad (6)$$

Without loss of generality we assume  $\bar{p}_1 \leq 1$ . This means that there exists a probability of legalization such that the richest illegal immigrants have an incentive to apply. Since  $w_1$  is the highest wage and since  $(\partial \bar{p}_i / \partial w_i) > 0$ , this in turn implies that for all groups of immigrants there exists a probability of regularization that incentivizes application<sup>13</sup>. The rest of the paper is devoted to characterizing the choice of  $p_i$  by the government.

We now summarize the timing of the game: 1) the government announces an immigration amnesty; 2) immigrants decide whether or not to apply; 3) the government decides whether or not to accept the applications. Successful immigrants pay taxes and are regularized; unsuccessful ones receive a removal order, which is ineffective for a share  $b \in (0, 1]$  of them. Our model is developed in the next section.

<sup>11</sup> See the report by Zorzella (2009).

<sup>12</sup> Our IC is similar to the one in Epstein and Weiss (2011).

<sup>13</sup>  $\bar{p}_i > 1$  means that there exist some groups of rich illegals who never come forward because for them legalization would be a loss (the tax would be more important than the fixed cost). Groups not interested in the amnesty would enter the government's utility as a fixed term and they make the algebra more cumbersome. We abstract from them with no loss of generality.

## 2.2 First best

Consider a government interested in minimizing the population of immigrants and maximizing fiscal revenues. When an application is rejected the removal order is effective with probability  $(1 - b)$ . For a given stock of illegal immigrants, the government will face a trade off between increasing the tax base and reducing the stock of illegal workers.

We write the utility of the government as follows:

$$G(p_1, \dots, p_n) = t \sum_{i=1}^n w_i p_i L_i - \frac{1}{2} \left[ \sum_{i=1}^n p_i L_i + b \sum_{i=1}^n (1 - p_i) L_i + \sum_{i=1}^n (N_i - L_i) \right]^2 \quad (7)$$

where

$L_i \leq N_i$  = immigrants who apply for the amnesty;

$t \sum_{i=1}^n w_i p_i L_i$  = tax revenue from the amnesty;

$\sum_{i=1}^n p_i L_i$  = legalized immigrants;

$b \sum_{i=1}^n (1 - p_i) L_i$  = applicants rejected with ineffective expulsion

$\sum_{i=1}^n [N_i - L_i]$  = immigrants who do not apply for the amnesty.

Since the government has to maximize (7) subject to the immigrants' IC it follows that  $L_i = N_i$  for  $i = 1 \dots n$ , therefore the term  $\sum_{i=1}^n (N_i - L_i)$  in (7) is zero and we can rewrite the utility as<sup>14</sup>

$$G(p_1, \dots, p_n) = t \sum_{i=1}^n w_i p_i N_i - \frac{1}{2} \left[ \sum_{i=1}^n p_i N_i + b \sum_{i=1}^n (1 - p_i) N_i \right]^2 \quad (8)$$

The problem of the government is then

$$\begin{aligned} \max_{p_1, \dots, p_n} G(p_1, \dots, p_n) &= t \sum_{i=1}^n p_i w_i N_i - \frac{1}{2} \left[ \sum_{i=1}^n p_i N_i + b \sum_{i=1}^n (1 - p_i) N_i \right]^2 \quad (9) \\ \text{s.t.} & \\ \bar{p}_i &\leq p_i \leq 1 \quad \text{for any } i \\ \lambda_i (p_i - \bar{p}_i) &\geq 0. \end{aligned}$$

Where  $\lambda_i \geq 0$  is the Lagrange multiplier.

Now we proceed to characterize the optimal amnesty. In the Appendix we prove that at most one of the  $n$  partial derivatives  $G_i$  can be zero. Suppose this happens for the group  $\tilde{i}$ . Then, we prove that  $G_i > 0$  for any  $i < \tilde{i}$ , and  $G_i < 0$  for any  $i > \tilde{i}$ . As a consequence, we observe corner solutions for any  $i \neq \tilde{i}$ . If  $\tilde{i} = n$ , every applicant would be let in, while if  $\tilde{i} = 1$  only immigrants within

<sup>14</sup>It is simple to prove that the government cannot be better off when the IC does not hold for some  $i$ : when immigrants come forward, if they are regularized they enlarge the tax basis (and cause less disutility); if they are not regularized, they are expelled.

the richest group could hope for the amnesty. We formalize this result in the following proposition.

**Proposition 1** (*First best*): *A first-best policy for the government is one for which a group of immigrants  $\tilde{i} \in \{1, \dots, n\}$  are assigned the probabilities of regularization  $p_i^* = 1$  for  $i < \tilde{i}$ ,  $p_i^* = \bar{p}_i$  for  $i > \tilde{i}$ , and  $p_i^* \in [\bar{p}_i, 1]$ .*

**Proof.** See the appendix. ■

The meaning of the proposition is intuitive since immigrants are ranked with respect to their income  $w_i$ : the richest groups of immigrants generate a positive marginal utility, therefore it is beneficial to legalize them. On the other hand, the marginal utility generated by the poorest immigrants can be negative, because their contribution to the tax base is negligible. In such a case the government's IC constraint binds, and it adopts the incentive compatible probability of legalization<sup>15</sup>.

In short, the first best solution is found by legalizing with probability  $p_i^* \in [\bar{p}_i, 1]_i$  all immigrants able to increase the marginal utility of the government and legalizing the others with probability  $p_i^* = \bar{p}_i$ . It is straightforward to realize that there exists an incentive to deviate from this policy, and reject the poorest applicants. We are going to examine the incentive to deviate in the next section.

### 2.3 Dynamic consistency

The reason for the government's deviation is intuitive: ex post, the government has no incentive to legalize the immigrants who generate a negative marginal utility. Therefore, the poorest immigrants are not granted the amnesty.

**Proposition 2** (*Optimal deviation*): *the optimal deviation for the government is finding a group of immigrants  $\check{i} \geq \tilde{i}$  such that the probabilities of regularization are  $p_i^d = 1$  for  $i < \check{i}$ ,  $p_i^d = 0$  for  $i > \check{i}$ , and  $p_i^d \in [0, 1]$ .*

**Proof.** See the appendix. ■

We have explained above why there is an incentive to deviate. Nevertheless, there is a detail we want to point out: one can expect that all the immigrants for whom the IC is binding in the first best are not granted amnesty ex post (i.e.  $p_i^d = 0$  for  $i > \check{i}$ ). Indeed, the government announces the probability  $\bar{p}_i$  when it is constrained by the IC, which is irrelevant ex post.

In practice however things are different: since the government now gets rid of the poorest immigrants, the marginal utility stemming from the other immigrants increases, and some groups who were given only the incentive-compatible probability  $\bar{p}_i$  could now achieve regularization with certainty. This is the reason why  $\check{i} \geq \tilde{i}$ .

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<sup>15</sup> $p_i^*$  is obtained by solving  $G_i \geq 0$ .

### 3 The Nash equilibrium

In a Nash equilibrium the players have no incentive to deviate. In our game there exist infinitely many such equilibria. For example, a policy ( $p_1^* = p_2^* = \dots p_n^* = 0$ ) would be time-consistent because nobody would apply. More generally,  $p_i^* < \bar{p}_i$  for some  $i$  is time-consistent, because group  $i$  does not apply and the government cannot modify ex post the announcement. Proposition 2 suggests that the amnesty is credible when legalization is granted only to the immigrants who generate a non-negative marginal utility. We present a refinement in the next proposition:

**Proposition 3** (*Non-trivial Nash equilibrium*): Consider the marginal utility  $G_i$ . Let  $i^E$  be the largest  $i$  such that  $G_{i^E}(1, 1, \dots, p_{i^E}, 0, \dots, 0) \geq 0$ . A non-trivial Nash Equilibrium is a vector  $(p_1^{**}, p_2^{**}, \dots, p_{i^E}^{**}, \dots, p_n^{**})$  such that  $p_1^{**} = p_2^{**} = \dots p_{i^E-1}^{**} = 1$ ;  $p_{i^E+1}^{**} = p_{i^E+2}^{**} = \dots p_n^{**} = 0$ ;  $p_{i^E}^{**} \in [\bar{p}_{i^E}, 1]$ .

**Proof.** See the appendix ■

In the Nash equilibrium the government begins by legalizing the richest immigrants, then it proceeds until it finds the last group ( $i = i^E$ ) who produces a non-negative marginal utility. Intuitively, in such a case there exists no incentive to deviate from the announced policy.

As a result of the commitment problem, all immigrants within the groups  $i > i^E$  stay illegal. This outcome is obviously sub-optimal because a large share of poor immigrants stays in the underground economy and generates disutility without contributing to the fiscal base. This is also the reason why  $i^E \leq \hat{i}$ : the marginal utility generated by the richest immigrants is smaller because in the case of the optimal deviation the poorest immigrants apply and are expelled, while in the Nash equilibrium they do not apply and enter the government's utility function<sup>16</sup>. Thus, with respect to the first best, in the time-consistent equilibrium the amnesty is unable to make all illegal workers come forward, and fiscal revenues are reduced. Somewhat paradoxically, the lack of commitment harms the poorest immigrants, who would gain most from legalization<sup>17</sup> and have the lowest  $\bar{p}_i$ s.

It is possible to prove that the equilibrium outlined in prop. 3 gives the government the highest attainable utility among all time-consistent equilibria. This is argued in the next proposition.

**Proposition 4** (*Optimal time-consistent equilibrium*): The time-consistent policy characterized in prop. 3 is the best among all time-consistent policies.

**Proof.** see the appendix ■

The intuition behind this result is clear: though the government's policy is credible whenever  $p_i < \bar{p}_i$  for some  $i$ , setting  $p_i < \bar{p}_i$  for  $i < i^E$  causes a loss, because the marginal utility  $G_i$  is always positive for  $i < i^E$ .

<sup>16</sup>We must mention, however, the only case in which the first-best is time-consistent, i.e. when  $G_n(1, 1, \dots, 1) \geq 0$ . In this contingency, even the poorest immigrants are sufficiently rich to cause an increase in the marginal utility.

<sup>17</sup>The fixed cost of clandestinity is more important for the lowest incomes.

The following step would be to explore the existence of a commitment technology able to restore the first best. However, it seems inevitable that the players involved in different amnesties are not identical: legalized immigrants do not need other amnesties; governments go out of office and are replaced by new governments with possibly different preferences. As a consequence, even though amnesties are frequent, it seems unreasonable to set up a repeated game where reputation can support the first best. This suggests that an efficient use of immigration amnesties is not achievable.

## 4 Comparative Statics

### 4.1 The effect of $w_i$ : time-consistent equilibrium

Consider the  $l^{th}$  group of immigrants and suppose that  $w_l$  increases. This change in  $w_l$  may or may not modify the ranking of the  $w_i$ s. When the ranking is modified,  $w_l$  moves to a new position  $l'$ . Then, we have either  $i^E < l' < l$ , or  $l' \leq i^E < l$ . In the first case the time-consistent policy is unaffected because the marginal group is unchanged. In the second case, the former marginal group shifts one position and there will be a new marginal group  $i^{E'} \geq i^E$ . When the change in  $w_l$  does not modify the ranking of the  $w_i$ s, the time-consistent equilibrium is affected only if  $l = i^E$ . In such a case, the wage increase makes it beneficial to legalize more immigrants from group  $i^E$ . Thus, the government will increase  $p_{i^E}^{**}$  if it is smaller than unity.

### 4.2 The effect of $w_i$ : first-best

Suppose that  $w_l$  increases in the first best. As in the previous case, this wage increase can shift the marginal group of immigrants. When  $l$  moves to  $l' \leq \tilde{i}$ , the result is the same as the time-consistent equilibrium, and there will be a new marginal group  $\tilde{i}' \geq \tilde{i}$ . However, things are different when  $l' > \tilde{i}$ . To understand what happens, consider the marginal utility

$$G_i = tw_i N_i - \left[ \sum_i^n p_i N_i + b \sum_{i=1}^n (1 - p_i) N_i \right] N_i (1 - b).$$

Since  $\partial \bar{p}_i / \partial w_i > 0$ , the increase in  $\bar{p}_l$  will decrease the marginal utility produced by *each* group of immigrants through the term  $(\sum_i^n p_i N_i + b \sum_{i=1}^n (1 - p_i) N_i)$ . As a consequence, the marginal utility  $G_i$  may become negative, and it is not possible to have a new marginal group  $\tilde{i}' > \tilde{i}$ <sup>18</sup>.

<sup>18</sup>Intuitively, a generalized wage growth tends to shift the marginal group of immigrants downwards: suppose that each  $w_i$  increases by  $\delta_i > 0$ . Then,  $G_i$  increases for any  $i$ , and it could be the case that  $G_i \geq 0$  for  $l > \tilde{i}$ .

### 4.3 The effect of $N_i$ : time-consistent equilibrium

Suppose that there is an increase of  $N_i$  for  $i = l$  in the time-consistent equilibrium. Then either  $i^E$  is unaffected, or it shifts backwards. If  $l > i^E$  this happens because the stock of immigrants who stay in clandestinity increases (and reduces the marginal utility for any  $i$ ),<sup>19</sup> so the government cannot be better off by legalizing more immigrants. If  $l < i^E$  the marginal utility  $G_{i^E}$  cannot be higher, thus the government cannot be better off by legalizing another group of immigrants.

### 4.4 The effect of $N_i$ : first-best

Since an increase in  $N_l$  reduces all the marginal utilities, its effect is the same in the first-best and in the time-consistent equilibrium: the marginal group  $\tilde{i}$  cannot shift towards a lower wage<sup>20</sup>.

### 4.5 The effect of $t$ : time-consistent equilibrium

Suppose that there is an increase of  $t$ . It is immediate to realize that  $\frac{\partial \bar{p}_i}{\partial t} > 0$ . Given our assumption that  $\bar{p}_1 \leq 1$ , in the time-consistent equilibrium an increase of  $t$  matters only if the I. C. binds for the marginal group  $i^E$ . In fact,  $p_i^{**} = 0$  for  $i > i^E$  and  $p_i^{**} = 1$  for  $i < i^E$ . Thus, higher taxes may push the government to increase the number of legalizations when the IC of the marginal group is binding.

### 4.6 The Effect of $t$ : First-Best

In the first-best equilibrium  $\bar{p}_i$  is binding for any  $i > \tilde{i}$ . After an increase of  $t$ , all immigrants in groups  $i > \tilde{i}$  require a higher probability of admission in order to come forward, thus there will be more legalizations for any  $i$ . This affects all the marginal utilities through a positive effect on the fiscal base, and through a negative effect on the stock of immigrants. The net effect is ambiguous, and the marginal group  $\tilde{i}$  can shift upwards or downwards.

## 5 Conclusions

Though it is well known that immigration amnesties are used in order to increase the fiscal base and that rejection rates are usually significant, the literature has only marginally explored this issue.

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<sup>19</sup>The marginal utility  $G_i$  in the time-consistent equilibrium is given by the marginal tax base  $tw_i L_i$  and the marginal disutility  $[\sum_i^n p_i L_i + b \sum_{i=1}^n (1 - p_i) L_i + \sum_{i=1}^n (N_i - L_i)] (1 - b) N_i$  (note that  $L_i = 0$  for  $i > i^E$ ).

<sup>20</sup>In the case of a generalized increase of  $N_i$ , the marginal utility  $G_i$  is reduced for any  $i$ , and this tends to shift the marginal group towards a higher wage, thus reducing the number of immigrants who are granted amnesty.

As stressed by Epstein and Weiss (2011), governments dislike large stocks of immigrants and spend significant resources in limiting the number of entries into their countries. However, once a stock of illegal immigrants has accumulated, a powerful incentive emerges to use the amnesty to retrieve some fiscal base from the richest immigrants, while expelling the others. In equilibrium, the poorest stay illegal. Many immigrants, however, apply because even though legalization is uncertain their expected utility is sufficient to make them come forward. The moral hazard of the government helps us to understand why rejection rates are substantial.

Unfortunately the lack of commitment condemns the immigrants who would gain most from legalization, and would like to come forward even under a low probability of success if the government's policy were credible, to illegality.

On the other hand, it is difficult to quantify the losses of fiscal base due to the commitment problem. For the 2009 amnesty, the Italian government was estimating fiscal revenues of 1.2-1.6 billion euros corresponding to 500,000-750,000 regularizations<sup>21</sup>. In fact, there were 295,126 applications and 222,182 regularizations. As we have argued, it is likely that the 2009 amnesty was badly designed; in addition, it was announced by a ministry of the anti-immigration Northern League, possibly worsening the problems of credibility. Though this amnesty cannot be considered typical, the fiasco suggests that commitment problems can be important, and that careful design is needed in order to reduce inefficiencies as much as possible<sup>22</sup>.

Unfortunately, we have to acknowledge that the conditions needed in order to establish a reputation are quite unlikely even though amnesties are frequent: legalized immigrants do not need new amnesties, and different governments have different tastes for immigration.

Immigration amnesties seem intrinsically provisional and sub-optimal.

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<sup>21</sup>This figure was obtained by summing application fees, bureaucratic fees, contributions to social security and income taxes over one year (source: A. Manganaro "La sanatoria vale subito 450 milioni di euro. Il Ministero dell'Interno si aspetta fino a 750000 istanze di regolarizzazione" *Il Sole 24 Ore*, 21-08-2009, p.6).

<sup>22</sup>See also Levinson (2005) on this point.



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## A Appendix

### Proof of Proposition 1

Consider the partial derivatives of (9):

$$\begin{aligned}
 G_1 &= tw_1N_1 - \left[ \sum_{i=1}^n p_i N_i + b \sum_{i=1}^n (1-p_i) N_i \right] N_1(1-b) \\
 G_2 &= tw_2N_2 - \left[ \sum_{i=1}^n p_i N_i + b \sum_{i=1}^n (1-p_i) N_i \right] N_2(1-b) \\
 &\vdots \\
 &\vdots \\
 &\vdots \\
 G_n &= tw_nN_n - \left[ \sum_{i=1}^n p_i N_i + b \sum_{i=1}^n (1-p_i) N_i \right] N_n(1-b)
 \end{aligned} \tag{A1}$$

And recall that  $w_1 > w_2 > \dots w_n$ .

To prove the proposition, it is crucial to remark that at most one derivative  $G_i$  can be equal to zero. Suppose for example that  $G_1 = G_2 = 0$ .

This implies  $w_1 = w_2$  i.e. a contradiction. Now we observe that  $G_j = 0$  implies  $G_i > 0$  for  $i < j$  and  $G_i < 0$  for  $i > j$

Suppose for example  $G_2 = 0$ . Then we have

$$tw_2 = \left[ \sum_{i=1}^n p_i N_i + b \sum_{i=1}^n (1-p_i) N_i \right] (1-b).$$

By substituting into  $G_1$ , we obtain  $tw_1N_1 - tw_2N_1 > 0$ . By substituting into  $G_3$ , we obtain  $tw_3N_3 - tw_2N_3 < 0$ , and so on.

To grasp intuitively how the government finds the optimal  $p_i^*$ s, it is useful to begin with the determination of  $p_n^*$ , i.e. the probability given to the poorest immigrants, who produce little fiscal base. If  $p_n^* = 1$ , it follows that all groups of immigrants must have  $p_i = 1$ . On the other hand, if the poorest immigrants generate a negative marginal utility, they can be granted only the incentive compatible probability  $\bar{p}_n$ . This process is iterated until the government finds a group of immigrants who produce a non decreasing marginal utility.

Now we show the optimization in detail. Let us consider the derivative  $G_n$  evaluated at  $(p_1 = p_2 = \dots p_n = 1)$ . If  $G_n(1, \dots, 1) \geq 0$ , we know that  $G_i(1, \dots, 1) > 0$  for any  $i$ , and the solution is  $(p_1^* = p_2^* = \dots p_n^* = 1)$ .

If  $G_n(1, \dots, 1) < 0$ , we know that  $p_n^*$  cannot be smaller than  $\bar{p}_n$ . Thus we consider  $G_n(1, \dots, \bar{p}_n)$ .

If  $G_n(1, \dots, \bar{p}_n) < 0$ , the solution is  $p_n^* = \bar{p}_n$ . If  $G_n(1, \dots, \bar{p}_n) > 0$  we compute the probability  $p_n^0$  such that the marginal utility  $G_n$  evaluated at  $(1, 1, \dots, p_n^0)$  is equal to 0. The optimal probability for the  $n$ th group will be then  $p_n^* = p_n^0$ . Once  $p_n^*$  is found, we consider  $G_{n-1}(1, 1, \dots, p_n^*)$ .

If  $G_{n-1}(1, 1, \dots, 1, p_n^*) \geq 0$  the optimal solution will be  $(p_1^* = p_2^* = p_{n-1}^* = 1; p_n^*)$  where  $p_n^*$  has been found previously.

If  $G_{n-1}(1, 1, \dots, 1, p_n^*) < 0$  we check  $G_{n-1}(1, 1, \dots, \bar{p}_{n-1}, p_n^*)$ .

If  $G_{n-1}(1, 1, \dots, \bar{p}_{n-1}, p_n^*) < 0$  we know that  $p_{n-1}^* = \bar{p}_{n-1}$

If  $G_{n-1}(1, 1, \dots, \bar{p}_{n-1}, p_n^*) > 0$  we compute the probability  $p_{n-1}^0$  such that the marginal utility  $G_{n-1}$  evaluated at  $(1, 1, \dots, p_{n-1}^0, p_n^*)$  is equal to 0. The optimal probability for the  $(n-1)$ th group will be then  $p_{n-1}^* = p_{n-1}^0$ . We have now found  $p_n^*$  and  $p_{n-1}^*$ . We iterate this process until we find the marginal group  $\tilde{i}$ .

Finally we obtain

$$\begin{aligned} p_i^* &= 1 \text{ for } i < \tilde{i} \\ p_i^* &\in [\bar{p}_i, 1] \\ p_i^* &= \bar{p}_i \text{ for } i > \tilde{i}. \end{aligned}$$

### Proof of Proposition 2: optimal deviation.

The method to prove Proposition 2 reproduces the proof of Proposition 1, but the maximization problem is not subject to the I.C., because immigrants have already applied for the amnesty. As a consequence, when the marginal utility  $G_i$  is negative it is now possible to set  $p_i^d \leq \bar{p}_i$  or to reject the application ( $p_i^d = 0$ ).

Consider the derivative  $G_n$  evaluated at  $(p_1 = p_2 = \dots p_n = 1)$ .

If  $G_n(1, 1, \dots, 1) \geq 0$ , we know also that  $G_i(1, 1, \dots, 1) > 0$  for any  $i \neq n$ . The solution is  $(p_1^d = p_2^d = \dots p_n^d = 1)$  and  $\check{i} = n$ .

If  $G_n(1, 1, \dots, 1) < 0$  we have to consider  $G_n(1, 1, \dots, 0)$ .

If  $G_n(1, 1, \dots, 0) > 0$  we compute  $p_n^0$ , i.e. the value of  $p_n$  such that  $G_n(1, 1, \dots, p_n^0) = 0$ <sup>23</sup>. In this case the solution is  $(p_1^d = p_2^d = \dots p_n - 1^d = 1; p_n^d = p_n^0)$ , and  $\check{i} = n$ .

If  $G_n(1, 1, \dots, 0) < 0$ ,  $p_n^d = 0$  and we iterate the procedure on  $G_{n-1}(1, 1, \dots, 1, 0)$ , until we find the marginal group  $\check{i}$ .

A corollary of this Proposition is that  $\check{i} \geq \tilde{i}$ . We know that  $\tilde{i}$  is the highest  $i$  such that  $G_i(1, 1, \dots, p_i^d, \bar{p}_{i+1}, \dots, \bar{p}_n) \geq 0$ . When it is possible to deviate,  $\check{i}$  is the highest  $i$  such that  $G_i(1, 1, \dots, p_i^d, 0, \dots, 0) \geq 0$ . Since the marginal utility  $G_i$  generated by the legalization of group  $i$  increases as the group  $(i+1)$  is expelled, the marginal group  $\check{i}$  in the optimal deviation cannot be lower than  $\tilde{i}$ .

In other words, when the government deviates it excludes the poorest immigrants from legalization. As a consequence, the marginal utility of regularizing the richest immigrants is higher, because the poorest do not appear in the utility function anymore. Therefore, the marginal group of immigrants cannot be ranked lower than in the first best.

### Proof of Proposition 3 (Nash equilibrium)

In the Nash equilibrium the marginal utility  $G_i$  is given by the partial derivatives

<sup>23</sup>Notice that for any  $i \neq n$  the value of  $p_i^0$  in the case of the optimal deviation is larger or equal to its value in the first best, because all arguments  $p_j^{**}$  for  $j > i$ , are now zero.

$$G_1 = tw_1 L_1 - \left[ \sum_{i=1}^n p_i L_i + b \sum_{i=1}^n (1 - p_i) L_i + \sum_{i=1}^n (N_i - L_i) \right] L_1 (1 - b) \quad (\text{A2})$$

$$G_2 = tw_2 L_2 - \left[ \sum_{i=1}^n p_i L_i + b \sum_{i=1}^n (1 - p_i) L_i + \sum_{i=1}^n (N_i - L_i) \right] L_2 (1 - b)$$

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$$G_n = tw_n L_n - \left[ \sum_{i=1}^n p_i L_i + b \sum_{i=1}^n (1 - p_i) L_i + \sum_{i=1}^n (N_i - L_i) \right] L_n (1 - b)$$

as it happens for the proof of prop. 1, the marginal utility can be zero at most for a single  $i$ , with  $G_i > 0$  for  $j < i$  and  $G_i < 0$  for  $j > i$ .

In order to find  $i^E$  it is sufficient to reproduce the procedure outlined in propp. 1 and 2.

For  $(1, 1, \dots, 1, p_{i^E}^{**}, 0, 0, \dots, 0)$  to be a Nash equilibrium we need that deviations are not profitable for the government. This is verified because for any  $G_i > 0$  setting  $p_i^{**} < 1$  would cause a loss, and for any  $G_i < 0$  setting  $p_i^{**} > 0$  would also cause a loss. Since  $p_{i^E}^{**}$  is found by solving  $G_{i^E} \geq 0$ , there is no incentive to deviate from  $p_{i^E}^{**}$  as well.

It is interesting to remark that  $i^E < \tilde{i} < \check{i}$ . We have  $i^E < \tilde{i}$  because in the time-consistent equilibrium the poorest immigrants do not apply and they reduce the marginal utility stemming from the richer groups of immigrants.

#### Proof of proposition 4

Consider the time-consistent equilibrium in prop. 3, i.e.  $(1, 1, \dots, p_{i^E}^{**}, 0, \dots, 0)$  where  $p_{i^E}^{**} \in [\bar{p}_{i^E}, 1]$ . Notice that  $p_i > 0$  is not credible for  $i > i^E$ . It follows that alternative equilibria are vectors of probabilities where  $p_i < \bar{p}_i$  for some  $i \leq i^E$ , because when  $p_i < \bar{p}_i$  immigrants do not apply and the government cannot reverse his decision.

Consider now a policy  $(1, 1, \dots, p_j^{**}, 1, \dots, 1, p_{i^E}^{**}, 0, \dots, 0)$  with  $p_j^{**} < \bar{p}_j$ . This policy is time-consistent, but since by construction  $G_j(1, 1, \dots, p_j^{**}, 1, \dots, 1, p_{i^E}^{**}, 0, \dots, 0) > 0$ , it is dominated by the policy  $(1, 1, \dots, 1, p_{i^E}^{**}, 0, \dots, 0)$ .

This reasoning holds whenever  $p_i^{**} \in [0, \bar{p}_i)$  for an infra-marginal group of immigrants. We conclude that the time-consistent policy outlined in prop. 3 is dominant.

Table 1					
Country	year	Type of permit	Applicants	Legalized	Approval rate
US	1986	permanent	1.7 million	1.6 million	94%
	1987	permanent	1.3 million	1.1 million	85%
Italy	1995	1 or 2 year	256,000	238,000	93%
	1998	temporary	308,323	193,200	63%
	2002	one year +	700,000	634,728	90%
	2006*	one year +	427,865	259,206	60%
	2009	one year +	295,126	222,182	75%
Greece	1998	6 month	370,000	370,000	100%
	1998	1-5 year +	228,000	220,000	96%
	2001	2 year	368,000	228,000	62%
Spain	1985	1 year +	44,000	23,000	50%
	1991	3 year	135,395	109,135	80%
	1996	5 year	25,000	21,300	85%
	2000	1 year	247,598	153,463	62%
France	1981	permanent	150,000	130,000	86%
	1997	permanent	150,000	87,000	58%
Portugal	1992	temporary	80,000	38,364	48%
	1996	temporary	35,000	31,000	89%
	2001	1 year	350,000	221,083	63%
Average					<b>75,7%</b>

Source: Levinson (2005) and Ministero degli Interni, Dipartimento per le Libertà Civili e l'Immigrazione, Rome, Italy.

Legend:

"+" indicates that the permit is renewable.

\*Since entries largely exceeded the legal quotas, in 2006 the Italian government increased the number of work permits ex post. This has been considered a "shadow amnesty".