Après nous le Déluge: Fertility and the Intensity of Struggle against Immigration[**]

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Abstract

This paper is inspired by a puzzling empirical fact that despite the importance of controlling migration for their future, the host countries allocate very limited amounts of resources to the struggle against illegal immigration. The present model analyzes this issue in the context of low fertility in the host countries and suggests a novel channel though which the intensity of the struggle against immigration can be related to fertility. The analysis shows that for childless individuals, who have no reason to care about the future, it is optimal to contribute less to the costly immigration-prevention measures.

Keywords: immigration, border enforcing, low fertility

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1. Introduction

This paper is inspired by a puzzling empirical fact that despite the importance of controlling migration for their future, the host countries allocate very limited amounts of resources to the struggle against illegal immigration. To provide a partial explanation, the present model analyzes this issue in the context of low fertility in the host countries and suggests a novel channel though which the intensity of the struggle against immigration can be related to fertility. The analysis shows that for childless individuals, who have no reason to care about the future, it is optimal to contribute less to the costly immigration-prevention measures.

Pioneered by Ethier (1986), several researchers suggest the external border protection, internal enforcement and deportation as an appropriate strategy to reduce illegal immigration.[1] However, in practice, the amounts of resources devoted to such costly measures are relatively minor. Thus, for example, as Garcia (2006) points out, despite the importance of the enforcement of the border for the prevention of illegal entrance, the budget of the US Border Patrol was only 1.7 billion US$ in 1998.[2]

The purpose of the present work is to contribute to a better understanding of the puzzle: Why, despite the importance of immigration control for their future, the amounts of resources allocated to immigration-prevention measures are so low? As a partial answer, this work refers to low levels of fertility in the host countries, which may be associated with a reduction of care about the future among childless individuals. The basic idea may be stated as follows. Consider an economy populated with two types of native agents: parents and childless. Natives of both types care about their private consumption and about the number of illegal immigrants arriving at their country. If, for some reason, illegal immigration has a negative effect on natives' expected utility, this provides an incentive for allocating resources to the costly immigration-prevention measures. Suppose also that parents perceive that the offspring of immigrants, who enter the country in their generation, will negatively affect the utility of their children. In contrast, childless individuals do not care about the future. For this reason, childless agents neglect the future effect of the offspring of the immigrants and, as a result, their optimal contribution to immigration-prevention

[1] Others have advocated transfers of resources to the source countries in order to reduce immigration pressure (see, e.g., Dula et al. 2006 and references therein).

[2] Although the budgets allocated to the US border and domestic control have recently increased in response to immigration pressure, they are still far lower than, for example, the total flows of the US foreign aid.

measures is lower that that of agents who have children. Moreover, if childless individuals behave strategically and take into account the others' contributions, when they decide on the amount of their own contribution, they will further reduce the size of their contribution.

Of course, this mechanism alone can not explain the puzzle of low intensity of the struggle against illegal immigration. Thus, for instance, the pro-immigration pressure of employers who eager to reduce the cost of labor at the expense of the local workers or an involvement of the forces from the underground economy provide more powerful explanations.[3] But the current argument can serve in conjunction with the other explanations and thereby it improves our understanding of this important issue.

In this model, the only difference between individuals arises from different weights given to the offspring in the adult's utility function. If this weight is below a certain threshold, for an adult agent it is optimal to remain childless. Otherwise, it is optimal to become a parent. In the model, each parent is assumed to give birth to one child. This assumption is an approximation to the situation in Europe, where native families with more than one child per parent are rare and in most countries the total fertility rate is far below two children per woman.[4]

The present work borrows several elements from Garcia (2006), who uses a two-party electoral competition model to show that if the anti-immigration policy is a central issue in elections, an ideological rather than a pure opportunistic behavior gives parties an advantage to win the election. In contrast to Garcia, I abstract from any role of the formal government and add an intergenerational context, which is the central point of this study.

In Garcia (2006), who provides a line of references in support of this assumption, the negative effect of immigration on native agents' expected utility is assumed to be induced by natives' perception that immigration gives rise to delinquency and social insecurity. More generally, Epstein and Nitzan (2006) argue

[3] An analysis of pro-immigration lobbying efforts of capital owners along with further references can be found, for example, in Epstein and Nitzan (2006). Epstein et al. (1999) argue that if foreign workers do not wish to return home, any guest-worker program, even though its intention is a temporary stay, will inevitably create a population of illegal immigrants.

[4] The assumption of an exogenously determined fertility differential between agents of different types that has been employed here is not crucial for this paper's results. Any model with endogenous fertility will also generate a stronger effect of immigration on more fertile parents and, as a result, their optimal contribution to immigration-prevention measures will be higher. Some references to the large recent literature that employs endogenous fertility can be found, for example, in Azarnert (2008, 2009a). Cigno (2006) provides a renegotiation-proof constitutional theory of the family.

that the utility of the local population may be negatively related to the number of migrants as a result of the desire not to interact with different cultures, the effect of the finance of public goods, as well as welfare and distributional effects that adversely affect the local population. The findings of the large recent literature on the determining of the attitudes of natives toward immigrants, such as Bauer et al. (2000), Gang et al. (2002), Dustmann and Preston (2006, 2007), among others, also indicate that this negative effect can result from a fiscal burden of immigration, labor market considerations, welfare considerations and racial attitudes.[5] Each of these reasons can play an important role in the determining negative effect of immigration on local population, and this paper is about the consequences, not about reasons.

The assumption that the effect of immigration on the utility of the local population increases with the number of immigrants is consistent with the findings of the recent empirical studies, such as, for example, Dustmann and Preston (2001), Gang et al. (2002), that demonstrate that increasing concentration of ethnic minorities in local neighborhoods leads to more hostile attitudes toward minorities among locals.

2. The Model

Consider an economy populated with two types of native agents: type-*NC* agents are childless and type-*CH* agents are parents who give birth to one child per parent. Suppose that the decision to remain childless follows from a low weight given to the offspring in the utility of the *NC*-type individuals relative to the cost of childbearing. Suppose that initially immigrants are absent and at the start the country is populated with the local population only.

The analysis abstracts from the utility of illegal immigrants and their offspring and concentrates on the host country's native population only.

2.1. Individuals

Natives of both types care about their private consumption and about the number of illegal immigrants arriving at the country (I). Assume that for some reason illegal immigration has a negative effect on the native agents' expected utility. This effect

[5] Further references along with a model that analyzes a negative effect of redistribution in favor of minorities on the incentives to invest in human capital among locals can be found in Azarnert (2009b).

may be induced, for instance, by the natives' perception that immigration gives rise to delinquency and social insecurity, the desire not to interact with different cultures, the effect of the finance of public goods, as well as welfare and distributional effects that adversely affect the local population. Suppose also that *CH*-type agents perceive that for the same reasons the offspring of immigrants, who enter the country in their generation, will negatively affect the utility of their children. The type-*CH* agents bear the costs of rearing their children, measured in terms of work time forgone, at δ per child, and care about the future well-being of their offspring. In contrast, the childless *NC*-type agents do not care about the future.

Preferences of native individuals are represented by the following utility function:[6]

$$U_t = C_t - \beta I_t + \gamma(W_{t+1} - \beta_2(nI_t)), \tag{1}$$

where C_t is the consumption level of an adult individual in period t, I_t is the amount of immigrants living in the country in period t,[7] β is a parameter that measures the impact of immigration on the utility of a native individual, γ captures the relative weight given to the child in the utility function of an adult individual, W_{t+1} is the total future income of an individual's child, n is the reproduction rate among immigrants, and β_2 measures a perceived impact of the offspring of the period-t immigrants on the offspring of natives.

Suppose that the relative weight given to the child in the individual's utility function is distributed over $[\gamma^{\min}, \gamma^{\max}]$. Therefore, if γ is low enough, an individual decides to remain childless. Suppose that there is a threshold $\hat{\gamma}$, such that as long as $\gamma < \hat{\gamma}$, an individual decides to remain childless, while if $\gamma \geq \hat{\gamma}$, an individual decides to become a parent. Further discussion is relegated to Section 2.4.

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[6] This particular form of the utility function is inspired by the one formulated by Garcia (2006) as: $U_i(c_i I) = C_i - \beta_i I$, where i denotes skilled or unskilled native workers.

Because children in turn will concern about their children's utility, a more general Barro-type utility function requires that the utility of parents should be represented by an infinite sum of utilities over different generations. However, because such utility function complicates the analysis without altering the qualitative nature of the results, in recent growth literature with endogenous fertility it became common to limit parental care to their own children only (see, e.g., references in Azarnert 2006, 2008, 2009a). In the context of the present model, parental care about the future generations will only increase the incentive for *CH*-type individuals to devote resources to the anti-immigration measures, relative to the *NC*-type individuals, thus strengthening the major message of the present paper.

[7] If in period t the size of the native population is normalized to one, I_t measures the fraction of population of immigrants to the native population.

Therefore, given the threshold $\hat{\gamma}$, preferences of native individuals of each type are represented as:

$$U_t^j = \begin{cases} C_t^j - \beta I_t, & \text{if } \ j = NC, \\ C_t^j - \beta I_t + \gamma(W_{t+1} - \beta_2(nI_t)), & \text{if } \ j = CH. \end{cases} \tag{1'}$$

Native workers receive an income or salary (W_t), which, after paying contributions, is devoted fully to consumption in the case of *NC*-type individuals and is allocated between consumption and childbearing in the case of *CH*-type individuals. Hence, native workers' budget constraints are:

$$C_t^j = \begin{cases} (1-t_t^j)W_t, & \text{if } \ j = NC, \\ (1-t_t^j)(1-\delta)W_t, & \text{if } \ j = CH, \end{cases} \tag{2}$$

where t_t^j is the fraction of personal income contributed by a *j*-type individual to immigration prevention. The amount of contribution can not be negative. We assume that there are no other taxes in the economy and that the wage (W_t) is the same across individuals and is exogenously determined.

2.2. Illegal Immigration

Suppose that the amount of illegal immigration that enters the country positively depends on the amount of potential immigration which is willing to reach the country, and it also negatively depends on the amount of resources devoted to immigration-prevention measures, such as, for example, border protection and deportation. In order to capture this idea, assume that

$$I_t = N_t / T_t^{\alpha}, \qquad \alpha > 0, \tag{3}$$

where N_t is the potential mass of immigration that wants to enter the country in period t, T_t is the total amount of resources collected and allocated to immigration-prevention measures, and α is a parameter that measures the efficacy of such measures.

This particular function implies that the number of illegal immigrants that enter the country decreases with the amount of resources allocated to immigration-prevention measures ($I_T' < 0$) with the decreasing returns to scale ($I_T'' > 0$), and it

increases with the number of potential immigrants ($I'_N > 0$), given $I''_{TN} < 0$. For technical tractability, suppose that $T_t > 0$ and $T_t^{\alpha} > 1$.

2.3. Optimization

Suppose first that native agents of each type behave non-strategically and maximize their own utility function, as specified in Eq. (1′), without taking into account the behavior of their counterparts from the other group. In such a case, given the budget constraints (Eq. 2), for a given amount of potential immigration, as specified in Eq. (3), the indirect utility function of each type of individuals is:

$$U_t^j = \begin{cases} W_t(1-t_t^j) - \beta(T_t^j)^{-\alpha} N_t, & \text{if } j = NC, \\ W_t(1-t_t^j)(1-\delta) - \beta(T_t^j)^{-\alpha} N_t + \gamma(W_{t+1} - \beta_2 n N_t (T_t^j)^{-\alpha}), & \text{if } j = CH, \end{cases} \quad (4)$$

where $T_t^j = t_t^j W_t$.

Optimization with respect to the level of contribution (t_t^j) yields that

$$t_t^j = \begin{cases} (\alpha\beta N_t)^{\frac{1}{1+\alpha}} (W_t)^{-1}, & \text{if } j = NC, \\ (\alpha(\beta + \gamma\beta_2 n)(1-\delta)^{-1} N_t)^{\frac{1}{1+\alpha}} (W_t)^{-1}, & \text{if } j = CH, \end{cases} \quad (5)$$

and, as a result, the amount of illegal immigration that enters the country is:

$$I_t^j = \begin{cases} (\alpha\beta)^{-\frac{\alpha}{1+\alpha}} (N_t)^{\frac{1}{1+\alpha}}, & \text{if } j = NC, \\ (\alpha(\beta + \gamma\beta_2 n)(1-\delta)^{-1})^{-\frac{\alpha}{1+\alpha}} (N_t)^{\frac{1}{1+\alpha}}, & \text{if } j = CH. \end{cases} \quad (6)$$

Equation (5) also demonstrates that the optimal contribution of a *CH*-type individual is higher than that of a *NC*-type individual ($W_t t_t^{CH} > W_t t_t^{NC}$).

2.4. Society as a Whole

Suppose that the fraction of *NC*-type native agents with γ below the threshold $\hat{\gamma}$ ($\gamma \in [\gamma^{\min}, \hat{\gamma})$) is S. Then, the fraction of *CH*-type native agents with γ above the threshold $\hat{\gamma}$ ($\gamma \in [\hat{\gamma}, \gamma^{\max}]$) is $1-S$. Suppose also that the fraction of childless individuals of *NC*-type is not too high. If individuals of both types contribute in accordance with their own optimal level of t, the total amount of resources collected and allocated to immigration prevention measures is:

$$T_t = [S(\alpha\beta N_t)^{\frac{1}{1+\alpha}} + (1-S)(\alpha(\beta+\gamma\beta_2 n)(1-\delta)^{-1}N_t)^{\frac{1}{1+\alpha}}](W_t)^{-1} \quad (7)$$

and the total amount of immigration is:

$$I_t = [S(\alpha\beta)^{\frac{1}{1+\alpha}} + (1-S)(\alpha(\beta+\gamma\beta_2 n)(1-\delta)^{-1})^{\frac{1}{1+\alpha}}]^{-\alpha}(N_t)^{\frac{1}{1+\alpha}}. \quad (8)$$

Equations (7) and (8) yield the following proposition:

Proposition 1: An increase in the fraction of NC-type individuals (S) is associated with a decrease in the total amount of resources allocated to immigration prevention measures ($T_s' < 0$) and an increase in the total amount of immigration ($I_s' > 0$).

Proceed now to the individuals' utility. Substituting the optimal contribution of each type of individuals, as given in Eq. (5), and the total amount of immigration (Eq. 8) into Eq. (4), the utility levels are, respectively:

$$\begin{aligned} U_t^{NC} &= (1-(\alpha\beta N_t)^{\frac{1}{1+\alpha}})W_t \\ &\quad -\beta(S(\alpha\beta)^{\frac{1}{1+\alpha}} + (1-S)(\alpha(\beta+\gamma\beta_2 n)(1-\delta)^{-1})^{\frac{1}{1+\alpha}})^{-\alpha}(N_t)^{\frac{1}{1+\alpha}} \end{aligned} \quad (9)$$

and

$$\begin{aligned} U_t^{CH} &= (1-(\alpha(\beta+\gamma\beta_2 n)(1-\delta)^{-1}N_t)^{\frac{1}{1+\alpha}})(1-\delta)W_t + \gamma W_{t+1} \\ &\quad -(\beta+\gamma\beta_2 n)(S(\alpha\beta)^{\frac{1}{1+\alpha}} + (1-S)(\alpha(\beta+\gamma\beta_2 n)(1-\delta)^{-1})^{\frac{1}{1+\alpha}})^{-\alpha}(N_t)^{\frac{1}{1+\alpha}}. \end{aligned} \quad (10)$$

Equations (9) and (10) yield the following proposition:

Proposition 2: An increase in the fraction of NC-type individuals (S) is associated with a decline in the utility level of both types of individuals ($U_s' < 0$).

The intuition behind this result is straightforward. An increase in S implies that the fraction of individuals who optimally contribute more to immigration-prevention measures decreases. As a consequence, for any optimal level of contribution of both types of individuals, the resulting amount of immigration increases, which in turn decreases utility of all native individuals.

Equation (9) also imply that the utility of *NC*-type individuals is positively related to the magnitude of the perceived effect of immigration on the offspring of *CH*-type individuals (β_2), as well as to the relative weight given to the offspring in their utility function (γ).

The current formulation also allows us to compute the 'over-utility' of *NC*-type individuals and the 'under-utility' of *CH*-type individuals relative to the basic case

when the amount of immigration is determined by the contributions of individuals of one type only. Subtracting the potential utility, as specified in Eq. (4), given the rate of contribution (Eq. 5) and the potential amount of immigration as given in Eq. (6), from the corresponding utility levels when both types contribute in accordance with their share in population (Eqs. 9 and 10), the 'over-utility' of the *NC*-type is:

$$\begin{aligned} {}_{\Delta}U_t^{NC} &= \beta[(\alpha\beta)^{-\frac{\alpha}{1+\alpha}} \\ &- (S(\alpha\beta)^{\frac{1}{1+\alpha}} + (1-S)(\alpha(\beta+\gamma\beta_2 n)(1-\delta)^{-1})^{\frac{1}{1+\alpha}})^{-\alpha}](N_t)^{\frac{1}{1+\alpha}}, \end{aligned} \tag{11}$$

whereas the 'under-utility' of the *CH*-type is:

$$\begin{aligned} {}_{\Delta}U_t^{CH} &= ((\beta+\gamma\beta_2 n)[\alpha(\beta+\gamma\beta_2 n)(1-\delta)^{-1})^{-\frac{\alpha}{1+\alpha}} \\ &- ((S\alpha\beta)^{\frac{1}{1+\alpha}} + (1-S)(\alpha(\beta+\gamma\beta_2 n)(1-\delta)^{-1})^{\frac{1}{1+\alpha}})^{-\alpha}](N_t)^{\frac{1}{1+\alpha}}. \end{aligned} \tag{12}$$

Suppose now that individuals behave strategically and take into consideration the others' contributions, when they decide on the amount of their own contribution. In this case, an intuition says that the *CH*-type individuals will slightly increase their contribution in order to offset the lower amount of the *NC*-type's contribution, whereas the *NC*-type will further reduce the size of their contribution.

To check this intuition, consider the extreme case, when the *NC*-type individuals reduce the size of their contribution to zero.[8] In this case, when $t_t^{NC} = 0$ and the total amount of contributed resources is $(1-S)t_t^{CH}W_t$, a re-optimization of *CH*-type yields:

$$t_t^{CH} = (\alpha(\beta+\gamma\beta_2 n)(1-\delta)^{-1})^{\frac{1}{1+\alpha}}(1-S)^{-\frac{\alpha}{1+\alpha}}(W_t)^{-1}N_t^{\frac{1}{1+\alpha}}. \tag{13}$$

Hence

$$T_t = [\alpha(\beta+\gamma\beta_2 n)(1-\delta)^{-1}(1-S)]^{\frac{1}{1+\alpha}}N_t^{\frac{1}{1+\alpha}} \tag{14}$$

and

$$I_t = [\alpha(\beta+\gamma\beta_2 n)(1-\delta)^{-1}(1-S)]^{-\frac{\alpha}{1+\alpha}}N_t^{\frac{1}{1+\alpha}}. \tag{15}$$

Obviously, such behavior will increase both the 'over-utility' of the *NC*-type agents and the 'under-utility' of the *CH*-type agents. Note also that, although in Eq. (13) $t_s' > 0,$ here as previously, $T_s' < 0$, $I_s' > 0$ and, as a result, for both types $U_s' < 0$.

[8] Such behavior of *NC*-type is optimal if their fraction in population is low enough and the amount of contribution of *CH*-type is high enough.

The current formulation also allows us to shed some light on the effect of immigration on the decision of natives to become parents or remain childless. Suppose for a moment that the optimal contributions of each type of individuals and the amount of immigration are given. Now comparing the level of utility of parents and the level of utility of childless individual, as specified in Eq. (1′), for given t^{CH}, t^{NC} and I_t,

$$\hat{\gamma} = \frac{(t^{CH} - t^{NC} + \delta(1 - t^{CH}))W_t}{W_{t+1} - \beta_2 n I_t}. \tag{16}$$

From Eq. (16), it is immediately clear that a higher amount of immigration (I_t), as well as a higher reproduction rate among immigrants (n), increase the threshold level $\hat{\gamma}$, below which native individuals decide to remain childless.

3. Implications and Policy Recommendations

The present framework allows us to formulate several suggestions regarding public policies that can have an immediate effect on the level of illegal immigration and the utility of native agents.

1. The model shows that the 'over-utility' of *NC*-type agents results from a relatively high contribution of *CH*-type agents, whose utility is in turn negatively affected by the presence of their *NC*-type counterparts who optimally contribute less, but, at the same time, enjoy from the higher contribution of the *CH*-type agents. In a sense, this generates a kind of "exploitation" of *CH*-type agents by the *NC*-type agents. As a consequence, some taxation of *NC*-type individuals, for example, limited by the amount of their 'over-utility', with the subsequent allocation of the proceeds to immigration-prevention measures, can be suggested. It will reduce both the *NC*-type's 'over-utility' and the *CH*-type's 'under-utility' thereby generating a more just outcome.

In addition, as demographers frequently observe, the ex-ante expected fertility, as perceived by young adults, is often lower than their actual ex-post fertility. Therefore, such taxation may be to the benefit of young childless individuals, who ex-ante behave as *NC*-type agents, but at a later stage of their life will, probably, change their minds and decide in favor of giving birth.

2. The model predicts that an increase in the attractiveness of having children, as captured by the relative weight given to a child in the utility function (γ), will

increase the optimal size of the contribution of *CH*-type individuals. Moreover, if the decision to remain childless is driven by the low γ relative to the cost childrearing in the utility of the *NC*-type, as has been assumed here, an increase in γ will also lower the fraction of *NC*-type agents (S) in the society. As a consequence, any public policy that focuses on an increase in the attractiveness of having children among the locals will contribute to an increase in the total amount of contributed resources (T_i) and then will lead to a reduction in immigration. In addition, if the fraction of *NC*-type agents in society will decrease, as stated in Proposition 2, this will lead to an increase in the utility level of both types of agents. In contrast, any pro-immigration special interest group has a clear reason to advocate an attractiveness of childlessness among the local population, which, in turn, as the model predicts, decreases the intensity of opposition to immigration.

3. The model implies that a higher rate of reproduction among immigrants, which is captured here by n, lowers the *CH*-type natives' utility through their perception that the offspring of current immigrants will have an impact on their own children. This result may partly explain why the attitudes of local individuals are generally more negative toward immigrants from the Muslim countries and black Africa who are more likely to produce more children. It also appeals for a reassessment of current policies that lower the costs of having children for immigrants, especially for those whose reproduction rates are currently higher than that of natives.

4. Conclusion

This paper contributes to a better understanding of the puzzling empirical fact that despite the importance of immigration control for their future, the host countries allocate very limited amounts of resources to the struggle against illegal immigration. To provide a partial explanation, the present model analyzes this issue in the context of low fertility in the host countries and suggests a novel channel though which the intensity of the struggle against immigration can be related to fertility. The analysis shows that for childless individuals, who have no reason to care about the future, it is optimal to contribute less to the costly immigration-prevention measures. This argument can serve in conjunction with the other explanations and thereby it enriches

the discussion over migration policy, which is becoming a very important issue in the developed world.

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