45th CONGRESS OF THE EUROPEAN REGIONAL SCIENCE ASSOCIATION,
23-27 August 2005, Vrije Universiteis Amsterdam

Politics of immigration: quotas of entrance and hidden economy

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Abstract. We have developed a simple model which considers the relationship between illegal immigration and the underground economy. Within this framework, we assess the actual effects of the policy of reducing legal immigration quotas. We conclude that this policy has only short-term effects on immigration: migratory flows are discouraged in the short run, however this effect is eventually lost over the long term. The proportion of legal to illegal immigrants therefore changes in terms of stationary equilibrium. Moreover, although the actual scale of the underground economy is also reduced in the short term, it actually increases in the long term.

Keywords: Illegal immigration, hidden economy.

JEL: F22, J61, O17.

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1. Introduction

One of the main challenges faced by an increasingly globalised world is that of assimilating migratory movements from the most underprivileged areas of the planet to those with better economic prospects. A clear example of these movements is the migration to the EU countries from North Africa and Eastern Europe. The main problem is the impossibility of completely controlling these migratory flows. Governments may consider different ways of restricting the entry of foreigners, the most evident one being to set maximum entry quotas, nevertheless, practical experience has shown that after these quotas have been reached, economic inequalities still drive the natives of developing countries to enter developed countries and remain there illegally. For instance, Coppel et al., 2001, calculate that 500,000 illegal immigrants arrive in EU countries every year.

An immediate consequence of illegal immigration is the growth of the underground economy which, in the European Union is around 12% of GDP, according to estimates by Schneider (2001). Illegal immigrants provide an abundant and inexpensive labour force that is utilised by the hidden economy, offering sub-standard working conditions (usually in conditions of exploitation) and with no payment of taxes. In particular, these wages are below market levels, and provide significant income to unscrupulous employers, thus spurring the appearance of illegal factories as networks for capturing and trafficking with illegal immigrants.

Within this framework, the aim of this paper is to analyse the effects of immigration quotas on both phenomena: illegal immigration and the underground economy. There is abundant literature on both these subjects, however, to our knowledge the clear relationship between these phenomena has received no attention in the literature.

To this aim we developed a simple model in which foreign workers were uncertain about whether their status would be legal of illegal after arrival at their destination. The only information on this point is the quota laid down by the particular government in question. This determines the probability of becoming either a legal or illegal worker. On this point our model differs from most others in the literature on

illegal immigration, where the condition of illegal immigrant is either established *a priori,* with no element of uncertainty (Djajic, 1997; Gaytán-Fregoso and Lahiri, 2000; Hazari and Sgro, 2003) or it is determined by the worker's qualification (Kondoh, 2000). Thus, immigration quotas act as an indicator of the possible status of potential immigrants. However, governments cannot completely prevent the entry of workers (on this point our specification differs from Carter, 1999, who considers that governments can impede illegal immigration). Once the immigration quota has been met, any further immigrants entering become illegal. The possibility of exploiting these illegal workers leads to native residents of the host country starting up underground economic activities.

Our main conclusion is that the effect of quotas on migration rates is only transitory and vanishes completely in the long run. However, the increasing proportion of illegal immigration after a reduction in the quota acts, in the long run, as an incentive to the underground economy. Accordingly, in order to meet their targets, politicians should take into account the short and long term effects of laying down a policy on the particular make-up of migration and on the hidden economy.

This study is structured as follows: the next section presents the model. Section 3 determines migration in the short and long run; the size of the shadow economy; and wages. The consequences of migration quota policies on illegal immigration and the underground economy are developed in section 4. Lastly, in section 5, the main conclusions are shown, pointing the way to future research.

2. The model

Individuals live for two periods. During the first one they work and during the second they consume the savings from the previous period. Before entering the labour market, they may decide to emigrate to a country with better living conditions. In this case, they adopt the behaviour of the native residents of the host country, and they themselves, and their descendants, are considered as natives in the period following. Let N be the size of the native population, m the migration rate (immigration in relation to the native population) and Q the legal immigration quota laid down by the government (permitted percentage of immigration in relation to the native population).

Labour market. All the participants (both legal and illegal native residents and immigrants) provide a unit of labour in every period.

A unique market exists where, apart from the legal economy, there is also an underground economy which uses illegal workers to produce goods and services which are fully equivalent to those produced by the legal economy. This underground economy survives thanks to the immigrants who arrive in the country with no documents and need the assistance of native workers who exploit illegal workers by appropriating a proportion of their wages. In Myers and Papageorgiou (2002), the "toll" plays a similar role in obtaining a residence permit.

These enterprises are competitive and pay for this labour with a wage w which reflects their marginal productivity. The illegal immigrants receive a proportion $\theta < 1$ of this productivity, while the native residents who arrange their placement, share out the rest between them. The proportion of native residents who are in charge of the formal production, is $\phi < 1$ in each period. The remainder of the native residents (1- ϕ) engage the underground economy in which individual income is given by an equal share-out of the rents deducted from the illegal immigrants.

The supply of native labour to the production system over the period t is therefore ϕN_t. Thus, $m_t N_t$ represents the immigration flow, of which $Q N_t$ are legal and $(m_t - Q)N_t$ are illegal. So, the labour supply in each period is

$$L_t = (m_t + \phi) N_t. \tag{1}$$

This labour supply grows during every period for two reasons: the fertility rate (*n rate*) and the immigration rate. As we consider immigrants as native residents in the following period, that is to say:

$$L_{t+1} = (1 + m_t)(1 + n) L_t \tag{2}$$

workers emigrate looking for better worker conditions, reflected by higher salaries (we assume perfect mobility of capital and thus there is no incentive to migration on the part of capital rents). The perspective of the host country is considered by assuming that this country is small, in the sense that its influence over the rest of the world is not significant. The salary in the country of origin is therefore given and lower than that of the host country: $w_0 < w$. However, income in the host country is uncertain because immigration is limited to a set quota, which is a percentage Q of the native population.

Once this quota has been met, immigration becomes illegal and wages for this group are reduced by the proportion appropriated by the native residents. When an immigrant takes the decision to emigrate, he or she does not know if he will be legal or illegal.

Technology. A Cobb-Douglas labour-augmenting technology is considered: $Y_t = AK_t^{\alpha}(\kappa_t L_t)^{1-\alpha}$, in which A is a scale parameter and κ is an index of knowledge which, in the presence of spillovers at an aggregate level, could be considered as a function of capital (see, for example Romer, 1986 and Kemnitz, 2001). Making $\kappa_t = K_t / L_t = k_t$, where *k* denotes capital-labour ratio, and assuming a competitive labour market, the wage is arrived at from

$$w_t = (1-\alpha)Ak_t \ , \tag{3}$$

The corresponding interest rate is constant and equal to $r = \alpha A$. If the rest of the world has access to the same technology, home and foreign interest rates coincide, and thus capital rents are not relevant in migration decisions.

Preferences. Individuals share the aim of maximizing the utility function, subject to intertemporal restriction. Let c_{1t} and c_{2t+1} be the consumption of the first and second period of life respectively. The utility given is a log-linear form, with a subjective rate of intertemporal discount $\delta < 1$.

$$U = ln\, c_{1t} + \delta ln\, c_{2t+1}, \tag{4}$$

3. Short and long-term equilibrium

3.1 Short term equilibrium

Migration. As salaries are higher in the host country, the legal immigration quota will be covered throughout the period. However, uncertainty over working conditions (either legal or illegal) in the emigration decision produces migration flows which exceed the legal quota. In contrast, expected income, although lower than in the formal market, is higher than wages in the home country. Given that the probability of a potential immigrant being hired legally is *Q/m*, equalling expected income in the host country and income in the country of origin implies:

$$\frac{Q}{m} w + \left(1 - \frac{Q}{m}\right) \theta w = w_0 . \tag{5}$$

From the relative wages in each period, $\tilde{w}_t = w_t / w_0$, the above condition determines the migration rate as:

$$m_t = \frac{Q(1-\theta)}{1 - \theta \tilde{w}_t} \tilde{w}_t . \tag{6}$$

This migration rate increases with the wage differential reflecting a greater stimulus to migration. Given relative wages, the same applies to the legal immigration quota Q and the proportion of illegal workers' salaries which the natives allow them to receive θ, since the higher these parameters, the higher the expected income in the host country (in the first case because this implies a greater probability of being hired legally, and in the second because penalisation suffered by illegal workers is lower).

Underground economy. We have measured its size as the volume of work devoted to this type of economy[1]. Free mobility between legal and illegal employment determines the decision of native workers regarding the employment they offer to the formal market and the work devoted to the underground economy, so that the marginal income will become equal in equilibrium (we assume no effort is devoted to prosecution of illegal activities and thus there is no risk involved in them).

Total income from managing illegal immigration is given by the fraction $(1-\theta)$ which is taken from the wages of the illegal workers $(m-Q)N$. These wages are shared out amongst native residents devoted to this activity, $(1-\phi)N$. Therefore, equating income per unit of time in the legal and the underground economy implies:

[1] The most usual measure of the scale of illegal employment is the amount of tax evasion (see, for example, Jung et al., 1999). We have not used this measure since we have not considered taxes in our simple model. In any case, apart from the amount of labour involved, two alternative measures of the size of the underground economy could be considered: i) the number of illegal workers, and ii) the production of this sector, which could be measured by the wages paid to illegal workers. For analytical convenience, we have chosen the labour force of residents devoted to this activity. This choice has no consequences, since, as it can be deduced from the analysis below, the three measures are proportional. This would also be the case for tax evasion, if the model had been extended to allow for taxes.

$$\left(1-\frac{Q}{m_t}\right)\frac{m_t N_t}{(1-\phi)N_t}(1-\theta)w_t = w_t, \tag{7}$$

from which it is deduced that the proportion of the underground economy is a growing function of the migration rate (the higher the migration rate, the higher the income produced in the underground economy), as in the expression:

$$1-\phi = (1-\theta)(m_t - Q). \tag{8}$$

Alternatively, substituting (6), a growing relationship with relative wages is obtained:

$$1-\phi = Q(1-\theta)\frac{\tilde{w}_t - 1}{1-\theta\tilde{w}_t}. \tag{9}$$

It is borne out that the quota, the proportion of wages received by illegal workers, and relative wages, all encourage the entry of illegal immigrants and therefore encourage native residents to manage this underground economy.

Saving and investment. From the consumer side, represented by maximising utility in (4), subject to the corresponding budget restriction, it is deduced that individuals save a percentage $\delta/(1+\delta)$ of their income. Native income N_t and legal immigrants' wages $m_t N_t$ coincide with that of the market. In the case of the illegal immigrants $(m_t\text{-}Q)N_t$, income is a fraction θ of this salary. The aggregate saving at the time t is given by:

$$S_t = \frac{\delta}{1+\delta}\left[(1+Q)+\theta(m_t - Q)\right]N_t w_t. \tag{10}$$

Supposing that capital depreciates completely after its use in the production system, this saving is the capital available for the next period, $K_{t+1}=S_t$. Standardising these variables to fit the job supply, we obtain $K_{t+1}/L_t = k_{t+1}(1+m_t)(1+n) = S_t/L_t$, where (2) has been used. Substituting the expression of saving (10), wages (3) and the expressions (6) and (9), we obtain the following difference equation in capital-labour ratio:

$$k_{t+1} = B\frac{w_0 - \theta(1-\alpha)Bk_t}{w_0 + [Q(1-\theta)-\theta](1-\alpha)Bk_t}k_t, \tag{11}$$

where $B = \frac{\delta}{1+\delta}\frac{1-\alpha}{1+n}A$. This equation indicates that the rise in the supply of capital from one period to another increases with the rate of saving $\delta/(1+\delta)$ andwith wages in the country of origin (w_0), due to the fact that higher income in the country of origin is a

disincentive to emigration, and therefore decreases the labour supply. Moreover it diminishes with the rate of fertility growth of the population, with the legal immigration quota (*Q),* and with the proportion *(θ)* of the wage that illegal workers receive, since they imply a greater immigrant labour supply.

3.2 Stationary state

Stationary equilibrium is characterised by a stable value of capital per unit of effective employment, as well as production per capita and the immigration rate. From (11) the stationary value of capital per unit of effective employment can be deduced:

$$k^* = \frac{B-1}{Q(1-\theta)+\theta(B-1)} \frac{w_0}{(1-\alpha)A} \tag{12}$$

which implies long term relative wages[2]:

$$\tilde{w}^* = \frac{B-1}{Q(1-\theta)+\theta(B-1)}. \tag{13}$$

This stationary equilibrium is stable and positive, provided that the parameters verify the restriction[3] $\theta(B-1)^2/(B+1)(1-\theta) < Q < B-1$.

Once the expression (13) has been deduced, we can confirm that a change in one of the parameters must occur, in order for relative wages to increase in the long term. If

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[2] Condition $B>1$ guarantees that both relative wages and income per capita in the stationary state are positive. Moreover, for relative wages to be higher than the unit, as we have supposed from the beginning, the legal immigration quota must verify the restriction $Q < B-1$.

[3] The slope of the expression (11) indicates the way in which capital per unit of labour changes over time. In stationary equilibrium, this slope takes on the value $\left.\frac{dk_{t+1}}{dk_t}\right|_{k^*} = \frac{Q(1-\theta)-\theta(B-1)^2}{BQ(1-\theta)}$. Values of the quota which satisfy $Q > \theta(B-1)^2/(1-\theta)$ imply that the slope is positive and less than the unit, which supposes that the stationary equilibrium is locally stable. In the opposite case the slope is negative in the stationary equilibrium. It can be confirmed that if the quota verifies $\theta(B-1)^2/(B+1)(1-\theta) < Q < \theta(B-1)^2/(1-\theta)$ the slope is a module less than the unit, which maintains the result of local stability of the stationary equilibrium. Nevertheless, when $Q < \theta(B-1)/(1-\theta)$, the slope is greater than one in module, and this gives rise to local instability.

either the entry quota for legal immigration *(Q)* or the fraction of wages received by illegal workers *(θ)* drop, long run relative wages increase, due to the fact that the labour supply is lower, in response to a greater incentive for native workers to devote time to the underground economy. This is due, in the former, to a greater entry of illegal workers, and in the latter, to a greater appropriation of the rents of illegal immigrants. If, on the contrary, the rate of saving or vegetative growth increases, the long run relative wage decreases, due to lower capital-labour ratio.

Taking the salary from (13) to (6), we obtain the expression of the immigration rate in the stationary equilibrium:

$$m^* = B - 1 = \frac{\delta}{1+\delta}\frac{1-\alpha}{1+n}A - 1. \qquad (14)$$

The expression (14), in relation to (6), shows that the determining factors of the immigration rate in the short and long term are different. Only changes in productivity in the host country, its rate of vegetative growth, and its preferences (manifested in the rate of saving) affect the immigration rate in the long term.

Finally, by substituting the previous expressions in (8) or (9), the size of the submerged economy in stationary equilibrium can be deduced. This is given by[4]:

$$(1-\phi)^* = (1-\theta)(B-1-Q). \qquad (15)$$

Thus, low legal immigration quotas stimulate the underground economy by giving incentive to the illegal immigration from whose income the host country benefits. For this same reason, the underground economy is also larger, the larger the proportion of illegal workers' income which natives can appropriate themselves. Finally, changes in the parameters which increase *B* have a similar effect, due to the fact that they increase the migratory flow, and therefore increase the scale of illegal immigration due to restrictions on the legal quota.

4. Immigration policies and the underground economy

Governments in countries which are the destination of immigrants use immigration quotas as a preventive measure to avoid the excessive entry of foreign

[4] La condition $Q > B - 1 - (1-\theta)^{-1}$ guarantees that there is an internal solution in the percentage of native employment devoted to the underground economy.

workers. The above results show that matching this policy to the desired objective depends on the time horizon considered, since short-run and long-run effects appear to be different. Moreover, the choice of quota should take into considerations the possible effects on the underground economy. These effects also differ, depending on whether we adopt a short or long term perspective.

From our analysis it can be deduced that the policies which toughen ceilings on immigrants admitted to a country only have short-term effects on the migratory flows that the country receives. In the long term, a more restrictive ceiling only affects the actual make-up of migration, not its intensity. This is due to the fact that toughening the conditions for entry through cut-backs on legal quotas has two effects. Firstly, it is an immediate disincentive for immigration, by reducing the probability of finally working legally in the destination country. This reduces expected gains from emigrating. Secondly, as illegal immigration falls, the volume of saving increases, and this favours the accumulation of capital per worker which, in turn, increases salary levels. In the short term the first effect creates a cut-back in the migration rates which the later upturn in salary differentials finally offsets. At the end, the benefits from immigration have not changed but the migratory flow contains a much higher proportion of illegal workers.

It is true, however, that both native residents and immigrants who gain legal status enjoy a relatively better standard of living because they earn higher wages (compared with the rest of the world) – a conclusion also reached by Lundborg and Segerstrom (2002). Nevertheless, one must be cautious on this point, since other studies come to the opposite conclusion (for example, Berry and Soligo (1969), albeit within a static framework).

Besides changing the mechanisms which affect immigration, a policy of reducing quotas also has an effect on the scale of the underground economy. In the short term, the fall in migratory flow reduces the total income earned from the exploitation of illegal immigrants and, coupled with this, the activity of this sector. However, the progressive increase in wages and the recovery of the migratory flow with a higher percentage of illegal immigration offsets the initial effect and actually overshoots this level, so that restrictions on legal immigration in the end actually spur the underground economy.

As economic incentives have not disappeared, the legal restriction (on quotas) brings an increase in illegal employment as an undesirable consequence of this. This

result suggests the need to propose policies to crack down on the underground economy, apart from other types of immigration policies. We have modelled this sector very simply, basically using the θ parameter which sums up the relation between employers who hire illegally and their workers. Governments' attempts to eradicate illegal employment could then take the form of reducing employers' ability to appropriate workers' income (for instance by avoiding contracts with no social security, which result in a lower immediate cost for the contractor but also lower future benefits in the case of unemployment or retirement for the worker).

In accordance with the results in the previous section, clamping down on underground economy, which takes the form of reducing the ability to exploit illegal immigrants economically, brings an incentive to immigration in the short term, by increasing the expected income of immigrants in the host country. This effect is so significant that it actually increases the size of the underground economy: in spite of the fact that employers in the sector appropriate a smaller proportion of the income of illegal immigrants in this case, there are so many of these workers that the income obtained through this channel increases. Nevertheless, as in the case of quotas, the incentive to migratory flows disappears over the long term so that, at the end of the day, the size of the underground economy finally falls. Thus, an adequate combination of policies to control immigration and crack down on illegal employment will be successful in achieving these aims.

5. Conclusions

We have developed a simple model that allows us to assess the relation between immigration policies in the form of quotas, the actual composition of immigration, and the size of the underground economy. We conclude that policies geared at cutting immigration quotas have the effect of reducing migratory flows only in the short run. This effect, however, vanishes completely over time.

A tougher immigration policy has the desired effect of discouraging the underground economy in the short run. Again, however, the long-term effect is actually quite the opposite. In order, therefore, to discourage the development of the underground economy in the long run, the policy should be the contrary i.e. an increase in immigration quotas.

Although we have considered a relatively simple framework, we consider that these results go some way to understanding the relationship between illegal immigration and the underground economy: very often actually the consequence of public policies. Of course, this analysis could be extended in several ways. Possibly the most interesting approach might be a public budget perspective which considers, on the one hand, the costs associated with setting migration quotas and, on the other, the effects of migration and the underground economy on tax revenues.

References

Berry, R.A. and Soligo, R., (1969): "Some welfare aspects of international migration". *Journal of Political Economy* **77**, 778–794.

Carter, T. (1999): "Illegal immigration in an efficiency wage model". Journal of International Economics, 49 (2), 385-401

Coppel, J., Dumont, J. and Visco, I. (2001): "Trends in immigration and Economic Consequences". OECD Economic Department WP No. 284

Djajic, S. (1997): "Illegal immigration and resource allocation". International Economic Review, 38 (1) 97-117

Gaytán-Fregoso, H. and Lahiri, S. (2000): "Foreign Aid and Illegal Immigration". *Journal of Development Economics,* 63, 515-527.

Hazari, B. and Sgro, P. (2003): "The simple analytics of optimal growth with illegal immigrants". *Journal of Economic Dynamics and Control*, 28, 141-151.

Jung, Y., Snow, A. and Trandel, G. (1999): "Tax evasion and the size of the underground economy*". Journal of Public Economics,* 54 (3) 391-402

Kemnitz, A. (2001): "Endogenous growth and the gains from immigration". *Economics Letters* 72, 215-218.

Kondoh, K. (2000): "Legal Migration and Illegal Migration: the Effectiveness of Qualitative and Quantitative Restriction Policies". *Journal of International Trade and Economic Development*, 9(3), 223-241.

Lundborg, P. y Segerstrom (2002): "The growth and welfare effects of international mass migration". *Journal of International Economics*, 56 (1), 177-204

Myers, G. and Papageorgiou, Y. (2002): "Towards a Better System for Immigration Control". *Journal of Regional Science*, 42(1), 51-74.

Schneider (2001): "The size and development of the Shadow Economy and Shadow Economy labour force in 18 Asian and 21 OECD Countries: First results for the 90s". WP Asian Pacific Finance Association Conference 2001.