Temporary Immigration, Overstaying and Policy under Zero Taxes and under the Correct Migrants’ Fiscal Impact

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* The views expressed in this paper are the author’s only and not necessarily those of the World Bank, its Executive Directors or the governments they represent.

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1. Introduction
The excess-demand for labor associated with the reconstruction and rapid economic growth in Western Europe following WWII led to large inflows of unskilled labor, as did the US demand for cheap labor to work in agriculture and other unskilled-labor-intensive activities. In an attempt to manage these large inflows, host countries implemented temporary immigration (TI) programs (e.g., the Bracero program in the US and the Gastarbeiter program in Germany) whereby foreigners who are offered a temporary job enter on a work visa and return home when their visa expires. The host countries’ objective was to obtain a permanent increase in labor force but not in population. However, these policies typically failed to achieve their objective as a substantial share of temporary immigrants (TIs) failed to return home when their visa expired.

The change from excess-demand to excess-supply of labor occurred in the mid-1970s (following the 1973 oil embargo) when productivity growth fell and unemployment increased. This led to increased concern with the size of the immigrant population, a concern exacerbated by the large number of illegal immigrants who either entered the country illegally or came in legally as TIs or as non-working visa holders (e.g., students and tourists) and stayed after their visa expired. This situation has resulted in a deterioration of natives’ attitudes towards immigrants over time and has increased demand for tighter immigration controls and for reducing inflows of TIs.

This paper deals with the issue of TIs who enter the host country with a temporary work visa and overstay. The analysis focuses on unskilled TIs because that is where host countries’ concern lies.¹ Though host countries are also concerned with illegal entry of

¹ Reasons for host countries’ concern with overstaying of unskilled rather than skilled TIs are as follows: i) skilled migrants tend to integrate more easily into their new environment than unskilled ones who tend to cluster and are more
unskilled TIs, this paper focuses on migrants who remain in the host country illegally after their contract has expired and whose share in the total number of illegal migrants was estimated for 2004 to be at least 36 to 40%. Overstaying is thus an important issue in the US and the same holds for other developed host countries (as occurred with the Gastarbeiter program in Germany and guest-worker programs in France, Switzerland and elsewhere).

This issue is important for developing source countries precisely because it is an important source of concern to host countries. Thus, source country authorities should take the issue seriously if they want to continue to enjoy the benefits obtained from migration. Unless some mutually beneficial arrangement between corresponding host and source countries is achieved, the latter run the risk of paying a high price as further deterioration of natives’ attitudes forces host countries to drastically curtail migrants’ access to their countries.

Migrants generate government revenues (from income, property and sales taxes, social security payments, etc.) as well as outlays (e.g., on public education). and the size (and sign) of their net fiscal impact is a matter of debate among academics (due to the use of different definitions, time periods, groups of migrants – e.g., legal, illegal, with or without their offspring, etc) and among politicians (in part due to ideological reasons).

attached to their culture; ii) though the share of skilled migrants has increased in recent years, unskilled migrants continue to constitute the bulk of immigrants from developing countries; iii) unskilled migrants’ net fiscal impact tends to be perceived – even if erroneously – as being negative (more on this in Section 5), which is not the case for skilled migrants; iv) skilled migrants tend to generate other positive externalities – including on economic growth by raising the host country’s average level of human capital (Lucas 1988) while unskilled migrants lower it and are thus likely to have the opposite impact; v) the illegal job market is less attractive for skilled labor as labor demand is essentially for unskilled labor (e.g., in construction, agriculture, the hospitality industry and domestic services); vi) skilled migrants have more to lose if caught working in the illegal job market, namely their professional reputation and value of their human capital; and vii) permanent residence is harder to obtain for unskilled than for skilled TIs.

2 The US Department of Homeland Security estimates for 2004 that overstaying TIs amounted to at least 3.6 million out of 9 to 10 million illegal immigrants or to at least 36 to 40 percent of the total.
This paper distinguishes between this net fiscal impact and that of the TI policy itself. The latter is likely to be very small compared to the former and is not an objective of TI policy, whose aim is to raise the size of the labor force but not that of the population. I argue in the penultimate section that existing studies have greatly underestimated the true contribution immigrants make to government revenues, leading to a sub-optimal TI program size and welfare impact.

The remainder of the paper is organized as follows. Section 2 briefly describes the policy instruments. Section 3 presents the model. The solution and some implications are provided in Section 4. Section 5 incorporates the issue of taxation and the provision of public goods and services. Section 6 concludes.

2. The Policy
The TI policy examined here is comprised of three policy instruments whose levels maximize the host country government’s objective function. The instruments are:

i) the share of TIs’ income ($\alpha$) it takes and which it returns to them if they return home when their contract elapses, or keeps if they overstay;

ii) the probability ($p$) of identifying firms employing overstaying TIs; and

iii) the quota of TIs ($N$) or size of the TI program.

3. Model
Assume individuals live and work for two periods. Unskilled labor is the only factor of production. For simplicity and without any impact on the results, and following de la Croix and Docquier (2010), further assume native workers are also the employers (or firms). There is therefore no strategic interaction between native employers and
population. There are six (groups of) “players”: contract-holding or legal TIs, overstaying or illegal TIs, firms employing the legal TIs (legal employers), firms employing the illegal TIs (illegal employers), the native population, and the government, though firms may employ both legal and illegal immigrants (e.g., in agriculture, construction, the hospitality industry, etc)\(^3\) and native workers are assumed to be the employers. Risk neutrality is assumed throughout and, given the excess-demand for entry into developed host countries, the immigration quota is assumed to be binding.\(^4\)

Natives’ utility is assumed to be linear in consumption or income (as there is no saving in this model) and in either a congested public good or in a common property resource, namely social well-being (i.e., social capital) which increases as more natives use it and either increases or falls with the number of immigrants (Schiff 1992, 2002). Thus, \(U(Y, S) = aY - bS\), where \(a, b > 0\), \(Y\) is income and \(S\) is social cost (the negative of social well-being). The host country government’s objective function may however weigh immigrants’ contribution to natives’ profits differently than native employers.

3.1. The temporary immigrants’ problem

Assume an aggregate good \(y\) produced with one factor, labor. The native labor force is given and is normalized to one. The number of legal TIs, \(N\), is determined by policy. The production function is

\[ y = f(L), \quad (1) \]

\(^3\) Thus, the distinction between legal and illegal employers is not clear-cut. However, we maintain the distinction here for the sake of expositional clarity.

\(^4\) For an analysis of motives for restricting entry into host countries, see Hanson (2007, 2010). Differences between trade liberalization and restrictive immigration policies’ impact are examined in Hatton and Williamson (2005).
where \( L \) stands for the labor force, inclusive of legal and illegal immigrants. Denoting the number of illegal migrants by \( N_i \), we have

\[
L = 1 + M = 1 + (N + N_i) = 1 + (1 + v_\psi)N,
\]

where \( M \) is the sum of legal and illegal TIs, \( v_\psi \) is the share (derived below) of the previous period’s legal migrants who overstayed and are now in the country illegally.

Native workers’ wage rate, \( W^N \), is equal to their marginal product, i.e., \( W^N = 1 \). Legal TIs are paid a wage rate \( W < 1 \), i.e., they are paid less than their marginal product and thus less than native workers, even in cases where they may appear to be paid the same.\(^5\) At the end of the first period, TIs decide whether to return home or remain in the host country and work in the illegal job market for a wage rate \( X < W \), an assumption supported by various studies, e.g., Rivera-Batiz (1999).\(^6\) I assume for simplicity and without impact on the results that the home-country wage rate is equal to zero.

Illegal employers’ probability of being detected is \( p \in (0,1) \), implying an expected benefit from overstaying equal to \( EB = (1 - p)X \). The government deducts a share \( \alpha \) of TIs’ first-period income \( W \), which is returned to them if they leave when their contract expires and which they forfeit otherwise.\(^7\) TIs also experience a heterogeneous psychic cost \( v \in [0,1] \) of being away from home (and on the run from the law).

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\(^5\) Various ways of paying legal TIs less than natives exist: i) legal TIs pay social security but do not benefit from it since they must return home when their visa expires; ii) in some activities (e.g., agriculture) where TIs may be more isolated, employers may provide them with food and lodging at non-competitive prices (made easier as the barter arrangement – of labor for food and lodging – reduces the transparency regarding the (implicit) terms of trade; and iii) TIs are typically tied to the employer with whom they signed the contract and have thus less bargaining power than natives.

\(^6\) I assume \( X < W \) because illegal employers often fail to comply with minimum wage laws or other labor market regulations (as illegal workers have no legal recourse). For instance, Rivera-Batiz (1999) found that male (female) Mexican legal immigrants in the US earn 41.8% (40.8%) more than undocumented ones and that the difference in characteristics explained less than half of that wage gap. He also found that undocumented immigrants who were legalized after the 1986 US immigration policy reform showed rapid wage growth in 1986-90, with the gains due mostly to the change in legal status and not to changes in migrant characteristics over time.

\(^7\) This has been done, for instance, in Taiwan by companies that recruit foreign workers, and similar programs existed in the UK for migrants from some of the new EU member countries working on three-month contracts in the hotel
Thus, the total cost of overstaying is \( C = \alpha W + v \). TIs’ decision to overstay (return home) depends on whether \( EB > (<) C \). Denote by \( \nu'_v \) the value of \( v \) that solves the equation \( EB = C \), so that \( (1 - p)X = \alpha W + \nu'_v \), or

\[
\nu'_v = (1 - p)X - \alpha W, \quad p \in (0,1), W \in \left(X, W^N\right). \tag{2}
\]

Thus, migrants with psychic cost \( v < (>) \nu'_v \) overstay (return home) at the end of period 1. Assuming \( v \) is distributed uniformly, a share \( \nu'_v (1 - \nu'_v) \) overstays (returns home).

3.2. The legal and illegal employers’ problem

Employers earn a profit, \( \pi \), from hiring a legal TI and paying a wage rate \( W < 1 \), with the profit \( \pi = 1 - W \). Illegal employers pay overstaying TIs a wage rate \( X < W \) and have a probability \( p \) of being detected. An illegal employer’s expected profit when detected depends on the penalty imposed by the government. Two types of penalties are examined here: confiscation of illegal employers’ profit \( (1 - X) \) and confiscation of the firm’s output, equal to 1. In the former case, illegal employers’ expected profit, \( \pi' \), is equal to \( \pi' = (1 - p)(1 - X) \). In the latter case, their expected profit is \( \pi' = 1 - p - X \). The impact of the two types of penalties is examined in Section 4 in the case where \( X \) is exogenous and where it is endogenous.

3.3. The native population’s problem

Unskilled TIs may affect i) natives’ income, and ii) natives’ social well-being or benefit they obtain from public goods and services. The former is examined in Section 3.3.1 and the latter in Section 3.3.2.
3.3.1. Impact on the native population’s income

A. Analysis

An ongoing debate is whether unskilled TIs affect unskilled natives’ wage rate or not. Three models have been used to examine this issue. The first one assumes i) an aggregate good produced with labor and a fixed factor (e.g., capital), and ii) perfect substitution between native and immigrant labor. In this case, the diminishing marginal product of labor implies that immigration has a negative impact on native wages. The second model maintains assumption i) but changes assumption ii). It posits that native and immigrant labor are either imperfect substitutes or complements, and immigration has either no impact or a positive impact on native workers’ wage rate.

The third model maintains assumption ii) but changes assumption i). Rather than assuming more factors (2) than goods (1), the model considered is the two-country, two-good, two-factor open economy model, where the host (source) country is capital-(labor-) abundant. Assuming first that the countries are small, goods’ prices are given, and immigration only changes the host country’s composition of output – with an increase (decrease) in the output of the labor (capital)-intensive importable \( Y \) (exportable \( X \)) – but has no impact on factor prices (see also Panagariya (2006) on this issue).\(^8\)

Relaxing the small-country assumption and assuming a sufficiently large immigration level and host country size, the increase (decrease) in output of \( Y \) (\( X \)) associated with immigration is expected to reduce \( Y \)’s relative price and reduces the wage rate. However, migration reduces (raises) source country output of \( Y \) (\( X \)), and world output of \( X \) and \( Y \) may remain unchanged under identical technologies and/or

\(^8\) This assumes an internal solution, with both goods being produced.
institutions, and goods and factor prices remain unchanged. Since the host country benefits from superior technology and/or institutions, its labor productivity and wage rate are higher as well. This difference is crucial in order for migration to have a negative impact on native wages as it results in larger output changes in the host than in the source country. Thus, any impact on input prices requires a sufficiently i) high level of migration (large source country population and incentive to emigrate, and a liberal immigration policy), ii) large technological/institutional superiority in the host country, and iii) a large host country. Thus, under such strict conditions, one would not expect immigration to have a significant impact on host country wages.

B. Evidence

A large number of empirical studies have examined migrants’ impact on native workers. Borjas (2003) finds that immigration reduces US native wages (by up to 7.5%), thus providing support for the first model. On the other hand, Ottaviano and Peri (2006) find that immigration between 1980 and 2000 raises the US average native wage by 2 percent – thus providing support for the second model – and its effect on unskilled wage was either nil or moderately negative. Peri (2007, 2011) finds that natives and immigrants in the same education/experience group are imperfect substitutes and a zero correlation between 1960-to-1985 immigration to California and natives’ wage and employment in the state.

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9 Trade falls as migration increases, the reason being that the two countries’ endowments become more similar, with the host (source) country becoming more (less) labor abundant.

10 Unskilled wages rise if unskilled migrants enable skilled natives to get a job. An example is nannies who replace skilled mothers who were taking care of their children and enables them to obtain a skilled job, thereby raising the demand for unskilled labor (Kremer and …).
The third model’s prediction is supported by a large number of studies, including Card (2001) for the US, Angrist and Kugler (2003) for the EU, and Dustmann et al. (2005) and Lemos and Portes (2008) for the UK. These and other studies generally find a small or no impact of immigration on wages of native workers. This holds even for the UK where the inflow of immigrants (from the new EU member countries) was one of the largest in British history. These results are confirmed by Longhi et al. (2006) who provide an overview of this literature. They perform a meta-analysis and conclude that if immigration has any effect on native workers, it is quite small. 11

Thus, much of the evidence indicates that immigrants’ impact on native wages is either small or non-existent, and may even be positive. Consequently, I assume that TI has no impact on native wages, an assumption reflected in the production function (1) where native labor’s marginal product and wage rate, \( W^N = 1 \), is independent of the size of the TI labor force. In other words, \( W^N \) is assumed to be exogenous (and the same holds for legal migrants’ wage rate \( W \)).

3.3.2. Impact on natives’ social well-being or benefit from public goods

The impact of migrants examined here can be interpreted either as their impact on natives’ social well-being or as their impact on natives’ benefit from public goods. The former is examined in Section A and the latter in Section B.

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11 Other studies have examined the impact of immigration on the unemployment of host countries’ natives. Lemos and Portes (2008) find little evidence that the large inflow of immigrants contributed to an increase in unemployment in the UK. Similarly, Malchow-Moller et al. (2009) find in the case of Denmark that low-skilled native workers are less likely to lose or leave their job when the firms employing them hire immigrants.
A. Social well-being

Natives’ welfare may in principle be enhanced or reduced by TIs’ social impact. Assume that, given the size of the native labor force $L$, natives consider $N = N_0$ as the TI level that provides an optimal degree of diversity, i.e., that maximizes their social well-being or minimizes social cost $S$.\(^ {12} \) This can be represented in the case of legal TIs by a function such as $S^L(N) = \beta(N^2 - 2N_0N)\beta > 0, N_0 > 0$. Assume for simplicity that $N_0 = 0$.\(^ {13} \) Then:

$$S^L(N) = \beta N^2; \beta > 0, N_0 > 0. \tag{3}$$

The choice of quadratic function for $S^L$ and $S^I$ (see below) is based on the assumption that legal and illegal migrants’ marginal social impact increases with the number of migrants.

Since a share $\nu_\psi$ of TIs overstays (Section 3.1), their number is $N_I = \nu_\psi N$ (where $I$ stands for ‘illegal’). The social cost they generate for natives, $S^I$, is

$$S^I = \gamma(\nu_\psi N)^2, 0 < \beta < \gamma. \tag{4}$$

The reason $\gamma > \beta$ is that natives resent the fact that TIs, who are offered the benefit of a higher wage rate, repay it by reneging on their commitment to return home when their contract expires, and because they are concerned that the presence of large numbers of illegal TIs may undermine the rule of law (Hanson, 2007). In other words, $\gamma - \beta > 0$ is the additional cost associated with illegality.

\(^{12}\) In this case, $S$ declines with the number of legal TIs up to $N = N_0$, rises thereafter, reaches zero at some point and is positive beyond it. A North-South model with a similar impact of migrants on natives’ social well-being or social capital function, and which examines both immigration and trade policy, is provided in Schiff (2002).

\(^{13}\) This assumption changes the optimal value of $N$ by $-N_0$ when $N_0 > 0$, nothing else.
In each period, the host country has $N$ legal and $N_I$ illegal TIs who failed to leave at the end of the preceding period and overstayed. Their social cost is:

$$S(M) = S^L + S_I = \beta N^2 + \gamma N_I^2 = \beta N^2 + \gamma (v_q N)^2.$$  \hspace{1cm} (5)

B. Congestion of public goods

Note that this model can be interpreted alternatively as follows. Assume natives make no distinction between themselves and immigrants, and that the cost $S$ in equation (5) reflects the cost of congestion of public goods and services, where access to it or its quality declines (or its cost increases) with the number of users, and does so at an increasing rate. A model where migrants’ cost is related to the increased congestion of public goods is Chao et al. (2008). That interpretation also permits a differentiation between legal and illegal migrants’ costs, with the latter being higher due to a greater use of public goods and services by illegal than legal TIs, an issue that is not examined in Chao et al. (2008). The social impact interpretation is used in the remainder of the paper, though the congestion interpretation is equally valid.

3.4. The government’s problem

Developed countries’ immigration policies reflect a certain level of ambivalence towards illegal immigrants because of the tension between employers' desire for cheap labor and society’s view on the optimal degree of diversity. This tension is reflected in the government’s objective function examined below.

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14 An example is the cost of an increase in the number of cars at rush hour in large metropolitan areas around the world.
The immigration policy is an equilibrium outcome of two major forces, the private sector’s desire for profits and the population’s desire for optimal diversity. As mentioned in the Introduction, the policy’s net fiscal impact is likely to be small and is not an objective of the policy (or at least not stated as such). Consequently, the policy’s net fiscal impact is excluded from the government’s objective function.

The government maximizes its objective function \( V \) with respect to \( p, \alpha \) and \( N \), with \( V = (\pi \lambda + \pi^I \phi \nu \psi)N - \beta N^2 - \gamma (\nu \psi N)^2 \), where \( \pi(\pi^I) \) is the legal (illegal) migrants’ profits, \( \lambda(\phi) \) is the weight the government places on legal (illegal) employers’ profits [with \( \lambda \geq \phi \)] and the last two terms represent the social cost of legal and illegal TIs.

4. Solution

As mentioned earlier, the government can penalize illegal employers who are detected in a number of ways. Two types of penalties are considered here, with the government confiscating illegal employers’ i) profits, and ii) output. Confiscation of profits (output) is examined in Section 4.1 (4.2). I also examine, for both types of penalties, the case where \( X \) is exogenous and where it is endogenous.

4.1. Confiscation of profits

In this case, illegal employers’ entire profits (i.e., the profits in the absence of detection, \( 1 - X \)) are confiscated with probability \( p \). Thus, expected profits are \( \pi^I = (1 - p)(1 - X) \).

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15 Native labor’s interests regarding migrants’ impact are abstracted from since the wage rate is fixed at \( W^N = 1 \).

16 Lee and Miller (2000) who examined immigrants’ net fiscal impact, state: “Perhaps the most important conclusion, on which most analysts agree, is that the overall fiscal consequences of altering the volume of immigration would be quite small and should not be a major consideration for policy.” This holds a fortiori for the much smaller public revenue impact from the policy itself.

17 This may be due to concentration of benefits and diffusion of costs, or to the arguments developed in Grossman and Helpman (1994).
A. Exogenous illegal migrants’ wage rate

As noted in the previous section, the host country government’s objective function is

\[ V = (\pi \lambda + \pi' \phi) N - \beta N^2 - \gamma (v_\psi N) \], \quad v_\psi = (1 - p)X - \alpha W. \]  

(6)

Maximizing \( V \) with respect to \( \alpha, p \) and \( N \), we obtain:

\[ v_\psi^* = \frac{\phi \pi' / \gamma}{\lambda / \beta}; N^* = \frac{\lambda \pi}{2 \beta}; M^* = \frac{\pi \lambda}{2 \beta} + \frac{\pi' \phi}{2 \gamma}; V^* = \frac{\pi^2 \lambda^2}{4 \beta} + \frac{(\pi')^2 \phi^2}{4 \gamma}. \]  

(7)

Note that \( v_\psi = X - (pX + \alpha W) \). Thus, \( p \) and \( \alpha \) enter in (7) symmetrically. Thus, one can solve for \( pX + \alpha W \) but not for \( p \) and \( \alpha \) individually, with \( (pX + \alpha W)^* = X - \frac{\phi \pi' / \gamma}{\lambda / \beta} \).

The optimal size of the TI program, \( N^* \), is equal to the ratio of the marginal profits generated by legal TIs (as valued by the government) and their marginal impact on natives’ social cost. Interestingly, \( N^* \) depends only on “legal” parameters \( \lambda \) and \( \beta \) (and not on “illegal” ones) even though it affects the level of \( N_l^* \). Similarly, \( N_l^* \) depends only on “illegal” parameters \( \phi \) and \( \gamma \). The share of overstaying TIs, \( v_\psi^* \), is equal to the ratio of the marginal impact of illegal TIs on profits (as valued by the government) and the social cost, divided by the same ratio for legal TIs. In other words, the share of legal TIs who overstay rises with illegal TIs’ marginal benefit-cost ratio and falls with legal TIs’ marginal benefit-cost ratio, where the benefit (cost) is defined as the impact on the native employers’ profits (population’s social cost). Not surprisingly, the total number of TIs, \( M^* \), and its welfare impact, \( V^* \), increase with the impact on legal and illegal employers’ profits and with the parameters of the government’s valuation of these profits, and decrease with the parameters of their impact on natives’ social cost.
B. Endogenous illegal migrants’ wage rate

Assume a perfectly competitive market for legal and illegal TIs’ labor services, so that \( \pi = \pi' \), i.e., the expected profits generated by legal and an illegal TIs must be identical.

With \( W \) is given exogenously, the illegal migrants’ wage rate, \( X \), must take a value such that legal and illegal migrants’ wage rates are equalized. From \( \pi = 1 - W \) and \( \pi' = (1 - p)(1 - X) \), it follows that \( 1 - W = (1 - p)(1 - X) \), \( p = (W - X)/(1 - X) \) and \( (1 - p)X = W - p \), with \( v_\psi = (1 - p)X - \alpha W = (1 - \alpha)W - p \). The function \( V \) is now:

\[
V = \{\lambda + \phi[(1 - \alpha)W - p]\}[\pi N - \beta N^2 - \gamma[(1 - \alpha)W - p]^2] N^2. \tag{8}
\]

The solution is:

\[
v_\psi^* = \frac{\phi / \gamma}{\lambda / \beta}; N^* = \frac{\lambda \pi}{2 \beta}; N_I = \frac{\phi \pi}{2 \gamma}; M^* = \frac{\pi}{2} \left( \frac{\lambda}{\beta} + \frac{\phi}{\gamma} \right); V^* = \frac{\pi^2}{4} \left( \frac{\lambda^2}{\beta} + \frac{\phi^2}{\gamma} \right). \tag{9}
\]

Below are some back-of-the-envelope calculations. As noted in footnote 6, Rivera-Batiz (1999) found the legal migrant wage rate \( W \) to be about 42\% higher that that of the illegal migrant wage rate \( X \) for Mexican immigrants, with more than half the wage gap due to difference in legal status and less than half to difference in characteristics (see footnote 6). So, assume the wage gap due to legal status difference is some 25\%, i.e., \( W = 1.25X \). Say \( X = .4 \) or 40\% of the native wage rate. Then, \( W = .5 \), and \( p^* = .1/6 = .167 \) (one out of every six illegal employers is identified). The share of legal migrants who overstay, \( v_\psi^* = .333 - .5\alpha \). Say \( \alpha = .4 \), then \( v_\psi^* = .133 \). Thus, if the government takes 40\% of legal migrants’ wage rate (and returns it if they leave when their contract expires), the share of legal migrants who overstay is 13.3\%. 
4.2. Confiscation of output

In this case, the government confiscates illegal employers’ entire output (equal to 1 unit per illegal TI) with probability $p$, i.e., they confiscate an expected amount equal to $p$. The sequence of events is as follows: illegal employers produce the aggregate good, then pay their workers a wage rate equal to $X$, and then sell the output. Given that $p$ is the expected amount that is confiscated and that their labor cost is $X$, expected profit is $\pi' = 1 - p - X$.

A subscript “1” is added for variables in this section whenever there is a need to differentiate them from those in Section 4.1, which have no subscript.

A. Exogenous illegal migrants’ wage rate

The solution in this case appears to be identical to the one in (7) but it is not because $\pi'$ is not. In fact, $\pi' = (1 - p)(1 - X) = 1 - X - p + pX$ while $\pi'_1 = 1 - X - p_1$. Though it seems likely that $\pi'_1 < \pi'$, the fact that there is no explicit solution for $p$, only for $pX + \alpha W$ means that we cannot be sure. As long as $p_1 > (1 - X)p$, it follows that $\pi'_1 < \pi'$.

B. Endogenous illegal migrants’ wage rate

In this case, $\pi = \pi'$, i.e., $1 - W = 1 - X - p_1$ or $p_1 = W - X$. Since $W$ is exogenously given, $\pi'_1 = \pi'$, and all the results remain unchanged with those in Section 4.1, part B, except of course for the values of $p$ and $X$ since $p_1 = W - X_1$ and $p = (W - X)/(1 - X)$.
In other words, the government may impose a harsher penalty on illegal employers but it is fully compensated by changes in other variables. For an identical value of $p, X_1 < X$, i.e., the market reacts and the illegal TIs’ wage rate falls.

Once gain, assume $W = .5$ and $X = .4$, and $\alpha = .4$. Then, $p^* = .1$ and $v_p^* = .36 - .6\alpha = .12$.

5. Implications

First, it is clear that one cannot solve for $\alpha$ and $p$ individually, only for a combination of the two, the reason being that $V_p/W = V_\alpha$ (see equation (6)). Thus, the government can maximize its objective function $V$ by choosing any value of $\alpha \in (0,1)$ and $p \in (0,1)$ such that $(1-\alpha)pW = \beta/\gamma$ is satisfied. The fact that the government has such policy flexibility is important because developed host countries’ norms may restrict the value of $\alpha$ to, say, $\alpha \leq \hat{\alpha}$, so that legal TIs have at least a (developed-country definition of a) subsistence-level income of $(1-\hat{\alpha})W$. Given the government’s policy flexibility, it is able to select a value of $p^* \geq (1-\hat{\alpha})W - \beta/\gamma$ such that the restriction $\alpha \leq \hat{\alpha}$ holds and its objective function $V$ is maximized.

Second, when the illegal wage rate is endogenous, harsher penalties on the illegal employers who are identified does not affect them because of the endogenous reduction in the wage rate they pay illegal TIs. The ones affected by this are the illegal TIs themselves.

Third, the worsening of attitudes towards immigrants in recent years can be represented by an increase in $\beta, \gamma$ or both. An increase in $\beta$ reduces the size of the
program and its welfare impact, while an increase in $\gamma$ leaves the size of the program intact but also reduces the program’s welfare impact.

Finally, assume an economic boom due to a positive technology shock that raises native labor’s marginal product and wage rate from $W^N = 1$ to $W^N = \mu > 1$, it follows that the size of the program and its welfare impact increase. This holds whether $W$ remains unchanged or increases by a smaller than $\mu/W > \mu$ (a most likely outcome as native wages are likely to increase more than those of migrants). Thus, the size of the program behaves pro-cyclically, increasing with booms and decreasing with busts. In fact, immigration to the US (see Passel and Cohn, 2010, on unauthorized immigration) fell during the Great Recession, an outcome that obtains under an optimal immigration policy.

6. Accounting for Immigrants’ Major Tax Contribution

The analysis so far has examined TI policy in response to firms’ wish for higher profits and the population’s views on the optimal degree of diversity. This section incorporates the issue of TIs’ net fiscal impact. A number of studies on this issue have provided a detailed accounting of migrants’ tax contributions and use of public services. The impact has been estimated for a specific year, a generation, and all future generations;\textsuperscript{18} for the current migrant stock and new migrant inflows; at the federal, state, local, and at all three levels; for skilled and unskilled migrants; legal and illegal ones, etc., with some studies obtaining a positive and others a negative net fiscal impact.

\textsuperscript{18} Auerbach and Oreopoulous (1999, 2000) provide theoretical analyses of the latter impact.
A report by the non-partisan Congressional Budget Office (CBO) states that “over the past two decades, most efforts to estimate the fiscal impact of immigration in the United States have concluded that, in aggregate and over the long term, tax revenues of all types generated by immigrants—both legal and unauthorized—exceed the costs of the services they use.” This does not mean that all state and local governments benefit, as federal revenues are not always shared in proportion to the services immigrants use.19

Surprisingly, a review of the literature on immigrants’ net fiscal impact indicates that an important contribution TIs make to the host country’s tax revenues has been ignored. Employers hire TIs to increase their profits and they pay taxes on them. Since these taxes would not be forthcoming in the absence of the TIs, a correct accounting of TIs’ net fiscal impact should include the additional taxes paid by their employers.

How important is this contribution? A back-of-the-envelope calculation is as follows: US corporations paid a total of US$ 1.665 trillion in 2010. The average share of labor in GDP is, say, around 70% (it has in fact declined since the mid-70s and is now lower), with the share of capital equal to some 30% (or more, but assume it is 30%). This means that 30% of corporate taxes, or US$ 500 billion, are based on income generated by capital.

19 Regarding undocumented or illegal immigrants, the CBO (2007) finds that the net fiscal impact at state and local levels is negative. Camarota (2004) finds that though over half pay payroll taxes (with a benefit for Social Security and Medicare programs of $7 billion annually), the costs to the federal government are higher by about $10.4 billion; though Wang and Holahan (2003) argue that the net fiscal cost is smaller than Camarota’s figures show as 37% of the immigrant households he claims received Medicaid were households where all the recipients were native citizens. Regarding immigrants in general, Smith and Edmonston (eds.) find that on average, US immigrants pay $1,800 more in taxes than they receive in public benefits; and over their lifetime, their net fiscal impact and that of their immediate descendants is $80,000. Lee and Miller (1998) found, for tax revenues of all types and at all levels, that they exceed the cost of public services immigrants use, with the fiscal balance positive (negative) (positive) for immigrant individuals (households) (immigrants and all their surviving children, i.e., long-term). Storesletten’s (2003) study on Sweden finds a positive (negative) (negative) fiscal impact for young (older) (average) immigrants, while Mayer’s (2005) study on Austria finds a positive long-term fiscal impact.
The number of immigrants in the US is about 37.5 million or around 12% of the US population. Assuming the same capital/labor shares for immigrant and native labor activities, it follows that the share of taxes paid by corporations associated with capital ‘employed’ by immigrant labor is some US$ 60 billion (12% of US$ 500 billion). This figure is large compared to the figures, positive or negative, that studies have found for immigrants’ annual net fiscal impact.

The decline in the share of labor in GDP and the rise in the share of capital means that the figure may be higher than US$ 60 billion. Second, since immigrants tend to move to host countries in order to work, they are likely to have a higher rate of labor force participation than natives, and the 12% used may be an underestimate of their share in the labor force. Third, the figures provided are for the corporate part of the economy and not for the entire private sector. Thus, the US$ 60 billion are likely to underestimate the actual contribution migrants make to tax revenues.

The analysis below examines this issue in the context of the policy examined. Assume for simplicity – and without impact on the main point of this section – that there are no sales or property taxes and that illegal employers and illegal migrants do not pay any taxes. The only taxes are income taxes on native and legal immigrant labor and on legal employers, with firms taxed at rate $\tau$ and legal immigrants at rate $t$.

Further assume that the illegal employers’ detection technology is $p = c - a$, i.e., the cost of the resources devoted to detection is $c = a + p$. Then, the government’s revenue from the policy is $G = aW - a$ and the objective function under the “standard” measure of the net fiscal surplus is:

$$V = \left[ (1 - \tau)\pi + \nu_x \pi^r \right] \lambda N + \left[ (W - Z) + (aW - a - Z^r) \nu_x \right] N - \beta N^2 - \gamma (\nu_N)^2, \quad (9)$$
where $Z(Z^I)$ is the value of public services obtained by legal (illegal) TIs, $v_x = v_x + Z^I$, the first square bracket shows employers’ net profits and the second one shows the standard measure of TIs’ net fiscal impact (per TI), both measured per legal TI. 20

The results, based on the standard measure of the net fiscal impact, are:

$$v_x^* = 0, p^* = \frac{1}{1 + X}, N_x^* = \frac{(1 - \tau)\pi + (tW - Z)}{2\beta} ; V_x^* = \beta\left(N_x^*\right)^2. \quad (10)$$

However, the taxes paid on the profits generated by the TIs, $\tau\pi$, should be included in TIs’ net fiscal impact in equation (10). In other words, the objective function should be:

$$\tilde{V} = \left[(1 - \tau)\pi + \tilde{v}_x\pi^I\right]N + \left[(\tau\pi + tW - Z) + \left(\tilde{a}W - a - Z^I\right)\tilde{v}_x\right]\tilde{N} - \beta\tilde{N}^2 - \gamma\left(\tilde{v}_x\tilde{N}\right)^2, \quad (11)$$

where the second square bracket shows the correct measure of TIs’ net fiscal impact.

The solution is:

$$\tilde{v}_x^* = 0, \tilde{p}^* = \frac{1}{1 + X}, \tilde{N}_x^* = \frac{\pi + tW - Z}{2\beta} ; \tilde{V}_x^* = \beta\left(\tilde{N}_x^*\right)^2. \quad (12)$$

Thus, the size of the program and its welfare impact are larger under the correct than under the standard net fiscal impact. As expected, $\partial \tilde{N}_x^* / \partial \beta < 0, \partial \tilde{N}_x^* / \partial Z < 0, \partial \tilde{N}_x^* / \partial \lambda \pi > 0, \partial \tilde{N}_x^* / \partial t > 0$, and the same holds for welfare $\tilde{V}_x^*$. In other words, both the size of the TI program and welfare impact fall with the social cost from legal TIs and with the value of public services they consume, and rise with the income tax they pay and with the profits they generate for legal employers as well as the weight of these profits in the government’s objective function.

The term $\pi / 2\beta$ is equal to the marginal pre-tax profits divided by the marginal social cost legal TIs generate. Welfare in this case is

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20 One can easily include other tax revenues, $T$, such as sales and property taxes, by substituting $(tW + T)$ for $tW.$
\[ \hat{V}_e^* = \beta \left( \hat{N}_e^* \right)^2 = \beta \left( N_e^* + \frac{\tau \pi}{2 \beta} \right)^2 = \beta \left( N_e^* \right)^2 + \tau \pi N_e^* + \frac{(\tau \pi)^2}{4 \beta} = V_e^* + \left[ \frac{\tau \pi N_e^* + (\tau \pi)^2}{4 \beta} \right]. \] (13)

Thus, welfare under the correct calculation of legal TIs’ contribution to tax revenues is greater than under the standard measure by the total tax revenues, \( \tau \pi N_e^* \), they generate (plus the marginal tax revenue squared over four times the marginal social cost).

8. Conclusion

This paper examined the issue of temporary immigration (TI) and the overstaying problem in the framework of a policy that consists of three policy instruments and maximizes the government’s objective function, defined as the weighted sum of the legal and overstaying TIs’ impact on profits, government revenue from the policy and social well-being. The main results are: i) the share of legal TIs who overstay is equal to the ratio of the marginal impact of illegal TIs on profits (as valued by the government) and on natives’ social cost, divided by the same ratio for legal TIs. ii) The number of legal and illegal TIs is equal to the ratio of the marginal profits (as valued by the government) and marginal social cost generated by them. iii) TIs’ welfare impact increases with the profits they generate and falls with the legal and illegal TIs’ impact on social cost. iv) There is no explicit solution for the TI income share taken by the government (and forfeited by overstaying TIs) or the illegal employers’ detection probability, only for their linear combination, which provides useful policy flexibility. v) under endogenous illegal TIs’ wage rate, a harsher penalty on illegal employers is compensated by a reduction in illegal TIs’ wage rate (or in a change in the detection probability) and does not affect
illegal employers’ profits, and vi) TIs’ net fiscal impact is greater than is found in the literature. , and so is the size of the program and its welfare impact.

Two points are worth making here. First, the analysis has abstracted from the possibility of screening potential migrants before they leave their home country. This can be incorporated in the analysis and has implications for the issue of trade in services and the temporary movement of persons (Mode IV) as well as for the issue of cooperative arrangements between the host and source countries. Second, the analysis has abstracted from illegal entry into the host country. This important issue is examined in Schiff (2004) in a different context and can also be incorporated in the analysis.

21 Some (small) programs exist whereby the sending country’s government screens workers for temporary/seasonal migration who can repeat migrate if their behavior in the host country is deemed to be satisfactory (for instance, Mexico and Canada have a program whereby Mexican citizens spend part of the year working in the Canadian agricultural sector). This type of arrangement is the product of negotiations between governments rather than between potential employers and either the government or private firms in the sending country.
References


Congressional Budget Office. 2007. The Impact of Unauthorized Immigrants on the Budgets of State and Local Governments. Congress of the United States (December).


Mimeo, Harvard University

Lemos, Sara and Jonathan Portes. 2008. “New Labour? The Impact of Migration from
Central and Eastern European Countries on the UK Labour Market.” IZA Discussion Paper No.
3756 (October).

and Their Descendants: Beyond the Immigrant Household,” in James P. Smith and Barry
Employment of Natives in Regional Labour Markets: A Meta-Analysis.” IZA Discussion Paper
No. 2044, Institute for the Study of Labor (IZA).

Monetary Economics.

Accounting Analysis.” Empirica 32: 181-216.

Ottaviano, Gianmarco I. P. and Giovanni Peri. Forthcoming. “Rethinking the Effects of

Brookings Institution Press, 229-244.

Down Sharply Since Mid-Decade.” Pew Hispanic Center (September 1).

Public Policy Institute of California 8 (3).

________. 2011. “Rethinking the Area Approach: Immigrants and the Labor Market in

Porter, Eduardo “Illegal Immigrants are Bolstering Social Security with Billions,” New

analysis of earnings of legal and illegal Mexican immigrants to the United States.” Journal of

Schiff, Maurice. 1992. “Social Capital, Labor Mobility, and Welfare: The Impact of
Uniting States.” Rationality and Society 4: 157–175.


to the Guest-Worker Program.” IZA Discussion Paper No. 1401 (November).

Smith, James P. and Barry Edmonston (eds.). 1997. The New Americans: Economic,
Demographic, and Fiscal Effects of Immigration. Washington, DC: National Research Council,
National Academy of Sciences Press (pp. 349, 351).


Wang, Marie and John Holahan. 2003 (May). “The Decline in Medicaid Use by
Noncitizens since the Welfare Reform,” Health Policy Online No. 5, The Urban Institute.