Time-consistent immigration policy under economic and cultural externalities

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Abstract

Discussions of immigration policy are typically framed in the context of their economic effects in receiving countries, notably labor market and fiscal effects. In this paper we characterize immigration policy in a richer model where migrants are also a source of cultural externalities stemming from either preferences or the functioning of formal and informal institutions in receiving countries. While in terms of pure economic effects immigrants do not generally have any more incentives than low-skilled natives to allow for more immigration in the future, this is not the case when accounting for cultural externalities. Therefore, insofar as past immigrants have a voice in affecting future policies, a time-consistent immigration policy entails back-loading, as natives attempt at limiting voice of immigrants in the future, the economic effects of immigration flows as well as the cultural externality they introduce. Furthermore, natives exploit any precommitment device to limit immigration flows, e.g., building "walls", limiting immigrants' political rights, or accumulating fiscal surpluses.

JEL codes: E61; F22; J61; Z1.

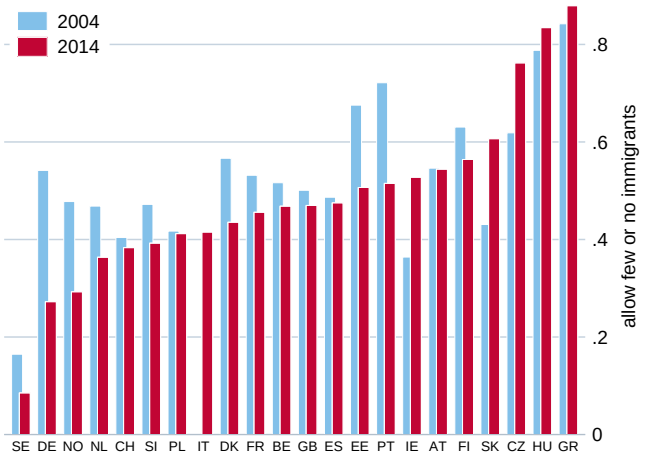
Keywords: immigration policy; culture; time inconsistency.

Few countries have had consistent immigration policies over long periods of time. Japan, however, is one that has: it has consistently kept immigrants out throughout its history. (Sowell, 1996, p. 44)

1 Introduction

Surveys of European voters' attitudes towards immigration reveal large potential support for restrictive immigration policies, with sizable heterogeneity across countries and over time. Figure 1 illustrates these attitudes using data from the European Social Survey (ESS). Native individuals are asked to what extent they believe that their government should allow immigrants to come and live in the country. The fraction of respondents who answered "few" or "none" can be taken as a rough indicator of the potential support for restrictive immigration policies. The Figure displays this fraction in 2004 and in 2014, for 22 countries[1]. The population-weighted average was 51.1% in 2004 and 43.9% in 2014. Countries such as Sweden and Germany appear more open, and progressively more so over the past decade, with only 8.5% and 27.2% of respondents in the 2014 wave wanting few or no immigrants, respectively. At the opposite side of the spectrum, in Hungary and Greece the fraction favoring a restrictive immigration policy has increased, and in 2014 it was as large as 83.4% and 87.9%, respectively.

Figure 1: Share favoring restrictive immigration policies in Europe



Notes: The figure shows, for 22 European countries, the fraction of respondents in the 2004 and 2014 waves of the European Social Survey (ESS) who stated that their country should allow "few" or "none" immigrants to come and live there, as opposed to "some" or "many". Sampling weights are applied. For Greece, Italy, and Slovakia, this information is not available in the 2014 wave of the ESS, and it is replaced by the most recently available data (2010 for Greece, 2012 for Italy and Slovakia).

[1]For Greece, Italy, and Slovakia, this information is not available in the 2014 wave of the ESS, and it is replaced by the most recently available data: 2010 for Greece and 2012 for Italy and Slovakia. For brevity, though, we always refer to year 2014.

While economic analyses suggest that the welfare gains from an "open borders" immigration policy are large (e.g., Freeman, 2006; Clemens, 2011; Kennan, 2013, 2017), popular opposition to these policies may reflect the perceived or actual impact of migrants on the labor market and welfare system of receiving countries, and the difficulty in implementing mechanisms that redistribute the large welfare gains generated by an open immigration policy from the winners (first and foremost the immigrants themselves, but also employers) to the losers (low-skilled workers, but also users of congestable public welfare services, possibly).[2]

Without disputing this argument, we suggest that the opposition to open borders also reflects negative cultural externalities that immigration imposes on natives in the process of social interaction. Based on this idea, we present a theory of immigration policy where low-skilled and high-skilled natives are affected by immigrants via three channels: labor market outcomes, congestable public goods, and cultural externalities.[3] The theory is intentionally simple, and is meant to illustrate in a transparent way the consequences of cultural concerns for our understanding of natives' aversion to open borders in European countries and elsewhere. We posit that this class of external effects arises from different channels: direct and indirect preferences, and the functioning of informal and formal institutions. The model implies that such cultural externalities induce natives to oppose a possibly welfare-improving open immigration policy even in the absence of any labor market or fiscal impact. Furthermore, the skill heterogeneity of natives and the presence of cultural externalities make immigration policy time-inconsistent, despite individual preferences being not necessarily so. This time-inconsistency induces natives to oppose immigration flows more strongly than they would if the government had commitment over its future immigration policy. Moreover, the time-inconsistency induces a demand for commitment devices by part of natives, i.e., strategies to increase the cost of admitting migrants in the future (or, equivalently, reducing the cost of keeping them out). One such strategy is building immigration "walls" (Brexit is a case in point). Other strategies include limiting immigrants' political rights and accumulating fiscal surpluses (i.e., a tight fiscal policy).

Our message is that a deeper understanding of the nature and consequences of the cultural externalities generated by immigration helps gaining deeper insights into immigration policy. We convey this message in various steps. Section 2 illustrates the notions of economic and cultural externalities from immigration. In Section 3 we build a model formalizing such economic and cultural concerns, and we use it to characterize immigration policy when the government can commit to a planned immigration sequence (commitment immigration policy), and when it cannot commit (no-commitment, or equilibrium immigration policy). In Section 4 data from the ESS is analyzed to gauge at the driving mechanisms embedded in the model. Section 5 concludes.

[2]Auctions to allocate employment permits to employers and work permits to those immigrants who can contribute the most to economic activity in a specific country is one such mechanism (Peri, 2012).

[3]Other channels are possibly relevant, such as the impact of immigration on crime rates (see Bell and Machin, 2013 for a review) or on innovation in the host country (Hunt and Gauthier-Loiselle, 2010). These other channels are not considered here.

2 The economic and cultural impact of immigrants

2.1 Economic impact

The labor market and fiscal effects of migrants in host countries are elusive. Despite a massive empirical literature, there is no consensus among economists about the impact of immigration on the labor market outcomes of different workers. One view is that immigration to the US over the past 30 years has reduced the wages of native workers, with larger effects for low-skilled individuals, both in the short and in the long run (e.g., Borjas, Friedman, and Katz, 1997; Borjas, 2003; Borjas, 2014 offers a comprehensive summary of this view). A contending view is that the long-run impact of immigrants on the wages of natives is positive both in the US and the UK (Ottaviano and Peri, 2012; Manacorda, Manning, and Wadsworth, 2012; Card, 2009 summarizes this alternative view). An intermediate view is that the impact of immigrants on wages is heterogeneous at different points of the wage distribution: negative at lower quantiles, positive at upper quantiles (Dustmann, Frattini, and Preston, 2013). The disagreement reflects different choices in the setup of the underlying econometric or theoretical models. How one measures the immigration flow, how fast the capital stock adjusts, how one classifies education groups, the labor supply elasticity and the elasticity of substitution between immigrants and natives within the same education group and, of course, the details of the empirical specification, all make an important difference (Card, 2012; Dustmann, Schönberg, and Stuhler, 2016; Card and Peri, 2016). There is no convergence of opinions on these issues.[4]

The fiscal effects of immigration are similarly elusive. If the new immigrants contribute to the fiscal system a per-capita amount equivalent to the per-capita public good enjoyed by residents before their arrival then immigration is fiscally neutral and there is no external effect.[5] However, measuring the net fiscal contribution of immigrants raises a number of conceptual and empirical issues, such as how to implement a multi-period, multi-generation measurement, whether tax incidence or tax revenue is the appropriate outcome to look at, the degree to which government services are subject to congestion, and the marginal cost of providing government services (MaCurdy *et al.*, 1998; Preston, 2014). A recent overview of existing estimates in the light of some of these issues can be found in Vargas-Silva (2014)

[4]This conclusion is based on studies of labor markets in the US and the UK, which are similar in many respects but different from labor markets in continental Europe. Also, the skill composition of the US and the UK labor forces, as well as the composition of the immigration flows resulting from self-selection of immigrants differ from continental Europe. These differences suggest caution when extrapolating results for the US and the UK to other labor markets. However, the theoretical and methodological issues arising from studies of the US or the UK are general. Moreover, Docquier, Özden, and Peri (2014) provide a consistent set of model-based estimates of the impact of immigration on natives' wages and employment for a large group of OECD countries: qualitatively, results for the US and the UK extend to the bulk of the OECD group, although there is interesting heterogeneity.

[5]This neutrality result is based on the assumption that the tax contributions of immigrants are not diverted from public good provision by the government. Whether they are or not is a political economy issue, not an effect of immigration *per se*.

and Preston (2014). Liebig and Mo (2013) provide, to the best of our knowledge, the only existing comparative analysis of the net fiscal impact of immigration for OECD countries, although based on a static accounting framework. The pattern emerging from this research is that the net fiscal impact of immigrants is positive in some countries and negative in others, but it is small relative to GDP, and essentially zero, on average, across European countries.[6] According to Liebig and Mo (2013) the heterogeneity in the net fiscal impact of immigrants in Europe reflects more the taxes they pay than the benefits they receive in different countries. This observation is consistent with the fact that empirical analysis does not provide strong support for the "welfare magnet" hypothesis (Borjas, 1999).[7]

2.2 Cultural impact

Natives may care about the cultural composition of their country for a variety of reasons, and an inflow of immigrants carrying a distinctive cultural identity different from the natives' increases the cultural heterogeneity of the country and generates a cultural externality. Similarly, immigrants care about this same cultural composition and they are also affected by the arrival of other immigrants. Several such reasons are emphasized in the literature, as reviewed in Bisin and Verdier (2011).

First, direct and indirect preference effects. A direct preference effect on natives occurs because of pure cultural intolerance. For example, the utility of a native may be decreasing in cultural heterogeneity because of a pure distaste for contact with different identities associated with different behavioral prescriptions (Akerlof and Kranton, 2000), such as when a native feels that immigrants threaten the cultural identity of the host country. An indirect preference effect, instead, occurs when native parents are biased towards the native culture in the process of building their offspring's identity due to imperfect empathy, whereby native parents evaluate their offspring's outcomes through their own preferences (Bisin and Verdier, 1998). This form of paternalistic altruism induces preferences over the cultural composition of the community, because such composition has a bearing on the process of cultural socialization of children and, possibly, grandchildren in a context in which the socialization technology available to parents takes as inputs their own effort and societal effects. For example, immigration affects the cultural composition of schools and neighborhoods, in a context

[6]The underlying heterogeneity indicates that immigration is more costly for some European countries than others, suggesting that transfers within Europe neutralizing the net fiscal impact of immigrants are possible, in principle. The tradable immigration quota scheme analyzed by Fernández-Huertas Moraga and Rapoport (2014) is an example of how such transfers can be implemented in practice.

[7]Reviewing the evidence about welfare benefits as driving self-selection of immigrants, Preston (2014) concludes that "while several studies have found evidence linking welfare to immigrant selection in particular cases, this is only one among several factors influencing migration decisions and no uniform picture emerges of relative welfare dependency among immigrants." (p. F576). That is, there seems to be no important or at least no consistent self-selection of immigrants in response to the different generosity of welfare systems across different locations. Moreover, like for the labor market impact of immigrants, mechanisms exist even for a single country to internalize the externalities arising from congestion of public goods. For instance, the eligibility of immigrants for several means-tested public programs is restricted in the US (Wasem, 2014).

where peers matter in the development of a child's identity. This "oblique" socialization mechanism implies a negative externality for parents of a certain cultural type when their children are exposed to a different type. Another example is the marriage market, whose composition is affected by the presence of immigrants. Heterogamous marriages (as opposed to homogamous ones) are associated with different socialization technologies because in mixed marriages the socialization efforts of parents work in opposite directions (Bisin and Verdier, 2000). This "vertical" socialization mechanism implies a negative externality if it increases the likelihood that one's children end up in a heterogamous marriage. Previous immigrants may instead value positively the arrival of more immigrants of the same type (e.g., ethnic or religious group) because the presence of a larger community sharing their own cultural identity facilitates the process of socialization of their own children via both oblique and vertical socialization. The cultural externality is positive, for them.[8]

Second, informal and formal institutional effects. An efficient institutional system optimally trades off informal and formal institutions. Informal institutions (e.g., reputational concerns facilitating the enforcement of contracts or virtuous forms of social control preventing crime) are relatively inexpensive but require civic capital, i.e., "persistent and shared beliefs and values that help a group overcome the free rider problem in the pursuit of socially valuable activities" (Guiso, Sapienza, and Zingales, 2011, p. 419). Formal institutions (e.g., the political and judicial systems) are relatively expensive but they, too, require civic capital to work effectively (Putnam, 1993). It has been argued that an increase in ethnic and cultural heterogeneity, like the increase that would follow from a large influx of immigrants of a different ethnic group from the majority, may lead to a reduction in the stock of civic capital because trust, ability to cooperate, and shared norms are scarcer in heterogeneous communities (Alesina and La Ferrara, 2002, 2005). Like for preference effects, this cultural externality arising from institutional effects is negative for the natives, who own the stock of civic capital at the baseline, pre-immigration state but is positive for immigrants, who build more of their own civic capital as more immigrants of the same type enter the economy.

3 Model

Taking stock of the labor market, fiscal, and cultural aspects of immigration discussed above, we now introduce a simple theoretical model whose objective is to frame a more formal discussion of the effects of immigration and to provide a tool for the study of immigration policies when cultural externalities matter. While the model can be easily extended to perform quantitative exercises, we intentionally present it here in its simplest, bare-bone form to strip down the analysis to its fundamental theoretical components.

[8] Whether a larger or smaller cultural group of one's own type increases or decreases parents' socialization effort depends on whether the socialization technology exhibits cultural substitution (cultural distinction) or cultural complementarity, i.e., whether minorities, other things equal, socialize more or less intensely their children. As a consequence, these mechanisms depend, among the other things, on the level of segregation and discrimination of immigrants.

3.1 Setup

The economy is populated by a group of natives who live for two periods, $t = 1, 2$, and who are either high-skilled native workers (h) or low-skilled native workers (l), as well as by a group of immigrant workers. Immigrants are (and remain, by assumption) low-skilled workers in the labor market of the host country. The native population is constant over time and is normalized to 1, so that L^h native workers are high-skilled and $L^l = 1 - L^h$ are not. At time t, a flow of m_t immigrants (expressed as a fraction of the constant native population) are admitted into the economy. Let $q_t = \sum_{\tau=1}^{t} m_\tau$ denote the stock of immigrants at time t, i.e, the immigrant/native ratio in the country.

Border enforcement is costly, i.e., it is costly to keep out migrants wishing to enter the country. For instance, a restrictive immigration policy may result into attempts to enter the economy in an unauthorized way, which is costly to contain. A stock of M_t migrants are ready to enter the economy, a number that we take as given. Let $\alpha(q_2)$ denote the associated cost function, i.e., the minimum cost of producing an inflow of m_t migrants for $t = 1, 2$.[9] We assume $\alpha'(q_2) < 0$ and $\alpha''(q_2) > 0$. That is, the more immigrants the country admits, the less costly border enforcement is. In the extreme case of open borders, it is $\alpha(M_t) = 0$. The marginal cost of border protection is assumed to be increasing, hence the convexity of $\alpha(q_2)$.

The labor market is characterized by inelastic labor supply and elastic labor demand functions for high-skilled and low-skilled labor. Denote by w_t^h and w_t^l the high-skilled and low-skilled wages, respectively. At equilibrium, for given L^h, $w_t^h = w^h(q_t)$ and $w_t^l = w^l(q_t)$. We also assume that low-skilled and high-skilled workers are complements in production, so that $\frac{\partial\, w^h(q_t)}{\partial\, q_t} > 0$ and $\frac{\partial\, w^l(q_t)}{\partial\, q_t} < 0$, $t = 1, 2$. These assumptions embed in our model the evidence that immigration affects natives' wages positively at the top of the wage distribution and negatively at the bottom (Dustmann, Frattini, and Preston, 2013). Therefore, as far as labor market effects are concerned, high-skilled natives would like more immigration, while low-skilled natives would like less.

Natives and immigrants have identical preferences over private consumption, c_t. However, low-skilled workers (natives and immigrants alike) value a government-provided public good, g_t, more than high-skilled workers. The latter, possibly, don't value the public good at all because they are already consuming privately-provided substitutes. The public good is provided by means of exogenous public expenditure γ_t, financed by lump-sum taxes τ_t on both natives and immigrants. The government budget is balanced in each period t, i.e., $\gamma_t = \tau_t$.[10] Preferences over goods are represented by a strongly monotonically increasing and strictly concave function $u^\theta(c_t^\theta, g_t)$, with $\theta = l, h$ and $\frac{\partial u^l}{\partial g_t} > \frac{\partial u^h}{\partial g_t} \geq 0$, which agents maximize

[9] We assume that this cost depends on the total migration stock, $q_2 = m_1 + m_2$, independently of the distribution of the flows over time. This is for simplicity and easy to relax.

[10] We will allow for accumulated deficits and surpluses at the end of Section 3.3

in each period t subject to the budget constraint and a public good provision constraint:

$$\begin{aligned} c_t^\theta &= w_t^\theta - \tau_t, \quad \theta = h, l; \\ g_t &= \gamma_t - g(q_t). \end{aligned}$$

Function $g(q_t)$ is increasing, with $g(0) = 0$, and captures a congestion effect arising, for instance, from decreasing returns in the production of the public good. Therefore, negative fiscal effects of immigration are embedded in our model, and as far as this fiscal externality is concerned, high-skilled natives are less averse to immigration (and possibly indifferent) than their low-skilled counterpart.

As for cultural identity, natives are characterized by a cultural trait that is different from the cultural trait of immigrants at arrival. The latter is denoted by i. Because immigrants are low skilled, it is $u^l(c_t^l, g_t) = u^i(c_t^i, g_t)$, i.e., immigrants carrying cultural trait i value private and public consumption like low-skilled natives. These traits do not change over time, but immigrants can (choose to) assimilate to the culture of the host country, in which case they acquire the natives' cultural trait, i.e., they become indistinguishable from low-skilled natives. Let p_t denote the stock of non-assimilated immigrants. As immigrants are not assimilated at arrival, $p_1 = q_1 = m_1$. The cultural dynamics from period $t = 1$ to $t = 2$ is represented by the population dynamics of the distribution of cultural traits,

$$p_2 - p_1 = f(p_1) + m_2 \tag{1}$$

where the map $f(p_1)$ represents cultural identity formation. Because we have assumed that immigrants may assimilate to the host culture but natives keep their cultural trait, $f(p_1) \leq 0$ represents the (negative of the) assimilation rate of immigrants. That is, of the m_1 immigrants admitted at $t = 1$, $-f(m_1)$ are culturally assimilated to the host country by $t = 2$ while $m_1 + f(m_1)$ keep their original cultural identity. Several micro-foundations of Eq. 1 (see Bisin and Verdier, 2011) suggest the following function form for $f(p)$:

$$f(p_1) = p_1(1 - p_1)d(p_1), \tag{2}$$

where $d(p_1) \leq 0$ captures the socialization effort of immigrant parents, and is assumed to satisfy $d'(p_1) < 0$, i.e., "cultural substitution". Roughly speaking, this means that immigrant parents' effort in transmitting cultural identity i to their children ("direct socialization", via family interactions) decreases with the frequency of cultural trait i in the community where the children grow up ("horizontal socialization", via social interactions).[11] In the special case in which assimilation is effectively impossible (or not desired), it is $f(p_t) = 0$ and so $p_t = q_t$.

Cultural externalities are captured by a component of each agent's preferences which depends on his/her cultural profile and skill group. Presumably, high-skilled natives have limited social contact with immigrants relative to the low-skilled, and so they are less subject

[11] Bisin and Verdier (2011) summarize the evidence regarding cultural substitution.

to the cultural externality.[12] The cultural component of preferences is thus represented by an additive indirect utility term $r^\theta(p_t)$, with $\theta = h, l, i$, which embeds in a reduced-form way all of the cultural externalities discussed in Section 2.2. The discussion there and the assumption that high-skilled natives have less social contacts with immigrants than low-skilled ones imply that $r^\theta(p_t)$ decreases in p_t for $\theta = h, l$, while it increases in p_t for $\theta = i$, with $\left|\frac{\partial r^l}{\partial p_t}\right| > \left|\frac{\partial r^h}{\partial p_t}\right|$. In other words, the cultural externality of immigration is negative for natives but is positive for non-assimilated past immigrants. Denoting by $v^\theta(w^\theta(q_t) + g(q_t))$ the value function resulting from type θ agents' maximization subject to the budget and public good provision constraints, preferences over the cultural composition of the country are represented by

$$v^\theta(q_t) + r^\theta(p_t), \quad \theta = h, l, i. \tag{3}$$

Notice that the component of preferences reflecting labor market outcomes and the public good, $v^\theta(q_t)$, is the same for low-skilled natives and immigrants, contrary to their different evaluation of the cultural composition of the economy, $r^\theta(p_t)$, unless the immigrants in question are culturally assimilated. High-skilled natives and non-assimilated immigrants, instead, differ in the evaluation of all of three impacts of additional immigration: wages, public good, and culture.[13]

3.2 Social welfare

Without explicitly specifying an institutional (e.g., voting) mechanism which delineates and implements policies, we assume that immigration policies are the result of the maximization of a government's objective function which takes into account the welfare of both natives and immigrants. Immigrants' welfare, in particular, is taken into account by the government for political, economic, social, or humanitarian reasons that are not specified here. Then social welfare weights ψ_t^θ, $\theta = h, l, i$, $t = 1, 2$ are monotonically increasing functions of population shares at the beginning of the period (prior to immigration flows):

$$\psi_1^h = \psi^h(L^h),\ \psi_1^l = \psi^l(1 - L^h),\ \psi_1^i = 0;$$

$$\psi_2^h = \psi^h\left(\frac{L^h}{1 + m_1}\right),\ \psi_2^l = \psi^l\left(\frac{1 - L^h}{1 + m_1}\right),\ \psi_2^i = \psi^i\left(\frac{m_1}{1 + m_1}\right).$$

These weights are normalized so that $\sum_\theta \psi_t^\theta = 1$, for $t = 1, 2$. Note that ψ_2^l and ψ_2^h decrease with m_1, while ψ_2^i increases in this quantity. Therefore, since these sum up to 1, it must be that $\psi_2^l + \psi_2^i$ increases with m_1: immigration at $t = 1$ reduces the "power" (as represented by

[12] Iceland and Scopilliti (2008) have documented that the residential segregation of immigrants in the US is higher than for minorities. Even within neighborhoods, Petermann and Schönwälder (2014) show some evidence (Table 1 therein) that the frequency of social interactions between immigrants and previous residents decreases with the income and education levels of the latter.

[13] The separability in Eq. 3 simplifies the exposition, but it is not driving the results derived below.

the weights in the government's objective) of high-skilled natives and increases the "power" of low-skilled workers, including the immigrants themselves, at $t = 2$. We distinguish two social welfare choice problems, with and without commitment, and we emphasize that our analysis is positive: the social welfare choice problem with no-commitment is the policy choice equilibrium outcome in our economy (again, the policy-maker cares about groups in proportion to their incidence for political, economic, or social reasons captured by the social welfare weights). The commitment problem is instead a useful benchmark, to identify the effects of time-inconsistency at equilibrium.

The *commitment* immigration policy is a sequence $\{m_1^c, m_2^c\}$ which maximizes the social welfare function under commitment, i.e., when the immigration flows both at $t = 1$ and $t = 2$ are chosen at $t = 1$ and maintained. This is the solution to

$$\max_{m_1,m_2} \sum_{\theta=h,l,i} \sum_{t=1,2} \psi_1^\theta \left[v_t^\theta(q_t) + r^\theta(p_t) \right] - \alpha(q_2) \tag{4}$$

$$\text{s.t.} \quad q_1 = p_1 = m_1; \; q_2 = m_1 + m_2; \; p_2 = p_1 + f(m_1) + m_2.$$

The *equilibrium* (or *no-commitment*) immigration policy, instead, is a sequence $\{m_1^{nc}, m_2^{nc}\}$ which maximizes the social welfare function without commitment. In this case the immigration flow at $t = 2$ is chosen at $t = 2$, after the flow at $t = 1$ has been chosen. At $t = 1$, the flow at $t = 2$ is perfectly anticipated as a function of the choice at $t = 1$. This policy solves

$$\max_{m_1,m_2} \sum_{\theta=h,l,i} \sum_{t=1,2} \psi_t^\theta \left[v_t^\theta(q_t) + r^\theta(p_t) \right] - \alpha(q_2) \tag{5}$$

$$\text{s.t.} \; m_2 \in \arg\max \sum_{\theta=h,l,i} \psi_2^\theta \left[v_2^\theta(q_2) + r^\theta(p_2) \right] - \alpha(q_2); \tag{6}$$

$$q_1 = p_1 = m_1; \; q_2 = m_1 + m_2; \; p_2 = p_1 + f(m_1) + m_2. \tag{7}$$

The difference between the two problems originates from constraint (6), which captures the fact that the immigration policy at $t = 2$ is chosen in fact at $t = 2$. Let

$$\begin{aligned} V_1(m_1) &= \sum_{\theta=h,l,i} \psi_1^\theta \left[v_1^\theta(m_1) + r^\theta(m_1) \right], \\ V_2(q_2, p_2) &= \sum_{\theta=h,l,i} \psi_1^\theta \left[v_2^\theta(q_2) + r^\theta(p_2) \right] \\ H_2(q_2, p_2) &= \sum_{\theta=h,l,i} \psi_2^\theta \left[v_2^\theta(q_2) + r^\theta(p_2) \right]. \end{aligned}$$

We impose stringent but standard assumptions on the concavity-convexity of the maps $w^\theta(q)$, $g^\theta(q)$, and $r^\theta(q)$ so that the commitment problem can be guaranteed to be convex and first order conditions are necessary and sufficient for a unique maximum. The no-commitment

problem, instead, is generally not convex. But can we impose Inada conditions guaranteeing that an interior maximum satisfying the first order conditions exists.[14] The first order conditions for the commitment problem, after exploiting the Envelope condition, are reduced to the constraints in (7) and

$$\frac{dV_1(m_1)}{dm_1} + \frac{\partial V_2(q_2, p_2)}{\partial m_1} = \frac{\partial \alpha(q_2)}{\partial m_1}, \tag{8}$$

$$\frac{\partial V_2(q_2, p_2)}{\partial m_2} = \frac{\partial \alpha(q_2)}{\partial m_2}. \tag{9}$$

The first order conditions for the no-commitment problem, instead, are[15]

$$\frac{dV_1(m_1)}{dm_1} + \frac{\partial V_2(q_2, p_2)}{\partial m_1} + \frac{\partial V_2(q_2, p_2)}{\partial m_2}\frac{dm_2}{dm_1} = \frac{\partial \alpha(q_2)}{\partial m_1} + \frac{\partial \alpha(q_2)}{\partial m_2}\frac{dm_2}{dm_1}, \tag{10}$$

$$\frac{\partial H_2(q_2, p_2)}{\partial m_2} = \frac{\partial \alpha(q_2)}{\partial m_2}, \tag{11}$$

where $\frac{dm_2}{dm_1}$ is obtained by the Implicit Function Theorem on (11), and the constraints in (7). We are now ready to characterize the immigration policy in this model.

A fundamental property of the immigration policy choice is that it is time-inconsistent. At equilibrium (without commitment) social welfare at $t = 2$ weights the preferences of immigrants, while only the natives' preferences enter social welfare at $t = 1$. Therefore, time-consistent immigration policy entails the natives, when choosing m_1 at $t = 1$, anticipating the subsequent policy choice m_2. In other words, when determining the immigration flow at $t = 1$ the natives take into account that in the future immigrants will contribute to the determination of immigration policy, via their positive weight in the social welfare function (i.e., their "political power"). This distorts the immigration policy, at equilibirum, with respect to the policy which would have been chosen under commitment. More formally:

Proposition 1 *The social welfare choice problem is generically*[16] *time-inconsistent; that is, the no-commitment solution for immigration flows,* $\{m_1^{nc}, m_2^{nc}\}$*, is generically distinct from the commitment solution,* $\{m_1^c, m_2^c\}$*.*

Proof. See Appendix. ■

We now turn to characterize the no-commitment solution, $\{m_1^{nc}, m_2^{nc}\}$, and to compare it with the commitment solution, $\{m_1^c, m_2^c\}$. We consider two different special environments first, one in which the cultural externality is assumed away, and another in which assimilation of immigrants to the natives' culture is not possible.

[14] For instance, $\lim_{q\to 0} \frac{d\alpha(q)}{dq} = \infty$ and $\lim_{q_2 \to M} \frac{dV_2^\theta}{dq_2} < 0$, for $\theta = h, l, m$, would suffice.

[15] Note that the Envelope condition does not hold in this case.

[16] Genericity is to be intended in the space of suitably parametrized utility functions.

Consider first the environment in which cultural identity is not a source of externality; that is, $r^\theta(p) = 0$, $\theta = h, l, i$.

Proposition 2 *Absent cultural externalities, $r^\theta(p) = 0$, $\theta = h, l, i$, the total immigration flow is smaller at equilibrium (with no-commitment) than with commitment:*

$$m_1^{nc} + m_2^{nc} < m_1^c + m_2^c.$$

Moreover, the immigration flow is smaller at equilibrium (with no-commitment) than with commitment in the first period:

$$m_1^{nc} < m_1^c.$$

Proof. See Appendix. ■

To understand this result, notice that in the absence of a cultural component of preferences it is still the case that social welfare at $t = 2$ weights the preferences of immigrants, while only natives' preferences enter social welfare at $t = 1$. Therefore, time-inconsistency is not a consequence of cultural externalities *per se*. However, the welfare evaluation of the effects of future immigration would be aligned between low-skilled natives and immigrants, because in the absence of cultural externalities, cultural traits are irrelevant and immigrants are effectively replicas of native low-skilled workers: formally, $v^l(q) = v^i(q)$ and $g^l(q) = g^i(q)$. Thus, in this environment, the time-inconsistency of social welfare is due to labor market and fiscal effects only: low-skilled workers (natives and immigrants alike) want to limit future immigration to avoid negative economic externalities. This is a consequence of the twofold fact that (a) new immigrants at $t = 2$ affect the labor market through the wage map $w^l(q_1)$, which is the same for natives and immigrants who have previously (at time $t = 1$) entered the economy; (b) congestion of the public good also affects natives and immigrants who entered at time $t = 1$ in the same way under our budget balance assumption, $\gamma_t = \tau_t$, for $t = 1, 2$.

At $t = 2$, therefore, social welfare with no-commitment will weight the low-skilled more than social welfare with commitment, thereby choosing a lower immigrant flow at $t = 2$ than with commitment. Anticipating this effect, at $t = 1$, the social welfare problem with no-commitment will reduce the immigration flow m_1 with respect to the commitment level, to reduce the weight of social welfare on low-skilled and immigrants at $t = 2$, effectively accomodating in part the preferences of high-skill workers who will pay the cost of the time-inconsistency at $t = 2$. This limits the reduction in the no-commitment immigration flow at $t = 2$, without overturning it.

Consider now an environment where culture is a source of externality $r^\theta(p)$, $\theta = h, l, i$. Assume first that assimilation of immigrants to the natives' culture never takes place, perhaps because it is never desired. That is, immigrants keep their original cultural trait i. In this case it is $p_t = q_t$. Bisin *et al.* (2011) and Algan *et al.* (2012) provide evidence that indeed

cultural integration of immigrants is very slow, so that this assumption provides a useful benchmark.

It can easily be shown that, allowing for culture with no assimilation, the commitment solution m_1^c does not change, while m_2^c is reduced to account for the negative effects of the cultural externality on both high- and low-skilled natives. As for the comparison between the commitment and no-commitment solutions:

Proposition 3 *Allowing for cultural externality $r^\theta(p)$, $\theta = h, l, i$, but with no-assimilation, $p_t = q_t$, the total immigration flow is larger at equilibrium (with no-commitment) than with commitment if the cultural externality is sufficiently large for past immigrants:*

$$m_1^{nc} + m_2^{nc} > m_1^c + m_2^c \quad \textit{if} \quad \frac{dr^i(q)}{dm_2} \quad \textit{is sufficiently large}$$

.

However, the immigration flow is smaller at equilibrium (with no-commitment) than with commitment in the first period:

$$m_1^{nc} < m_1^c.$$

Proof. See Appendix. ■

Allowing for the cultural externality introduces a component of the preferences of immigrants which values future immigration flows positively. The time-inconsistent social welfare function generally weights the immigrants preferences and hence internalizes these preferences. On the other hand, in terms of their effects on wages and on the public good, immigrants of course, value immigration flows negatively. The relative strength of these components of the preferences of immigrants determines whether at equilibrium (with no-commitment) the immigration flow is larger or smaller than with commitment. In either case, however, the social welfare choice anticipates this effect and in part limits it by reducing the immigrant flow at $t = 1$, thereby lowering the weight of immigrants at $t = 2$.

Consider finally the general case, where a fraction of the immigrants at time $t = 1$ assimilate to the natives at $t = 2$. Suppose $m_1 < \frac{1}{2}$, so that immigrants are effectively a minority, at least at $t = 1$. In this case the effect of the immigrant flow at $t = 1$ on wages and on the public good is unchanged, but it is more limited on the cultural externality, that is, $\frac{dm_1 + f(m_1)}{dm_1} < 1$. Indeed, in this environment, m_1^c is larger than with no assimilation, for any m_2^c and so is m_2^c. As long as assimilation is relatively contained, we can show that the general comparison between the flows at equilibrium (with no-commitment) and with commitment is not changed.[17] In particular, it is still the case that m_2^{nc} is greater or smaller that m_2^c, depending on $\frac{dr^i(q)}{dm_2}$, and that $m_1^{nc} < m_1^c$.

[17] Formally, consider $p + f(p)$ to be a local perturbation of the identity map, $I(p) = p$ which satisfies the assumptions of cultural substitution: $d(p) \leq 0$ and $d'(p) < 0$. This is the case, for instance, if $-\epsilon \leq d(p)$, for a small ϵ.

3.3 Commitment strategies

In the presence of negative cultural externalities, the time-inconsistency of the social welfare function induces at a hypothetical time $t = 0$ a demand, on the part of natives, for commitment strategies, i.e., choices and distortions which would increase perceived cost of immigration at time $t = 1$ and $t = 2$. While in the bare model we are using no such strategy is available, we can envision several interesting extensions which would allow for them. We offer the reader three examples.

First, investing in irreversible border protection devices. For instance, the natives may ask the government to tax them and build a wall around the border at time $t = 0$. This is tantamount to a downward shift in the marginal cost of border protection, $\alpha'(q_2)$. At that point, it is relatively inexpensive to keep immigrants out, and so the government would choose, at the no-commitment equilibrium, small immigration flows relative to what it would have chosen had the wall not being built.[18] Therefore, in the presence of this commitment device, border policy at equilibrium would be more stringent than under commitment.

Second, reducing the welfare weight on immigrants. For instance, the natives may ask the government to limit immigrants' political rights (such as voting rights) at time $t = 0$. This would result in a downward shift in welfare weight function ψ_2^i. At that point, the government admits fewer new immigrants at $t = 2$ (i.e., it chooses a low m_2) than it would have done in the case of a larger welfare weight on past immigrants. Therefore, in the presence of this commitment device, immigrants' political rights at equilibrium would be more limited than under commitment.

Third, engaging in a tight fiscal policy. To see why this is a possible commitment device, let's relax the budget balance assumption in every period, so that the government now can run a deficit or a surplus. Assume that $\gamma_t = \gamma$ exogenously, $t = 1, 2$, and that natives and immigrants are taxed homogeneously. Consider fiscal policies in which τ_1, the lump-sum tax to be paid by natives and immigrants alike at time 1, is chosen at time $t = 0$; while τ_2 must satisfy intertemporal budget balance, that is, $(\gamma - \tau_1)(1 + m_1) + (\gamma - \tau_2)(1 + m_1 + m_2) = 0$. When $\gamma < \tau_1$, that is, fiscal policy is characterized by a fiscal surplus at time $t = 1$, is it more costly, for both natives and immigrants entered at $t = 1$, to admit new immigrants at $t = 2$. This is because the new immigrants will participate in sharing the proceeds of the surplus at $t = 1$ by facing lower taxes τ_2, at $t = 2$. In other words, a fiscal surplus is a commitment device which the natives could use to restrict the incentives to admit immigrants in the future. This commitment device is costly, in that the fiscal surplus created at time $t = 1$ is shared with the new immigrants at $t = 2$. On the other hand, when $\gamma > \tau_1$, that is, fiscal policy is characterized by a fiscal deficit at $t = 1$, it is less costly, for both natives and immigrants entered at $t = 1$, to admit new immigrants at $t = 2$. This is because the new immigrants will have to contribute to the repayment of the debt contracted at $t = 1$ by means of higher taxes τ_2, at $t = 2$. In other words, a fiscal deficit reduces the fiscal burden

[18] A "wall" is a metaphor for any costly and hard to reverse choice making borders less permeable. In this sense, the 2016 "Brexit" was like building a wall.

for natives and immigrants entered at $t = 1$; but, in the presence of time inconsistency, it represents a cost for the natives because it induces stronger incentives to admit immigrants in the future. Therefore, in the presence of this commitment device, fiscal policy at equilibrium would entail smaller budget deficits than under commitment.

In sum, the model shows that the presence of economic and cultural externalities makes immigration policy time-inconsistent, so that the chosen immigration flow in the early period is smaller than it would be under commitment. Moreover, natives would exploit commitment devices, when available, that further limit the immigration flow or immigrants' voice in future immigration policy. Contrary to economic externalities, which favor high-skilled natives and so make them favorable to more immigration, cultural externalities reconcile high- and low-skill natives: the cultural motive makes both these groups averse to more immigration – although more strongly so the low-skilled. Although at this level of analysis we cannot test the theory, we provide in the next section evidence that is consistent with it.

4 Evidence

The ESS allows us to gauge at the key driving mechanisms we have embedded in the model, namely the relation between, on the one hand, the perceived economic and cultural effects of immigration and, on the other hand, attitudes towards immigration policy. Consider the economic impact first. Three variables can be constructed from the ESS that proxy for one's beliefs about immigrants' impact on wages, jobs, and the fiscal balance. First, the 2002 wave included a question about how much a respondent agreed or disagreed with the statement that "average wages and salaries are generally brought down by people coming to live and work" in the respondent's country, on a 1–5 scale. We take an answer of 1 (agree strongly) or 2 (agree) as an indicator that one believes immigrants are bringing natives' wages down. Second, waves 2002 and 2014 asked for the degree of agreement with the statement that "people who come to live here generally take jobs away from workers,", on a 1–10 scale. We take an answer between 1 and 4 as an indicator that one believes immigrants are hurting natives' employment. Third, waves 2002 and 2014 also asked the following question: "Most people who come to live here work and pay taxes. They also use health and welfare services. On balance, do you think people who come here take out more than they put in or put in more than they take out?", on a 1–10 scale. An answer between 1 and 4 is again taken as an indicator that one believes the fiscal impact of immigrants is negative. Table 1 shows how these three variables predict a respondent's statement that the government should allow few or no immigrants in their country, using a linear probability model with country fixed effects and individual covariates. In 2002, believing that immigrants have a negative impact on all of the three economic dimensions was associated with a 40 percentage points higher probability of supporting a restrictive immigration policy (last column). Notice that the correlations become larger between 2002 and 2014.[19]

[19]Estonia and Slovakia are not present in the 2002 wave, and Greece and Italy are not present in the 2014 wave. Results using the subset of countries present both in 2002 and in 2014 are available from the authors, and show that the unbalanced nature of the panel does not explain the larger correlations in 2014.

Table 1: Projection of attitude towards immigration on beliefs about its economic impact

Immigrants:	Allow few or no immigrants							
– bring wages down	0.180*							0.123*
	(0.010)							(0.010)
– take jobs away		0.205*	0.264*			0.156*	0.200*	0.131*
		(0.009)	(0.011)			(0.010)	(0.010)	(0.010)
– take more than they put in				0.201*	0.233*	0.159*	0.165*	0.147*
				(0.012)	(0.013)	(0.012)	(0.013)	(0.012)
Observations	30,076	30,076	28,395	30,076	28,395	30,076	28,395	30,076
Year	2002	2002	2014	2002	2014	2002	2014	2002
Individual covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

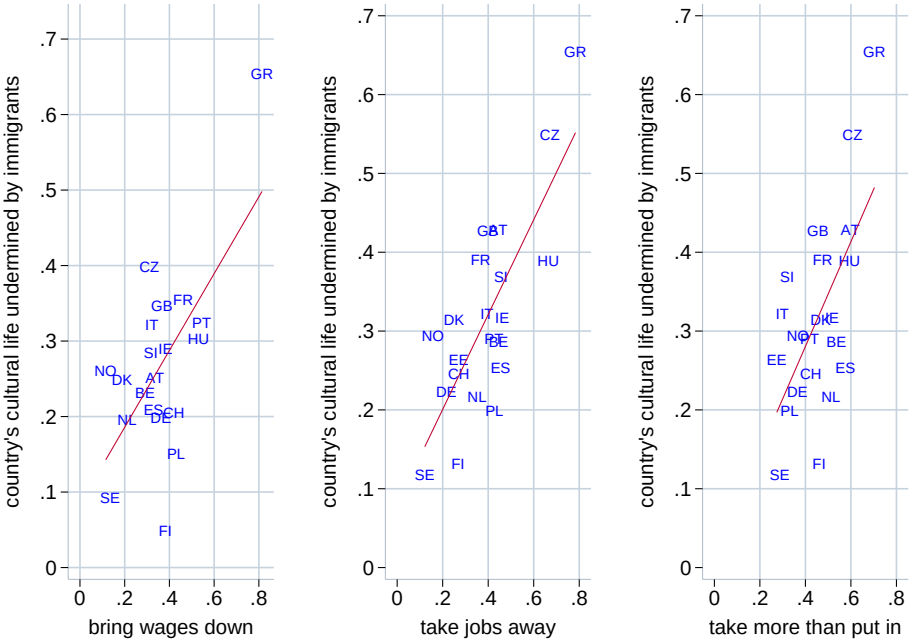
Notes: Linear probability models. The dependent variable is a dummy taking value 1 if a respondent states that the government should allow few or no immigrants in the country. Country fixed effects are included, as well as the following individual covariates: gender, age dummies, marital status, number of children, education, employment status, self-reported trust in other people and belonging to a religious denomination. Due to missing data in the ESS, there are no observations from Estonia and Slovakia in the regressions using the 2002 wave, and there are no observations from Greece and Italy in the regressions using the 2014 wave. Robust standard errors in parentheses, clustered at the country level. * significant at 1% or better.

Table 2: Projection of attitude towards immigration on beliefs about its economic and cultural impact

Immigrants:	Allow few or no immigrants							
– bring wages down	0.143*							0.107*
	(0.009)							(0.010)
– take jobs away		0.154*	0.194*			0.122*	0.155*	0.102*
		(0.009)	(0.010)			(0.010)	(0.010)	(0.010)
– take more than they put in				0.156*	0.165*	0.128*	0.119*	0.119*
				(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
– undermine country's cultural life	0.234*	0.218*	0.264*	0.215*	0.266*	0.190*	0.237*	0.178*
	(0.018)	(0.018)	(0.021)	(0.017)	(0.019)	(0.016)	(0.019)	(0.016)
Observations	30,076	30,076	28,395	30,076	28,395	30,076	28,395	30,076
Year	2002	2002	2014	2002	2014	2002	2014	2002
Individual covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

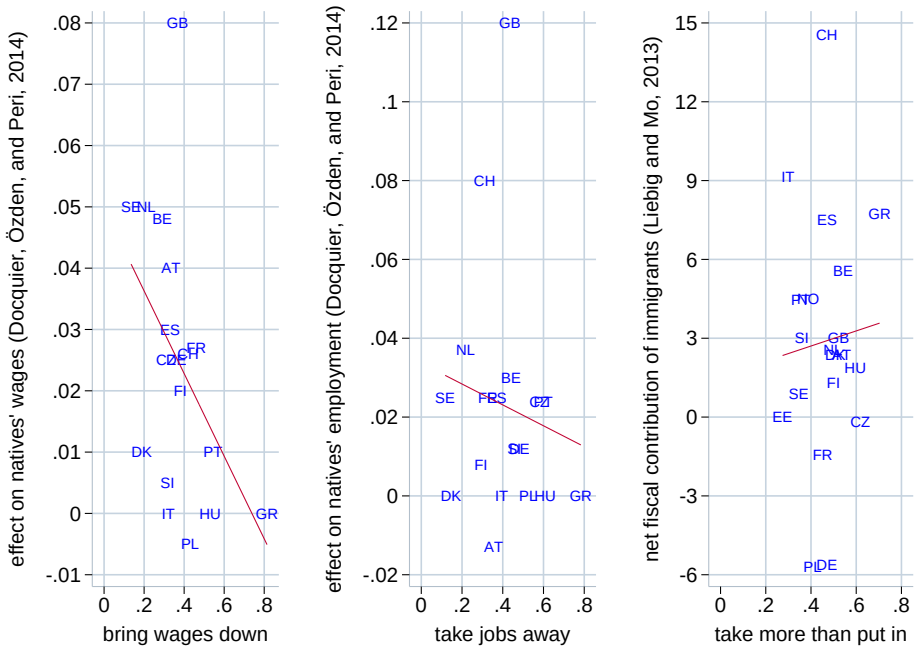
Notes: Linear probability models. The dependent variable is a dummy taking value 1 if a respondent states that the government should allow few or no immigrants in the country. Country fixed effects are included, as well as the following individual covariates: gender, age dummies, marital status, number of children, education, employment status, self-reported trust in other people and belonging to a religious denomination. Due to missing data in the ESS, there are no observations from Estonia and Slovakia in the regressions using the 2002 wave, and there are no observations from Greece and Italy in the regressions using the 2014 wave. Robust standard errors in parentheses, clustered at the country level. * significant at 1% or better.

Figure 2: Concern over cultural impact of immigration vs. perceived economic impact.



Notes: The figure plots the average degree of agreement (0-10 scale) with the statement that immigrants "undermine country's cultural life" (vertical axis) against the share of respondents believing immigrants bring wages down (2002 wave), agreement with the statement that immigrants take jobs away, and agreement with the statement that immigrants net fiscal contribution is negative (2014 wave, 2002 for Italy and Greece). Linear fit superimposed. Sampling weights are applied.

Figure 3: Actual vs. perceived labor market and fiscal effects of immigrants.

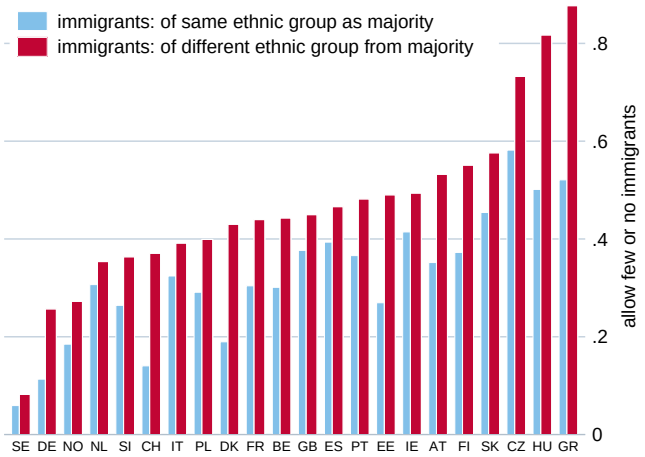


Notes: The figure relates the perceived labor market and fiscal effects of immigration (horizontal axis) and the actual effects as estimated by Docquier, Özden, and Peri (2014), percentage effects, and Liebig and Mo (2013), thousand of euros. Linear fit superimposed. Sampling weights are applied to ESS data. Ireland is excluded from this figure because it's an outlier.

Taking the estimated effects at face value, how can we explain the stark discrepancy between perceptions and reality? One possibility is that people's perceptions are largely imprecise. Estimates of economic effects certainly are. Another, more interesting possibility suggested by the lack of correspondence between estimates and perceived reality and, at the same time, the positive correlation between perceived economic effects and concerns about the country's cultural life (Figure 2) is that the frequently observed opposition to immigration is justified in terms of its perceived economic effects but it is actually motivated by the kind of cultural externalities we have embedded in the model. For instance, a respondent who is intolerant towards immigrants because of cultural or ethnic reasons may have persuaded himself (or report to the interviewer, as a justification) that immigration has adverse economic effects.

To corroborate this presumption, consider one of the implications of the model: absent cultural externalities, if all immigrants are low skilled then their ethnic identity should be irrelevant for natives. Not so in the data: the expressed preference for a restrictive immigration policy vary with respect to the ethnic origin of immigrants. The ESS question about whether the government should allow immigrants to come and live in one's country is asked separately for "immigrants of same race/ethnic group as majority" and "immigrants of different race/ethnic group from majority". The respective shares of respondents stating that their country should allow "few" or "none" of a specific type of immigrants is displayed in Figure 4 for year 2014. The population-weighted average fractions across the 22 countries are 31.1% for immigrants of the same group as the majority, and 42.2% for immigrants of a different group, a substantial difference suggesting that the cultural identity of migrants matters per se.

Figure 4: Share favoring restrictive immigration policies, by type of immigrants

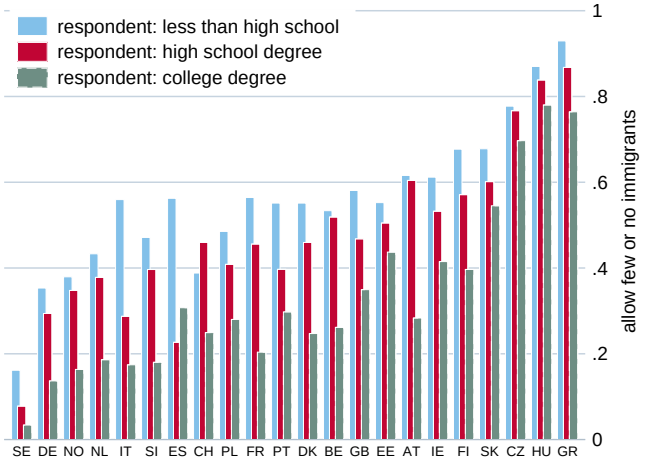


Notes: The figure shows, for 22 European countries, the fraction of respondents in the 2014 wave of the European Social Survey (ESS) who stated that their country should allow "few" or "none" immigrants to come and live there, as opposed to "some" or "many", by ethnic origin of the immigrants in question. Sampling weights are applied. For Greece, Italy, and Slovakia, this information is not available in the 2014 wave of the ESS, and it is replaced by the most recently available data (2010 for Greece, 2012 for Italy and Slovakia).

Differences in natives' attitudes by education are also informative. In the model, low-skilled natives oppose immigration because of negative economic and cultural externalities. However, the low-skilled favor immigration because a larger low-skilled population has more political power (formally, a larger weight in the government's objective function). On the contrary, high-skilled natives oppose immigration because of cultural and political externalities (and some negative perceived fiscal externality, possibly) but favor it because of their complementarity in the labor market. Presumably, the cultural externality is smaller for the high-skilled because they have limited social contact with immigrants relative to the low-skilled. Therefore, there should be an education gradient in natives' opposition to open borders.

This is shown in Figure 5, which displays the fraction of natives wanting to allow for few or no immigrants in their country around 2014, by respondents' educational attainment. The population-weighted average fractions across the 22 countries are 57.8% for natives with less than a high school degree, 52.7% for natives with a high school degree, and 31.9% for natives with a college degree or more.

Figure 5: Share favoring restrictive immigration policies, by respondent's education



Notes: The figure shows, for 22 European countries, the fraction of respondents in the 2014 wave of the European Social Survey (ESS) who stated that their country should allow "few" or "none" immigrants, as opposed to "some" or "many", by education of the respondent. Sampling weights are applied. For Greece, Italy, and Slovakia, this information is not available in the 2014 wave of the ESS, and it is replaced by the most recently available data (2010 for Greece, 2012 for Italy and Slovakia).

The bottom line of this empirical analysis is that the kind of cultural externalities that play a key role in our model seem to matter in determining natives' attitudes towards immigration policy, in addition and possibly more than economic externalities: the ethnic identity of potential immigrants is salient (while it should be irrelevant if immigrants were merely low-skilled workers), and the perceived economic effects, while uncorrelated with estimated effects, are correlated with concerns about the country's cultural life (a particular aspect that should be orthogonal to the economic impact of immigrants).

5 Concluding remarks

We have motivated and studied a model of the effects of immigration flows where cultural externalities are a driving force in addition to standard economic externalities. Contrary to the latter, which favor high-skilled natives and so make some voters favorable to more immigration, cultural externalities make both high- and low-skill natives averse to more immigration, although more so the low-skilled. Evidence from the European Social Survey is consistent with this theoretical structure, supporting our claim that one gains deeper insights into immigration policy by considering the nature and consequences of the cultural externalities generated by immigration. We have also briefly discussed three examples of commitment devices – border infrastructure, immigrants' political rights, and fiscal policy – we may expect natives to acquire in response to the resulting time-inconsistency of the immigration policy. Perhaps it is no accident that these three examples correspond to heated political issues in contemporary Europe. Although the model we have studied is simple and lays no claims to being general, we believe it leads to important insights and, most important, it provides a theoretical framework for more comprehensive studies of immigration policy when cultural concerns play a primary role in shaping attitudes towards migrants in receiving countries. This seems to us a key issue in the present economic and political landscape.

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Appendix: Proofs or propositions

Proposition 1 *The social welfare choice problem is generically time-inconsistent; that is, the no-commitment solution for immigration flows, $\{m_1^{nc}, m_2^{nc}\}$, is generically distinct from the commitment solution, $\{m_1^c, m_2^c\}$.*

Proof. Time-inconsistency follows directly from the comparison of conditions (9) and (11), respectively, for the commitment and the no-commitment cases. Condition (9) is satisfied at the unique commitment solution, while any solution of the no-commitment problem instead requires (11). By the Inada conditions, $m_1^c > 0$. But, for any $m_1 > 0$, $V_2(q,p)$ and $H_2(q,p)$ are distinct and $V_2^i(q,p)$ can be perturbed locally around the commitment solution (m_1^c, m_2^c), which is independent of $V_2^i(q_t)$, to guarantee that (m_1^c, m_2^c) does not satisfy (11). ■

Proposition 2 *Absent cultural externalities, $r^\theta(p) = 0$, $\theta = h, l, i$, the total immigration flow is smaller at equilibrium (with no-commitment) than with commitment:*

$$m_1^{nc} + m_2^{nc} < m_1^c + m_2^c.$$

Moreover, the immigration flow is smaller at equilibrium (with no-commitment) than with commitment in the first period:

$$m_1^{nc} < m_1^c.$$

Proof. Under the Indada conditions, we can without loss of generality restrict our analysis to $m_1 > 0$ in both the commitment and the no-commitment case. Note that $r^\theta(p) = 0$, $\theta = h, l, i$, implies that the commitment problem depends only on q_t (the stock of immigrants) not on p_t (the stock of *non-assimilated* immigrants). As a consequence, $V_2(q,p) = V_2(q)$ and $\frac{\partial V_2(q_2)}{\partial m_1} = \frac{\partial V_2(q_2)}{\partial m_2}$. Replacing into (8) and (9), implies then that the unique solution to the commitment problem satisfies $\frac{\partial V_1(m_1)}{\partial m_1} = 0$. Remember that the weights are normalized so to sum-up to 1 and that immigrants have zero weight in the first period:

$$\begin{aligned} \psi_1^h + \psi_1^l &= 1, \\ \psi_2^h + \psi_2^l + \psi_2^i &= 1. \end{aligned}$$

As a consequence, $m_1 > 0$ implies $\psi_2^h < \psi_1^h$, $\psi_2^l < \psi_1^l$, $\psi_2^i > \psi_1^i$, and $\psi_2^l + \psi_2^i > \psi_1^l$. Given weights ψ_2^θ, any solution for the no-commitment problem satisfies equation (11). Also, for given weights ψ_2^θ, the no-commitment problem, too, depends only on q_t and not on p_t. Recall that $\{m_1^c, m_2^c\}$ satisfies $\frac{\partial V_2(q_2)}{\partial m_2} = \frac{\partial \alpha(q_2)}{\partial m_2}$, while m_2^{nc} satisfies $\frac{\partial H_2(q_2)}{\partial m_2} = \frac{\partial \alpha(q_2)}{\partial m_2}$. But, in this environment, $V_2(q_2) = \sum_{\theta=h,l,i} \psi_1^\theta v_2^\theta(q_2)$, and $H_2(q_2) = \sum_{\theta=h,l,i} \psi_2^\theta v_2^\theta(q_2)$, where $q_2 = m_1 + m_2$. Furthermore, under our assumptions, $v_2^l(q_2) = v_2^i(q_2)$. Using these facts, compare first order conditions (9) and (11), which are rewritten here explicitly for easier reference:

$$\psi_1^h \frac{\partial v_2^h(m_1+m_2)}{\partial m_2} + \psi_1^l \frac{\partial v_2^l(m_1+m_2)}{\partial m_2} = \frac{\partial \alpha(m_1+m_2)}{\partial m_2}, \tag{9}$$

$$\psi_2^h \frac{\partial v_2^h(m_1+m_2)}{\partial m_2} + (\psi_2^l + \psi_2^i) \frac{\partial v_2^l(m_1+m_2)}{\partial m_2} = \frac{\partial \alpha(m_1+m_2)}{\partial m_2}. \tag{11}$$

The change in weights implies that, for a given q_2, the LHS of (11) decreases relative to the LHS of (9). This is so because under our assumptions $\frac{dv_2^l(q_2)}{dm_2} < \frac{dv_2^h(q_2)}{dm_2}$, for any m_2. Therefore, the concavity of $v_2^\theta(.)$ and the convexity of $\alpha(.)$ imply that $m_1^{nc} + m_2^{nc}$ satisfies (11) if $m_1^{nc} + m_2^{nc} < m_1^c + m_2^c$. This result holds for any weight structure $\psi_2^h < \psi_1^h$, $\psi_2^l < \psi_1^l$, $\psi_2^i > \psi_1^i$, that is, for any weight structure associated with $m_1 > 0$. This proves the first part of the proposition.

To prove the second part, notice that equation (10) would be satisfied for a $m_1^{nc} = m_1^c$ if the social welfare weights were constant in m_1; in this case $\frac{dm_2}{dm_1} = -1$ (because in this case $m_1 + m_2$ would be the same under commitment and under no-commitment) and, as a consequence, the no-commitment problem, too, would satisfy $\frac{\partial V_1(m_1)}{\partial m_1} = 0$. However, the social welfare weights are not constant in m_1. Accounting for the dependence of the social welfare weights on $m_1 > 0$, it must be $\frac{dm_2}{dm_1} < -1$ (because in this case $m_1 + m_2$ is smaller under no-commitment than under commitment, as proved above). Equation (10) is then satisfied for $m_1^{nc} < m_1^c$. ■

Proposition 3 *Allowing for cultural externality $r^\theta(p)$, $\theta = h, l, i$, but with no-assimilation, $p_t = q_t$, the total immigration flow is larger at equilibrium (with no-commitment) than with commitment if the cultural externality is sufficiently large for past immigrants:*

$$m_1^{nc} + m_2^{nc} > m_1^c + m_2^c \quad \textit{if} \quad \frac{dr^i(q)}{dm_2} \quad \textit{is sufficiently large}$$

.

However, the immigration flow is smaller at equilibrium (with no-commitment) than with commitment in the first period:

$$m_1^{nc} < m_1^c.$$

Proof. The proof is analogous to the proof of Proposition 2. In this environment it is still the case that the commitment problem depends only on q_t, and so the unique solution to the commitment problem satisfies $\frac{\partial V_1(m_1)}{\partial m_1} = 0$. Under the Indada conditions, we can still restrict to $m_1 > 0$ in both the commitment and the no-commitment case and as a consequence, $\psi_2^h < \psi_1^h$, $\psi_2^l < \psi_1^l$, $\psi_2^i > \psi_1^i$, and $\psi_2^l + \psi_2^i > \psi_1^l$. Furthermore, it is still the case that, for given weights ψ_2^θ, the no-commitment problem, too, depends only on q_t. In this environment, however, differently from the case with no cultural externality, $V_2(q_2) = \sum_{\theta=h,l,i} \psi_1^\theta [v_2^\theta(q_2) + r^\theta(q_2)]$ and $H_2(q_2, p_2) = \sum_{\theta=h,l,i} \psi_2^\theta [v_2^\theta(q_2) + r^\theta(q_2)]$. Under our

assumptions, $v_2^l(q_2) = v_2^i(q_2)$ and $\frac{d[v_2^l(q_2)+r^l(q_2)]}{dm_2} < \frac{d[v_2^h(q_2)+r^h(q_2)]}{dm_2}$, for any m_2. Compare first-order conditions (9) and (11), reproduced here explicitly like in the proof of Proposition 2:

$$\psi_1^h \frac{\partial[v_2^h(m_1+m_2)+r_2^h(m_1+m_2)]}{\partial m_2} + \psi_1^l \frac{\partial[v_2^l(m_1+m_2)+r_2^l(m_1+m_2)]}{\partial m_2} = \frac{\partial \alpha(m_1+m_2)}{\partial m_2},$$

$$\psi_2^h \frac{\partial[v_2^h(m_1+m_2)+r_2^h(m_1+m_2)]}{\partial m_2} + \psi_2^l \frac{\partial[v_2^l(m_1+m_2)+\partial r_2^l(m_1+m_2)]}{\partial m_2} = \frac{\partial \alpha(m_1+m_2)}{\partial m_2} - \psi_2^i \frac{\partial v_2^l(m_1+m_2)+\partial r_2^i(m_1+m_2)}{\partial m_2}.$$

Extending the reasoning behind the proof of Proposition 2, these imply that if $\frac{d[v_2^l(q_2)+r^i(q_2)]}{dm_2}$ is sufficiently larger than $\frac{d[v_2^h(q_2)+r^h(q_2)]}{dm_2}$, that is, if $\frac{dr^i(q_2)}{dm_2}$ is large enough, then $m_1^{nc} + m_2^{nc} > m_1^c + m_2^c$. Otherwise, $m_1^{nc} + m_2^{nc} < m_1^c + m_2^c$. In this environment, therefore, the weight structure might affect whether the $m_1 + m_2$ which solves (11) is greater or smaller than $m_1^c + m_2^c$. This proves the first part of the proposition.

To prove the second part, suppose that at the weight structure determined by m_1^c it is $m_1^{nc} + m_2^{nc} > m_1^c + m_2^c$. Equation (10) is then satisfied for a $m_1^{nc} = m_1^c$ if $\frac{dm_2}{dm_1} = -1$. This would be the case if social weights were constant in m_1. But accounting for the dependence of social welfare weights on $m_1 > 0$, it is $\frac{dm_2}{dm_1} > -1$ (because in this case m_1+m_2 is larger under no-commitment than under commitment). Equation (10) is then satisfied for a $m_1^{nc} < m_1^c$. If instead, at the weight structure determined by m_1^c, it is $m_1+m_2 < m_1^c+m_2^c$, with $\frac{dm_2}{dm_1} < -1$, then equation (10) is still satisfied for a $m_1^{nc} < m_1^c$. ■