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# The Effect of Mode 4 Liberalization on Illegal Immigration

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## **Abstract**

This paper aims to assess the impacts of the temporary movement of workers on the illegal immigration. It uses a discrete time, forward-looking model with heterogeneous agents, in order to describe the decision made by illegal migrants from developing countries. Illegal migrants are supposed to accede only to the informal sector and are price-takers, as they have no negotiating power. Taking into account these specifications, the theoretical model is solved analytically and illustrated numerically. It demonstrates that under some conditions, the liberalization of temporary movement of workers could lead to a decrease of illegal migration.

Key words: Mode 4 liberalization, Illegal immigration.

JEL classification: F. 6002; J. 10005

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# 1. Introduction

The recent globalization episodes have led to a dramatic expansion of capital movement and trade flows. Labor seems to be the only factor of production assigned to important restrictions. Since the 1980s, many developed countries have adopted “zero immigration” as a border control policy and have implemented restrictive and complex visas systems in order to prohibit foreigners from accessing their job markets. Developing countries see these restrictions as a lost opportunity to take advantage of their relative abundance of labor in order to compensate their current account deficit. Meanwhile, they have no possibility to protest since the migration policy is considered as a part of the developed countries’ sovereignty. They cannot pursue any policy of retaliation, since this could affect their tourism industry.

Negotiations about the liberalization of Mode 4 of the General Agreement on Trade in Services (GATS)<sup>1</sup> were a turning point. Developing countries obtained a unique opportunity to discuss the developed countries’ migration policy as part of the market access negotiations and use the same type of argument used by developed countries in order to request better access to their job market.

Studies on the economic impact of liberalization of Mode 4 suggest that it could generate global gains ranging from USD 150 million to over USD 300 million per year (Walmsley and Winters (2002), Winters et Al. (2002) and Whalley (2003)). In addition, and as pointed out in World Bank (2004) and the OECD (2004), temporary migration can constitute a useful substitute to permanent migration for the hosting country. It has almost the same advantage as the permanent migration such as responding to labor shortages and easing demographic pressures, and it presents a lower cost. Temporary migrants not being concerned by social integration and making less use of social security programs.

Nevertheless, and despite the consensus about its usefulness and the fact that it is a win-win liberalization scheme, mode 4 remains the mode of supply where the fewest commitments were made at the end of the Uruguay Round (Nielson and Taglioni (2003)). The Reasons for this delay are multiple. The most important is the position of developed countries that consider mode 4 as a new gate of illegal immigration. As defined by Schiff (2004), illegal migration has two sources. The first is the illegal entry and the second is the over-staying of people that cross borders legally, but establish themselves permanently after the allowed period comes to an end. Liberalization of mode 4 may reinforce this problem as it extends access to temporary workers. Taking into account that illegal immigration is one of the main fears of the public and voters, the reluctance of developed countries of making headway on the liberalization of Mode 4 can be easily understood.

Finding arguments that put at ease the public concerns by showing that movement will

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<sup>1</sup> Mode 4 of the General Agreement on Trade in Services (GATS) concerns the temporary movement of natural persons linked to the supply of services, from one Member of the World Trade Organization (WTO) to another. The Annex on Movement of Natural Persons Supplying Services under the Agreement. Two categories of measures are covered: those affecting “service suppliers of a Member” of the GATS (i.e., self-employed suppliers who obtain their remuneration directly from customers) and those affecting the natural persons of a member who are “employed by a service supplier of a Member, in respect of the supply of a service.” The Annex also states that the GATS does not apply to measures affecting individuals seeking access to the labor market of a member country, or to measures regarding citizenship, residence, or employment on a permanent basis.

indeed be temporary and not permanent could unblock the negotiations. The literature that focuses on finding mechanisms that prevent the transformation of temporary migrants into permanent migrants is now rich. Hatcher (2003) proposed the posting of a bond as a solution to this problem. Migrants have to come back home and the term of their contracts in order to get back his bond. Schiff (2004) develop the idea of the bond mechanism that imply the guest worker employers and employees and the host country government. The paper suggests that the guest worker employer has to purchase a government bond and to post it to an agency. The agency will be able to apprehend the guest worker if he overstay and became an illegal worker and thus recuperate the bond. Amin and Mattoo (2006) proposed two mechanisms implying host and source country. The first mechanism consists on implicating the sending country on boarder control process and to compensate its effort by monetary transfer or other concession. This mechanism is the one adopted by the European Union with its south Mediterranean neighbors. The second mechanism is to link the effort of the sending country to the setting-up of guest worker program. The second option seems to be the one used between United States and Mexico. Amin and Mattoo (2006) demonstrate nevertheless that the transfer option is the first best solution.

This paper is a contribution to this literature, but does not suggest a new mechanism aimed at impeding guest workers to overstay. It aims to demonstrate that without supplementary controls, but under some realistic conditions, the liberalization of Mode 4 could be a way to deal with illegal immigration by influencing the decision of potential illegal migrants in two ways. The first one is to offer them an opportunity to increase their earnings, without migrating permanently, by participating in guest workers programs. The second by decreasing the wages in the informal sectors in the developed country, as the informal sectors are the only job opening for them. The theoretical framework of this paper is a discrete time, infinite horizon, model with endogenous illegal immigration decisions and informal job market description for the developed country. This last component of this theoretical framework seems to be not taken into account in the previous works but it has an important implication as will be demonstrated in this paper.

Section 2 presents the model and some analytical results. Section 3 offers numerical illustrations of theoretical results based on the model presented in the previous section by simulating the model using an archetypal database. The last section is dedicated to the conclusion and the main policy implication of the paper.

## 2. The model

As defined by Entorf (2000), the description of the economic context of illegal migration focuses on three basic elements: a) the income differential between the receiving and the sending countries, b) the probability of being caught, and c) the sanctions. The theoretical framework used in this paper takes into account these three elements in order to model the behavior of illegal immigrants. The model is a discrete time, infinite horizon model with heterogeneous agents. Considering a world with two countries, a home country,  $h$ , assumed to be a developing country, from where individuals may decide to migrate illegally or not, and a host country,  $f$ , a developed country, to where individuals migrate and from which



there is no immigration. If an illegal migrant succeeds, he will join the illegal job market where he will agree to work at a wage below the reservation<sup>2</sup> wage of local workers. Employers in the developed country profit from the precarious situation of illegal migrants and their lack of bargaining power by compelling them to accept wages that are far below those a native born worker would expect to receive. The migration literature considers migration decision (legal and illegal) as an investment decision (Sjaastad, 1962; Hanson and Spilimbergo, 1996). An individual decides to migrate when the expected difference between income in the new and old location is sufficient to cover moving costs. The migration decision is supposed to depend only on the differential in wages in the origin and destination countries. This hypothesis is adopted in this model in order to endogenise the decision of the illegal migrant.

## 2.1 The situation in the country of origin

The decision process of illegal migration is supposed to result from a wealth maximization program. At the beginning of his career, a prospective migrant decides to migrate or not. He will implement his decision in the next period and will not change his mind. Individuals are supposed to be heterogeneous in their perception of the risk of being controlled, arrested, expelled and deported to their home country.

### 2.1.1 Without mode 4 liberalization

The individual has the choice between two options. The first one is to stay in his home country where he will earn each year  $t$ , a salary  $w^h(t)$ . Thus, the permanent revenue  $PR_h^\lambda$  that he will get in this case is given by equation (1) and is equal to the actualized sum of wages that he will receive during his professional life.

$$PR_h^\lambda = \sum_{t=1}^{\infty} \frac{w^h(t)}{(1+\rho)^t} \quad (1)$$

Where  $\rho$  is the one period discount rate assumed to be constant over time. Wages in the home country are supposed to grow at a constant rate  $g$ . The permanent revenue can then be defined by equation (2):

$$PR_h^\lambda = \frac{w^h}{\frac{1+\rho}{1+g} - 1} \quad (2)$$

Where  $w^h$  is the wage at the beginning of the career. The alternative is to migrate clandestinely into the developed country and to work in the informal labor market where he will earn, if he succeeds, the salary in the informal sector  $w_{u_1}^f(t)$ . In this case, he incurs a fixed cost  $c$  and faces a probability  $P$  each year to be controlled and expelled. An individual of type  $\lambda$  perceives the probability to be arrested as  $\lambda P$ .  $\lambda$  is a real in the interval  $[0, \frac{1}{P}]$  describing the level of risk aversion. The lower  $\lambda$  is, the more risk loving is the individual. If arrested and expelled he returns to his country and earns  $w^h(t)$ . Taking into account all these specifications implies that the expected gain of clandestine migration  $PR_{E_1}^\lambda$  is given

<sup>2</sup> Wages that are considered low for a native worker might be very attractive to an illegal migrant when compared to those he would receive in his country of origin

by equation (3) and equals: the actualized sum of wages that he will earn abroad balanced by the probability of escaping migration control each year  $(1 - \lambda P)$ ; and the actualized sum of wages that he would receive in his home country, balanced by the probability of being controlled and each year  $(\lambda P)$  minus the cost of illegal migration  $c$ .

$$PR_{E_1}^\lambda = \sum_{t=1}^{\infty} \left[ \frac{w_{u_1}^f (1 - \lambda P)^t}{(1 + \rho)^t} + \frac{w^h (\lambda P)^t}{(1 + \rho)^t} \right] - c \quad (3)$$

Wages in the foreign country are supposed to grow at the same constant rate  $g$  as in the developing country<sup>3</sup>. Taking into account this specifications, the permanent revenue  $PR_{E_1}^\lambda$  is given by equation (4):

$$PR_{E_1}^\lambda = \frac{(1 + g)(1 - \lambda P) w_{u_1}^f}{1 + \rho - (1 + g)(1 - \lambda P)} + \frac{w^h (1 + g) \lambda P}{1 + \rho - (1 + g) \lambda P} - c \quad (4)$$

Individual  $\lambda$  decides to migrate if and only if  $PR_{E_1}^\lambda \succeq PR_h^\lambda$ . Defining  $\Phi_1(\lambda)$  as the difference between  $PR_{E_1}^\lambda$  and  $PR_h^\lambda$ , individual of type  $\lambda$  decides to migrate if and only if  $\Phi_1(\lambda)$  is positive.

**Proposition 1** *if illegal immigration exists, there exists a unique  $\lambda_1 \in [0, \frac{1}{P}]$  such that:*

$$\Phi_1(\lambda_1) = 0 \text{ and for all } \lambda < \lambda_1, \Phi_1(\lambda) > 0 \quad (5)$$

**Proof.** *derivative of  $\Phi_1$  according to  $\lambda$  is given by:*

$$\frac{\partial \Phi_1(\lambda)}{\partial \lambda} = \frac{w_{u_1}^f \frac{(1+g)P}{1+\rho}}{\left(1 - \frac{(1+g)(1-\lambda P)}{1+\rho}\right)^2} - \frac{w^h \frac{(1+g)P}{1+\rho}}{\left(1 - \frac{(1+g)\lambda P}{(1+\rho)}\right)^2}$$

Thus  $\frac{\partial \Phi_1(\lambda)}{\partial \lambda} > 0$  if and only if

$$\lambda > \lambda^* = \frac{\frac{(1+\rho)}{(1+g)} \left( \sqrt{\frac{w_{u_1}^f}{w^h}} - 1 \right) + 1}{P \left( \sqrt{\frac{w_{u_1}^f}{w^h}} + 1 \right)} \quad (6)$$

Condition (6) means that: If  $\lambda > \lambda^*$  then  $\frac{\partial \Phi_1}{\partial \lambda}(\lambda) > 0$ . Which means that  $\Phi_1$  is an increasing function on the interval  $[\lambda^*, \frac{1}{P}]$ . In addition  $\Phi_1(\frac{1}{P}) = -c < 0$ . Combining the two facts gives:

$$\text{for all } \lambda \in \left[ \lambda^*, \frac{1}{P} \right] \Phi_1(\lambda) < 0 \quad (7)$$

Now, if  $\lambda < \lambda^*$  then  $\frac{\partial \Phi_1}{\partial \lambda}(\lambda) < 0$  this means that  $\Phi_1$  is a decreasing function on the interval  $[0, \lambda^*]$ . Taking into account the fact that illegal immigration exists, this means that at least individuals having the lowest risk aversion  $\lambda = 0$  will immigrate i.e.  $\Phi_1(0) > 0$ . Combining this to the facts that  $\Phi_1(\lambda^*) < 0$ , the Intermediate Value Theorem gives:

$$\text{There exists a unique } \lambda_1 \in [0, \lambda^*] \text{ verifying:} \quad (8)$$

$$\Phi_1(\lambda_1) = 0$$

<sup>3</sup> The effect of convergence on the emigration decision is not studied.

$$\begin{aligned} & \text{for all } \lambda \in [\lambda_1 \lambda^*] \Phi_1(\lambda) < 0 \\ & \text{and for all } \lambda \in [0 \lambda_1] \Phi_1(\lambda) > 0 \end{aligned}$$

Combining results (7) and (8) prove the proposition 1 ■

Proposition (1) implies that all individuals with risk aversion lower than  $\lambda_1$  will migrate illegally. If the distribution function of  $\lambda$  is a uniform function, this implies that a fraction  $\frac{\lambda_1}{P}$  of the active population will try to leave the country illegally.

### 2.1.2 With mode 4 liberalization

In this case, the developed country offers a number of individuals from the developing country the possibility to work legally as a guest worker during a year and to go back home at the end of the contract. The number of workers accepted as part of this Mode 4 program represents a percentage  $q$  of total workers in the developing country. Individuals can apply each year to the mode 4 program.

In this case, each worker in the sending country has to choose between two options. The first one is to stay at home and to apply each year to the mode 4 program. If he is accepted he will go to the developed country for a year, where he will earn a mode 4 salary  $w_{M4}(t)$  then go back home after a while re-postulate to the next program. If he is not accepted he stays working at home and receive a salary  $w^h(t)$ <sup>4</sup> and re-postulates the year after. The difference in qualifications between individuals and learning by doing mechanisms are not taken into account in this model, thus each year, all individuals face the same probability of being accepted in a mode 4 program. This probability is then equal to the quota  $q$  allowed by the importing country. When choosing the legal career, the expectancy of gain of a developing country worker is given by equation (9) and equal to the actualized sum of mode 4 wages balanced by the probability of being integrated in a mode 4 program each year  $q$  and actualized sum of wages that he will receive in his home country abroad balanced by the probability of not being integrated in a mode 4 program each year  $(1 - q)$ .

$$PR_{M4}^\lambda = \sum_{t=1}^{\infty} \frac{w_{M4}(t)}{(1+\rho)^t} q^t + \sum_{t=1}^{\infty} \frac{w^h(t)}{(1+\rho)^t} (1-q)^t \quad (9)$$

The mode 4 wages are supposed to grow at the same constant growth rate  $g$ . The permanent revenue  $PR_{M4}^\lambda$  of a local worker who candidates every year to a mode 4 program is defined by equation (10):

$$PR_{M4}^\lambda = \frac{w_{M4}}{\frac{1+\rho}{q(1+g)} - 1} + \frac{w^h}{\frac{1+\rho}{(1-q)(1+g)} - 1} \quad (10)$$

The second possibility of career is to immigrate illegally. In this case individuals have two options. The first one is to participate in the mode 4 program and to go to the informal sector in the host country after completing the contract. But if arrested and expulsed, he is blacklisted and he can no more participate to further mode 4 program. In this case mode 4 becomes a free gate of illegal immigration. The second option is to migrate clandestinely by

<sup>4</sup> Here we suppose that quota is low and do not affect the job market in the developed country. That is why we suppose that the salary in home country do not change with mode 4 liberalization.

entering in an illegal way and paying the fixed cost  $c$ . With mode 4, the expected earnings  $PR_{E_2}^\lambda$  of an illegal immigrant is given by equation (??):

$$PR_{E_2}^\lambda = q \sum_{t=1}^{\infty} \frac{w_{u_2}^f (1 - \lambda P)^t + w^h (\lambda P)^t}{(1 + \rho)^t} + (1 - q) \left( \sum_{t=1}^{\infty} \frac{w_{u_2}^f (1 - \lambda P)^t + w^h (\lambda P)^t}{(1 + \rho)^t} - c \right) \quad (11)$$

Which after simplification gives the relationship (12):

$$PR_{E_2}^\lambda = \frac{(1 + g)(1 - \lambda P) w_{u_2}^f}{1 + \rho - (1 + g)(1 - \lambda P)} + \frac{w^h (1 + g) \lambda P}{1 + \rho - (1 + g) \lambda P} - (1 - q) c \quad (12)$$

Individual  $\lambda$  decides to migrate if and only if  $PR_{E_2}^\lambda \succeq PR_{M4}^\lambda$ . Defining  $\Phi_2(\lambda)$  as the difference between  $PR_{E_2}^\lambda$  and  $PR_{M4}^\lambda$ , individual of type  $\lambda$  decides to migrate if and only if  $\Phi_2(\lambda)$  is positive.

**Proposition 2** *If illegal immigration exists, there exists a unique  $\lambda_2 \in [0, \frac{1}{P}]$  verifying:*

$$\Phi_2(\lambda_2) = 0 \text{ and for all } \lambda < \lambda_2 \text{ then } \Phi_1(\lambda) > 0 \quad (13)$$

**Proof.** position 2 can be proved like proposition 1 if the fact that  $w_{M4} \succeq w^h$  is taken into account. ■

Proposition (2) implies that all individuals with risk aversion lower than  $\lambda_2$  will migrate illegally. If the distribution function of  $\lambda$  is uniform, this means that a fraction  $\frac{\lambda_2}{P}$  of the active population will try to migrate illegally by illegal entry or by overstaying after the participation in a guest workers program.

### 2.1.3 Effect of Mode 4 liberalization on illegal immigration on home country

Proposition (1) proved that without mode 4 liberalization all individuals who have risk aversion less than  $\lambda_1$  will try to immigrate illegally and proposition (2) proved that with mode 4 liberalization all individuals with risk aversion less than  $\lambda_2$  will try to immigrate illegally. The important question from a political point of view and the central point of this paper, is under which conditions, individuals who would immigrate with mode 4 would have immigrated without mode 4 liberalization? This question can be formulated mathematically by: under which conditions  $\lambda_2$  is lower than  $\lambda_1$ ?

**Proposition 3**  $\lambda_2 < \lambda_1$  if and only if:

$$\frac{w_{u_1}^f - w_{u_2}^f}{\frac{1+\rho}{1+g(1-\lambda P)} - 1} + q \left( \frac{w_{M4}}{\frac{1+\rho}{1+g} - q} - \frac{w^h}{\left(1 - \frac{(1+g)}{(1+\rho)}\right) \left(\frac{1+\rho}{1+g} - (1-q)\right)} - c \right) > 0 \quad (14)$$

Proposition (3) gives a sufficient and a necessary condition implying that the liberalization of mode 4 will lead to a decrease of the total number of illegal migrants (illegal entry and overstaying). The implications of this condition will be discussed in the following sections.

## 2.2 The situation in the receiving country.

Only a fixed part of developed countries employers are supposed to recruit illegal migrants. Employers take advantage from the precarious situation and low bargaining power of the undocumented workers and fix the salary and work conditions. Illegal immigrants are price takers in this model, they cannot refuse the offer nor the work conditions because in that case he will be denounced and expelled. Illegal employers can be controlled each year with a probability  $1 - P$ , in this case they are supposed to pay a penalty  $c_{emp}$ .

### 2.2.1 Without mode 4 liberalization

Without mode 4 workers illegal employers fix the salary  $w_{u1}^f$  in a manner that the expected salary paid to undocumented workers does not exceed the salary in the formal sector<sup>5</sup>.

$$w_{u1}^f (1 - P) + (w_{u1}^f + c_{emp}) P = w_f^f \quad (15)$$

Equation (15) can be reformulated as:

$$w_{u1}^f = w_f^f - c_{emp}P \quad (16)$$

### 2.2.2 With mode 4 liberalization

With guest workers programs, an illegal employer reconsider his position. The Mode 4 program offers to him a legal way to recruit cheaper workers. This situation allows him to fix the salary of illegal workers  $w_{u2}^f$  in a manner that the expected salary does not exceed the mode 4 salary.

$$w_{u2}^f P + (w_{u2}^f + c_{emp}) (1 - P) = w^{M4} \quad (17)$$

Equation (17) can be reformulated as:

$$w_{u2}^f = w^{M4} - c_{emp}P \quad (18)$$

### 2.2.3 Effect of Mode 4 liberalization on illegal immigration on foreign country

The liberalization of mode 4 is supposed not to affect the salary in the formal job market<sup>6</sup> in the host country. Combining equations (16) and (18) gives a relationship between the difference between the salary in formal sector and in mode 4 programs and the salary in the informal job market with and without job market liberalization:

$$w_{u1}^f - w_{u2}^f = w_f^f - w^{M4} \quad (19)$$

Equation (19) implies that:

$$\text{as long as } w_f^f \succeq w^{M4}, w_{u1}^f \succeq w_{u2}^f. \quad (20)$$

Relationship (20) gives the important result. If mode 4 exporters are allowed to practice wages lower than wages in the formal sectors in mode 4 importing country, the salary in

<sup>5</sup> Salary in the informal sector could be lower but do not exceed this value.

<sup>6</sup> This hypothesis is realistic if we suppose that the quota of mode 4 workers is very low and do not affect the supply of labor in the host country.

the informal sector decreases, inducing a reduction in the supply of illegal workers. If the importer country does not pay lower wages under mode 4 (imposes to the exporter not to practice a social dumping) this mechanism will not work (and the salary in the informal sectors will not change.) drop

## 2.3 The global effect of Mode 4 liberalization on illegal immigration

The analysis is based on the implicit assumption that illegal migrants respond to economic incentives. Thus using mode 4, the developed country could influence the decision of potential illegal immigrants by changing the costs and benefits from illegal migration. Mode 4 policy is totally described by the determination of two parameters

- $q$  : the percentage of developing country's workers accepted in mode 4 programs.
- $w_{M4}$  : the salary offered to the mode 4 worker in the developed country.

In the model, mode 4 liberalization can influence illegal immigration by two opposite forces:

- Increase the expected earnings of a resident worker in the developing country reducing the desire to migrate.
- Decrease the cost off illegal migration reinforcing the desire to migrate illegally (This force will push individuals to immigrate illegally).

The question is whether the developed country can find a mode 4 policy that reduces the number of illegal migrants. The complexity of the model does not allow a complete analytical resolution. Two particular cases can be studied. The first is when the level of the quota is supposed fix (and not endogenous) and the second is when the mode 4 wages is equalized to the wage in the formal sector.

### 2.3.1 If the quota $q$ is fixed

For a given quota  $q$ , combining equations (14) and (20) give sufficient conditions for a positive (meaning what exactly) impact of mode 4 on illegal immigration. Indeed as if  $w_f^f \succeq w^{M4}$  and thus  $w_{u1}^f \succeq w_{u2}^f$  it is sufficient to have  $w_{M4} \succeq w_{M4}^*$  such as:

$$w_{M4}^* = \frac{\left(1 - q \frac{(1+g)}{(1+\rho)}\right) w^h}{\left(1 - (1-q) \frac{(1+g)}{(1+\rho)}\right) \left(1 - \frac{(1+g)}{(1+\rho)}\right)} + \frac{c((1+\rho) - q(1+g))}{(1+g)} \quad (21)$$

Broadly speaking, relationship (21) demonstrates that if the salary offered by guest workers program is higher than a limit value  $w_{M4}^*$ , the liberalization of mode 4 will lead to a decrease of the number of illegal migrants. This means that if the mode 4 salaries are sufficiently high, they can persuade at least some potential illegal migrants to participate to mode 4 programs and not to over stay at the end of their contracts. Noting also that the limit value  $w_{M4}^*$  is a decreasing function of the quota  $q$  and an increasing function of the salary in the sending country and the cost of illegal migration. Thus, if the importing country aims for the decrease of the number of illegal migrants when implementing a mode 4 program it has

to offer a combination of a sufficiently high salary and quota . The offer should also take into account the level of wages in the sending country and the cost of illegal migration. The higher the value of these two parameters the higher must be the mode 4 wages.

### 2.3.2 If the salary of mode 4 worker is fixed

In this case, the mode 4 salary is supposed to be equal to the salary in the formal sector as developed countries propose it. Equation (19) gives that  $w_{u_1}^f - w_{u_2}^f = 0$ . In this case condition (14) will be verified if and only if:

$$\Psi(q) = \frac{w_f^f}{\left(\frac{1+\rho}{1+g} - q\right)} - \frac{w^h}{\left(1 - \frac{(1+g)}{(1+\rho)}\right) \left(\frac{1+\rho}{1+g} - (1-q)\right)} - c > 0 \quad (22)$$

As  $\frac{\partial \Psi(q)}{\partial q} > 0$ <sup>7</sup> two cases of figure can take place:

- If  $w_f^f > c \frac{1+\rho}{1+g} - w^h \left(\frac{1+\rho}{\rho-g}\right)^2$  and thus  $\Psi(0) > 0$ . In this condition, Mode 4 liberalization will reduce the number of illegal immigrants for any  $q > 0$ .
- If  $w_f^f > c \frac{1+\rho}{1+g} - w^h \left(\frac{1+\rho}{\rho-g}\right)^2$  and thus  $\Psi(0) > 0$ . The fact that  $\Psi(1) = \frac{w_f^f}{\left(\frac{1+\rho}{1+g}-1\right)} - \frac{w^h}{\left(\frac{1+\rho}{1+g}-1\right)} - c > 0$  as long as there are clandestine immigration, the Intermediate Value Theorem implies that there exists a unique  $q^* \in [0, 1]$  verifying that for any  $q > q^*$   $\Psi(q) > 0$ .

This means that if the quota of workers admitted in a mode 4 program is sufficiently high, mode 4 liberalization will lead to a decrease in the number of illegal immigrants.

## 3. Numerical simulations

In order to illustrate the theoretical model, a set of numerical simulations is realized in this section. This exercise is conducted using archetypal database. what is that The growth rate  $g$  is assumed to be equal to 1%. The intertemporal discount rate  $\rho$  is assumed to be equal to 9%. Wages in the sending country  $w^h$  are normalized to unity. The wage in the formal sector in the developed country  $w_f^f$  is assumed to be equal to  $2.5w^h$ . The cost of illegal migration  $c$  is supposed to be equal to one and a half times the wage in the exporting country. Which means that illegal migrants have to pay the equivalent of one year and a half of work in his born country in order to access illegally to the developed country's informal job market. The probability faced by illegal migrant to be arrested  $P$  is equal to 90%.

### 3.1 The effect of mode 4 liberalization on the number of illegal

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<sup>7</sup>  $\frac{\partial \Psi(q)}{\partial q} = \frac{w_f^f}{\left(\frac{1+\rho}{1+g} - q\right)^2} + \frac{w^h}{\left(1 - \frac{(1+g)}{(1+\rho)}\right) \left(\frac{1+\rho}{1+g} - (1-q)\right)^2} > 0$

### 3.1 The effect of mode 4 liberalization on the number of illegal migrants

The first simulation consists in varying the quota of temporal worker  $q$  allowed by the developed country and computing for each value, the proportion of population who migrate illegally. The resulting portion<sup>8</sup> is then compared to the portion of population who migrate illegally when no mode 4 program exists.

Simulations show that the portion of individuals who migrate illegally is a non-linear function of the quota. The curve representing this function presented in figure (1) have inverted U shape. Comparing the portion of illegal migrants with and without mode 4 program for each given level of quota, shows that the two curves have two intersection points  $q_1$  and  $q_2$ . Between  $q_1$  and  $q_2$  the ‘with mode 4’ curve is over the ‘without mode 4’ which means that in this case the mode 4 generates more illegal migrants. When the quota is higher than  $q_2$ , there is a quasi-free circulation of labor. The number of persons who migrate illegally becomes very low and even equal to zero. Nevertheless, this result is not an interesting one from a political point of view since the liberty of circulation of labor is far from being an admissible situation for developed countries. The interesting case from a political point of view, is the interval  $]0, q_1]$ . The quota allowed by the importing country is low but non-null and the mode 4 liberalization negatively affects the illegal immigration.

This result follows from the fact that the existence of mode 4 programs affects the decision of the potential migrants by two opposite driven forces. The first one incites workers to migrate illegally as the Mode 4 is seen as a supplementary and a free way of entry to the developed country job market. Illegal migration is created by both illegal entry and overstaying. The second force incites the workers not to migrate illegally because wages in the informal sector decreases and the fact that overstaying migrants if arrested and expelled to their home country could never participate again in further mode 4 programs. Simulations demonstrate that if the quota is relatively low but non-null, the second force will dominate. In this case allowing developing countries’ workers to enter in a temporary and a legal manner but with a clear contract that stipulates that overstaying workers will not participate again in mode 4 programs could be a useful tool to decrease illegal migration in its totality (illegal entry and overstaying). This first result is conditioned by a good management of quotas. Because if they overshoot a critical level  $q_1$ , the opposite result is obtained and mode 4 becomes a new gate of illegal migration.

The fact that, low quotas are more efficient in order to struggle against illegal migration leads to an interesting conclusion for policy makers. According to this model, developed countries should not allow their quotas to a single and little partner but should on the contrary allow little quotas to different partner, which means that multilateral liberalization of mode 4 is a more efficient policy than bilateral liberalization in order to decrease illegal migration.

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<sup>8</sup> Defined mathematically as  $\frac{\lambda^2}{P}$  as the risk aversion and is supposed to be uniformly distributed between 0 and  $P$ .



### 3.2 The effect of mode 4 wages

This section discusses the effect of wage differential between Mode 4 wages and formal sector wages on illegal migration. To do this, the ratio of mode 4 salary per formal sector salary is varied and the model computes the level of quota  $q_1$  assuring the same portion of illegal migrant with and without quota. This variable is adopted as an indicator of the efficiency of mode 4 liberalization as a policy of illegal migration struggle. The higher is the value of  $q_1$  the longer is the interval of quotas assuring the decrease of the number of illegal migrants. The computed quota is drawn as a function of the ratio of Mode 4 wage per formal wage. Figure (2) shows that as expected  $q_1$  is a decreasing function of the Mode 4 wage. This result is underpinned by the fact that the increase of the mode 4 wage will increase the informal sector wage as the two wages are linked by equation (18). Thus, in the extreme case, when equalizing the mode 4 wage and the formal wage, as it is demanded by developed countries in WTO negotiations, the informal wage will not move and the negative influence of the mode 4 on the decision of illegal migration will lose one of its two pillars.

### 3.3 The effect of initial economic conditions

According to the model, initial economic condition affects the decision of illegal immigration and this with and without mode 4 liberalization. Two variables are studied in this section. The first one is wage difference between sending and receiving countries and second is the cost of illegal immigration.

(figure3a) shows that the maximum level of quota assuring the decrease illegal migration with mode 4 implementation is an increasing function of the wage gap. This result means that the lower are the wages in the exporting country the largest is the policy space in the receiving country for quota implementation.

In addition, figure (3b) shows that the share of illegal migrants is an increasing function of the wage gap between the exporting and importing country. This points out that the incentive to migrate illegally (with or without Mode 4) is as high as the wage gap is important. But at the same time, with the implementation of mode 4, the punishment that constitutes the exclusion from guest workers programs is dissuasive. They prefer respecting their contracts and not losing the chance of being enlisted in the following program.

Combining these two results could give an interesting recommendation for migration policy. When affecting their migration quotas between two developing countries, developed country has to privilege the more developed country, as the share of illegal migrant is lower than that of the less developed one. Meanwhile, the quota attributed to the first country shall not exceed a critical value that increases the number of illegal migrants. This critical value is as low as the level of development of the exporting country is high. For this reason a low quota must be attributed to the first country and rest of the global quota can be affected to the less developed country. By this mechanism mode 4 implementation can reduce illegal migration from both countries.

The second point discussed in this section is the cost of illegal migration. The fixed cost paid by illegal migrants can vary between sending and receiving countries. As reported in

(Walker 2000) this cost can vary between 500 USD for a Moroccan immigrant who enters illegally to Spain using a car or a little boat, to 30,000 USD for a sophisticated travel package for an undocumented migrant from China to the United States. Figure (4a) shows that the highest is the cost of illegal migration the highest is the level of the maximum quota assuring the decrease of illegal migration after the implementation of mode 4 program. Figure (4b) shows in addition that the higher is the cost the lower is the portion of individuals that migrates illegally. Individuals who are accepted in a mode 4 program are less tempted by overstaying as they know that if arrested and expelled they have to pay important cost if they wish to return to the developed country. That's why a majority of them will prefer respecting the contract to not loose the possibility of earning high wages. This result implies that quota policy should privileged countries from which the cost of illegal migration is high.

Taking into account this last recommendations indicates that when affecting their migration quotas between two developing countries with relatively the same size of population, a developed country must privileged countries with higher migration cost.

### 3.4 The effect of the migration control policy

The migration policy is based on two pillars. The first one is the control policy modeled by the parameter  $P$  and the second one is the system of penalty imposed to employers who employs illegal migrant modeled by the parameter  $c_{emp}$ . To asses the effect of each one of these pillars on the effect of mode 4 liberalizations on the illegal migration, the model is simulated when varying each one of the two parameters and compute the variables  $q_1$ . Figure (5) shows that as expected, the higher is the value of the probability of potential detection, the higher is the maximum quota assuring the decrease of illegal immigration after the implementation of mode 4 program. This result means that the use of mode 4 as a tool of struggling against illegal migration is more efficient when the control policy is drastic. Figure (6) shows also that  $c_{emp}$  have the same effect. Increasing the penalties for informal employers decreases the illegal sectors wages and thus the inactivity of illegal migration. Combining the liberalization of mode 4 with a restrictive migration control policy could improve the effect of mode 4 liberalization as a measure that could strike the problem of illegal migration. Gulf states situation are an illustration of this result. Indeed, these countries are the third immigration recipient region after United States and European Union with 8.0 million of migrants in 1990. immigration is essentially based on temporary schema, permanent establishment is very rare and the naturalization is mainly impossible. According to this description, immigration policy in Gulf States looks like mode 4 imports more than an immigration phenomenon. Despite the important number of temporal migrant, the number of overstaying migrant is relatively low. For example, when the Saudi government offer to illegal migrants leave the country without punishment, more than 350,000 left Saudi Arabia, but most of them was not guest workers but persons that arrived in Saudi Arabia in order to do the pilgrimage to Mecca. This result is obtained due to a very restrictive control policy implying essentially immigrant sponsors (normally employers) that are in charge of the obtainment of work and residence permits (Iqama) for their employers and are responsible for their leaving of the country when contracts come

to an end.

## 4. Conclusion

The objective of this paper was to study the effects of mode 4 liberalization on illegal migration. This subject draws its importance from the fact that the blockage of the WTO negotiation about the liberalization of mode 4 was in large part due to developed countries fears about the increase of the number in overstaying workers and the increase in the stock of illegal migrants. The assessment was based on a theoretical model solved analytically in the second section and simulated numerically in the third section. Results confirm the fears of developed countries and demonstrate that mode 4 liberalization could in some cases increase the number of total illegal migrants but it could under some other conditions decrease this number. Developed countries authorities can influence the global effect by managing quotas addressed to their sending partner and by the condition of payment of guest workers and by their migration control policy. Low but non-null quotas can reduce the number of illegal migrants. Simulation shows also that the highest is the guest workers wage the less efficient is the use of mode 4 as a reducing illegal migration policy.

The conditions in the sending countries may also affect the results. If developed countries aims at the reduction of illegal migrants when it liberalizes mode 4, it should accord the privilege to poor and costly illegal migration countries.

This result is not just a theoretical one, some countries experiences confirmed the existence of a negative correlation between the existence of guest workers programs and the number of illegal immigrant in the country. Before giving these examples, an important point should be kept in mind, the number of illegal migrants is by definition non observable that's why all studies aiming at the quantification of the number of illegal aliens are based on proxies. A first example of the relationship between guest workers and illegal migration is the example of Saudi Arabia a country with a huge program of working force imports based on sponsoring system. As shown in this paper, the number of illegal migrant was approached by the number of persons that lived the country when the Saudi authorities allow illegal resident to leave the country without any punishment. This example shows that a very little portion of the 11 person who had left the country had entered as guest workers, the majority of these persons who enter to the country as tourist and overstay their journey.

Another interesting example reported by Anderson (2003) is the Bracero program. A program that allowed the admission of Mexican farm workers in order to be employed as seasonal contract labor in United States between 1942 and 1964. Anderson (2003) based his approximation of the evolution of the number of illegal Mexican migrants by the number of migrants apprehended by the US migration control authorities (the INS). The data shows that during the Bracero program the number have decreased notably. According to this paper, apprehensions fell from 885,587 in 1953 to lower than 45,336 in 1959 and the number of illegal migrant increased at the end of the program in 1964.

The model do not take into account the economic convergence mechanism nor the learning by doing mechanism that can both decrease the number of the overstaying guest workers

and thus enforce the argumentation about the positive effect of mode 4 liberalization on the illegal migration struggle.

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## 6. Figures

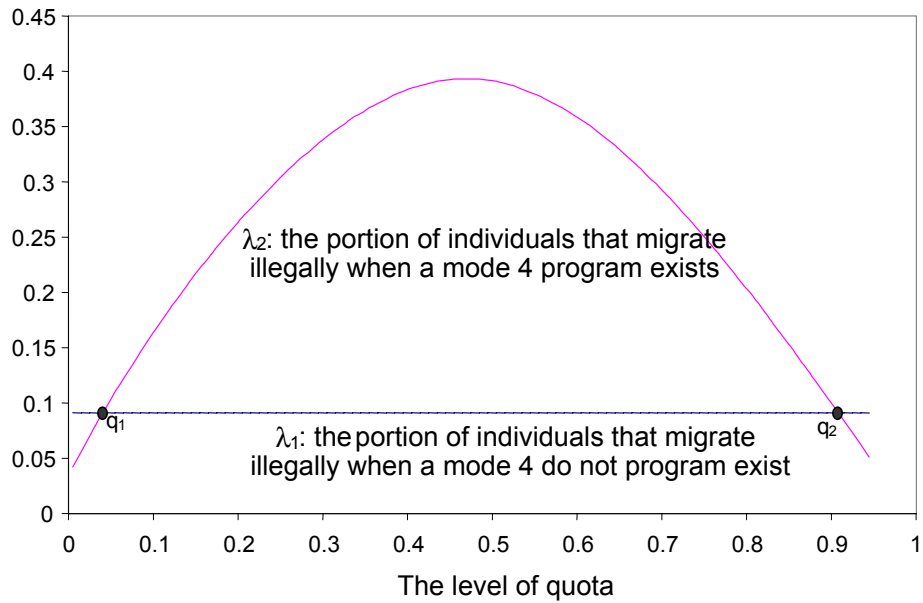


Figure 1: The impacts of mode 4 quota on the share on illegal migrant in the sending country.

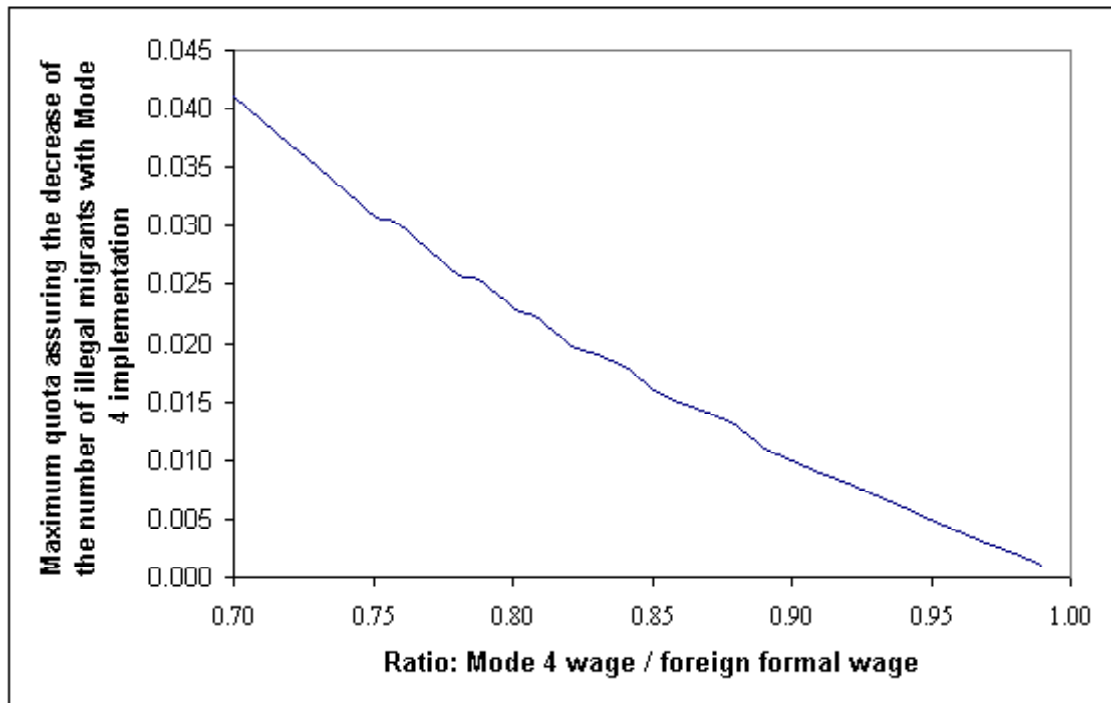


Figure 2: The effect of mode 4 wage's on the maximum quota assuring the decrease of illegal migration.

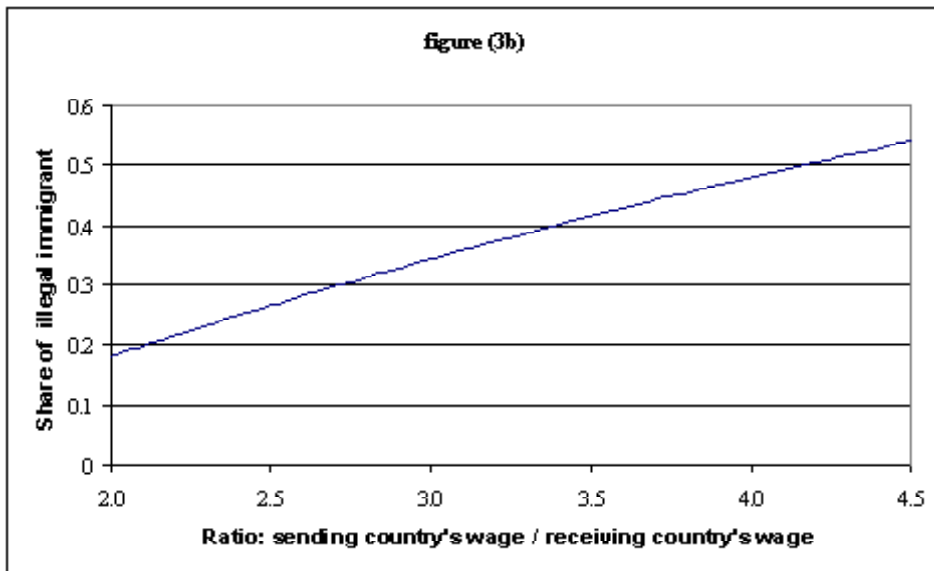
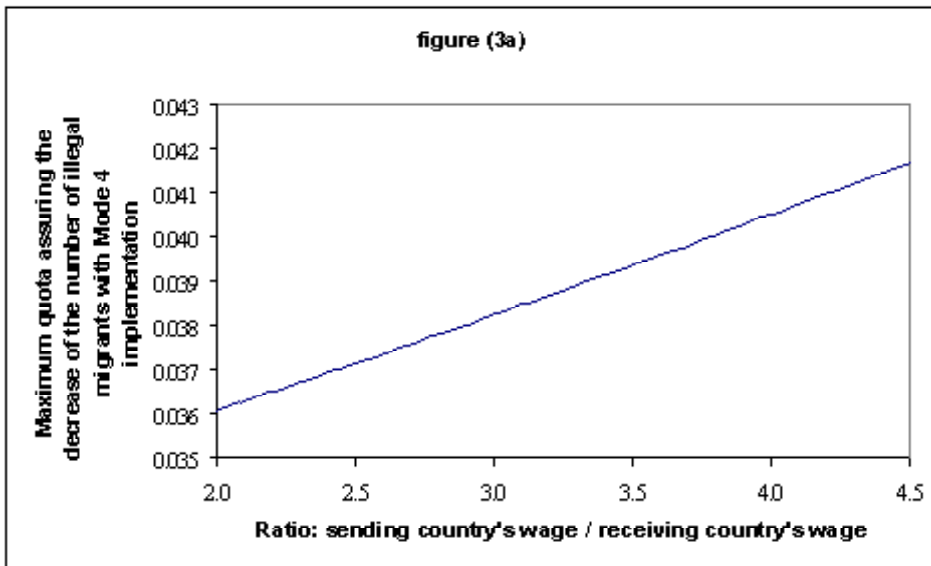


Figure 3: The effect of wages gap between sending and receiving countries on mode 4 impacts on illegal migration.

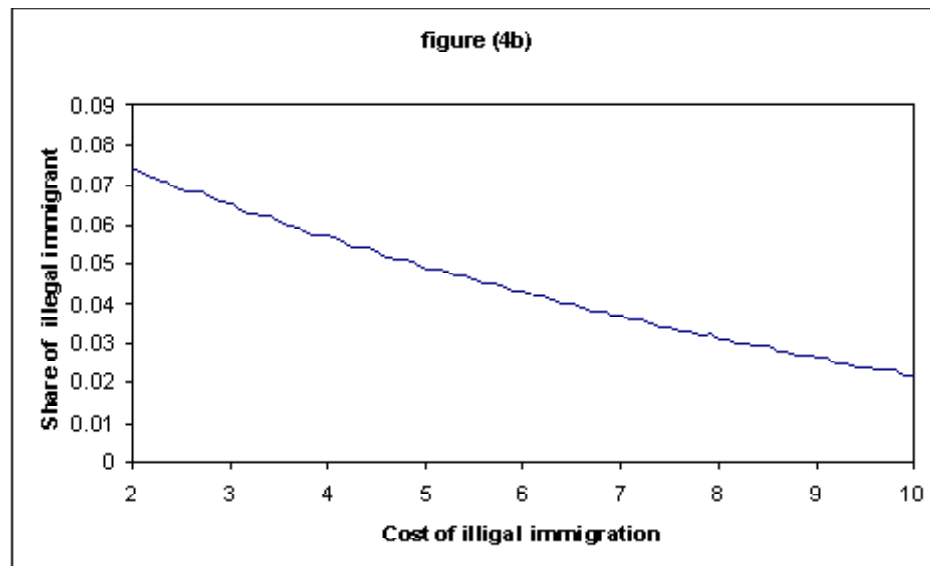
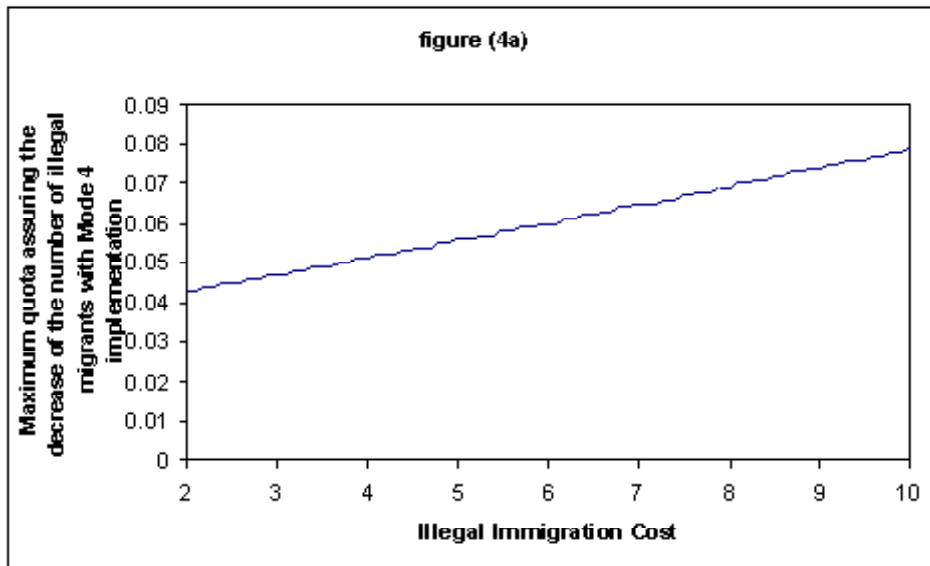


Figure 4: The effect of illegal migration cost on mode 4 effects on mode 4 impacts on illegal migration.



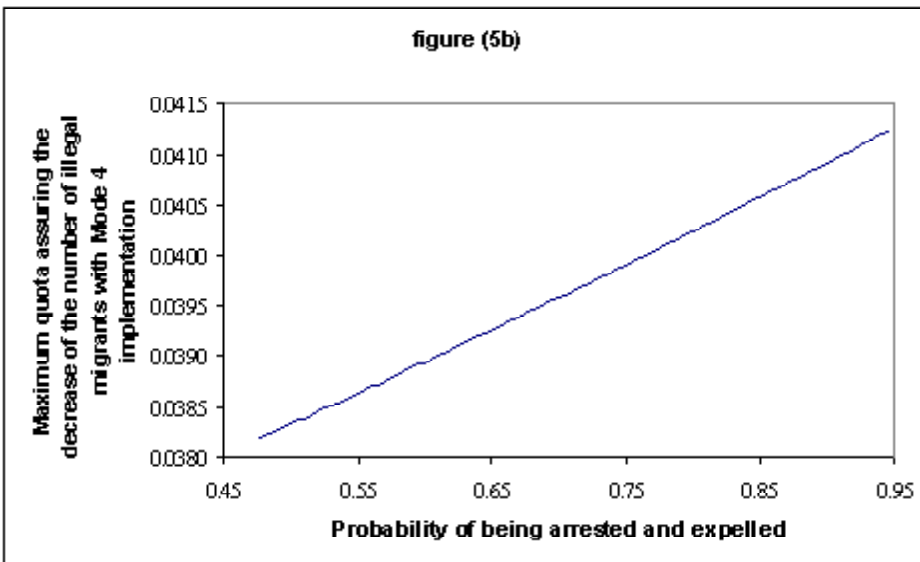
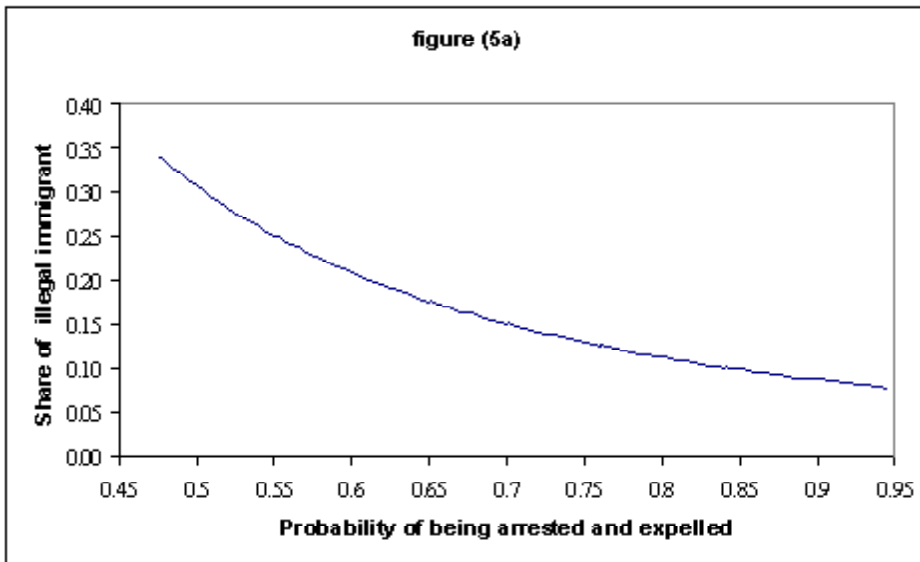


Figure 5: The effect of receiving country's control policy on mode 4 impacts on illegal migration.

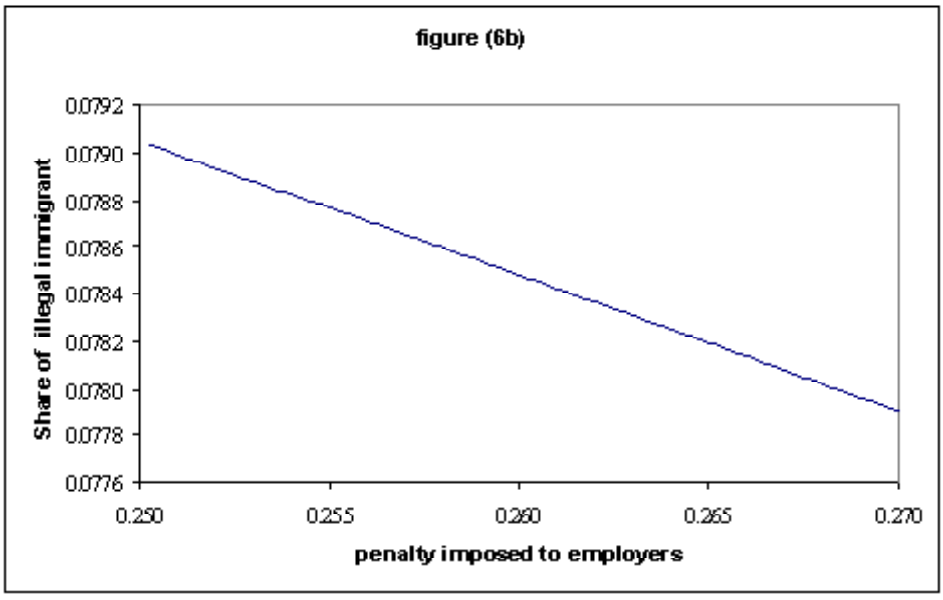
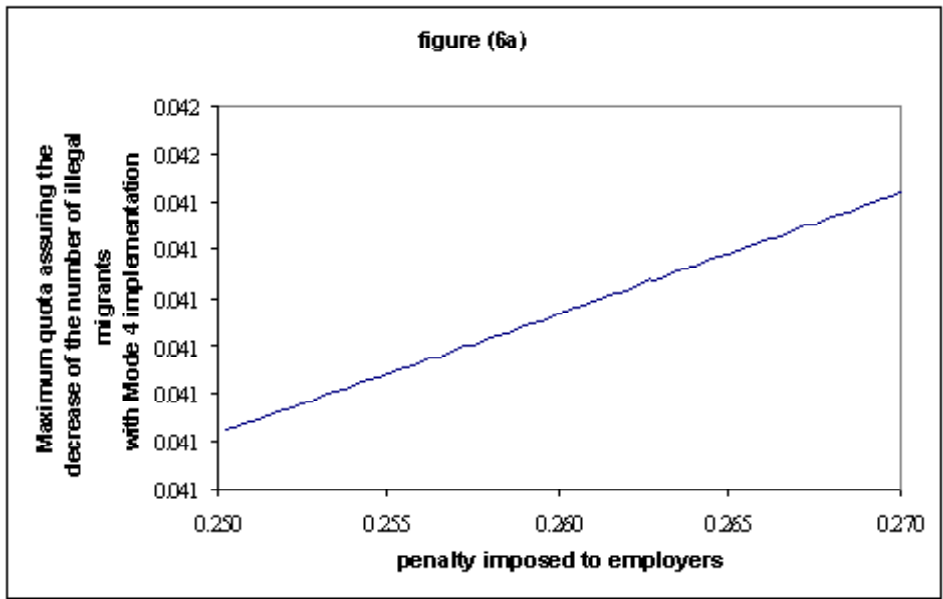


Figure 6: The effect of the level of the penalty imposed to illegal migrant employers on mode 4 impacts on illegal migration.

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