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Assimilating under Credit Constraints: Public Support for Private Efforts

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Abstract

We examine the effect of borrowing constraint facing new immigrants on the process of their assimilation in the new society. We shall do so in a two-period model. In period one, immigrants invest, with some costs to them, in trying to assimilate. The probability of success in this endeavor depends on the amount invested and also on the level of the provision of a 'public' good paid for by lump-sum taxation of 'natives'. Those who succeed enjoy a higher level of productivity and therefore wages in period 2. The level of investment is endogenously determined. Assimilation also affect remittances by immigrants. Given this framework, we examine the effect of public support on the degree of assimilation and income repatriation. We do so under two scenarios regarding the credit market facing new immigrants. In the first, they can borrow as much as they want in period 1 at an exogenously given interest rate. In the second scenarios, there is a binding borrowing constraint. We compare the equilibrium under the two scenarios.

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1 Introduction

Migration — domestic and international — has been going on since time immemorial. It has very significant short-run and long-run implications for everyone involved in the process: immigrants, natives, the country of origin of immigrants, and so on. Therefore, all these groups of people respond to waves of migrations. As for the place or country of origin, the early literature expressed concerns for brain drain and suggested ways of compensating the source countries of migration (see, for example, Bhagwati and Wilson (1989)). More recently, the issues have been reassessed and viewed very differently. Stark (2004), for example, has shown the possibility of human capital development in the source country in the presence of emigration possibilities. The volume of remittances by immigrants and their impacts on the source countries have also led to discussions on the benefits from emigration for source countries (see, for example, OECD (2005), Fajnzylber and López (2008), and Hanson (2010)).[1]

As for the host country of migration, in spite of protestations from vested interest groups about immigration, most studies look at immigration favorably (see, for example, Friedberg and Hunt (1995)). According to Tilghman (2003), 20% of the members of the U.S. National Academy of Sciences are of foreign origin. About one-third of Nobel laureates from the U.S. are foreign-born. However, it should be acknowledged that the effect of immigration on the employment and wages of natives may well depend on the specific characterisctics of the immigrants as well as the characteristics of the labor market (see, for example, Gang and Rivera-Batiz (1994) and Gang et al. (2002)).

As for immigrants themselves, the extent of their wellbeing depends, *inter alia*, on the level of their assimilation in the new society (see, for example, Constant et al. (2008)). Perhaps, it is because of the lack of assimilation that immigrants tend to earn a lot less than

[1] For some source countries such as Bangladesh total remittance from remittances form a very large part of their total foreign exchange earnings.

their comparable natives (see, for example, Altonji and Blank (1999), Blau and Kahn (2007) and Bhaumik et al. (2006)). Why is there a lack of efforts on the part of many immigrants to assimilate? Epstein and Gang (2009) explain this phenomenon in terms of hostility and harassment from natives in the labor market. Hatton and Leigh (2010) find that immigrants tend to assimilate as communities rather than as individuals, and this makes the issue of assimilation much more complex. Epstein and Gang (2006) analyzes the interlinkages between assimilation and networks, and its impact on the level of assimilation. Fan and Stark (2007) show that when assimilation results in immigrants getting 'closer' to their richer natives and more 'distant' from their fellow immigrants, the efforts for assimilation get muted.

Efforts by immigrants does not always imply that they will succeed in their attempts to assimilate. There could be many factors that would determine the rate of success in assimilation for a given level of effort from immigrants. We have already mentioned about hostility from natives, and this will reduce the probability of success. Chiswick and Miller (1996) and Bauer et al. (2005) examine the effect of high adjustment costs (such inadequate language skills or lack of information on the labor market) on the probability of success in assimilation. Public policies can of course help immigrants in overcoming some of these hindrances. For example, publicly provided language schools, information centers, etc. can go a long way in helping immigrants to succeed in assimilating into their new environment. Many of these schemes exist in many of the countries where the inflow of immigrants is high. For example, in Canada new immigrants are entitled to settlement assistance such as free language training under provincial government administered programs usually called Language Instruction for Newcomers to Canada (LINC), for which the federal government budgeted about \$350 million to give to the provinces for the fiscal year 2006-2007.[2]

The assimilation of immigrants not only has effect on their earnings, it may also

[2]http://en.wikipedia.org/wiki/Economic_impact_of_immigration_to_Canada; accessed on February 27, 2010.

affect their preferences in other ways. In particular, assimilation can lead to immigrants caring more about themselves and relatively less about people left behind in the country of their origin. This can, as Fan and Stark (2007) show, lead to less income repatriation by immigrants.

From the above discussions it should be clear that private efforts by immigrants to assimilate and remittances by them are interdependent on each other, and public support for assimilation of immigrants can affect both these variables in a significant way. However, one aspect of the host country that hitherto has not been considered in the literature in explaining the lack of private efforts in assimilation is the access, or the lack of it, to credits by immigrants. The manner in which credit ratings are normally calculated in most developed countries are by design stacked against newcomers in those countries. Often low-risk skilled immigrants are denied credits because of a lack of records on their credit history, while, as it is now well known, the same financial institutions have been bending over backwards to offer credits to high-risk natives resulting in one of the worst financial crisis since the Great Depression.[3] In fact, because of the lack of credits from the formal credit institutions, many immigrant groups form their own credit institutions. For example, the institution of Rotating Credit and Savings Associations (ROSCA) can be found among many immigrant groups in the U.S.A.: among Mexican and Cuban immigrants in Southern California (Velez-Ilbanez, 1983; Gama et a., 2010), Caribbean immigrants in New York City (Laguerre, 1998), and Korean Immigrants in Los Angeles (Light et al., 1990) to name a few. Although the ROSCAS help the immigrants in many ways particularly in acquiring consumer durables, there are not typically used for investment purposes.

Since the costs of private efforts at assimilation are incurred upfront, and benefits in the form of higher wages come in the future, credits have an obvious role to play in the determination of private efforts at assimilation. It is this void in the literature that

[3]On a personal note, let me state my own experience in this respect, having been an immigrant in two different countries. When I moved to the U.S.A with a respectable job, after spending 25 years in the U.K. with an immaculate credit history there, I was surprised to find out that no financial institution was willing to give me a loan at a rate that natives were being offered.

the present paper attempts to fill. In order to do so, we shall develop a two-period model in which an immigrant spends a certain amount of effort in assimilation, and this has an opportunity cost to the immigrant in terms of time and income. The probability that the immigrant succeeds in assimilation depends on the level of this private effort and the level of public support for assimilation in the host country. If the immigrant succeeds in assimilation, not only that it raises the wage income of the immigrant but it also has an implication for its preference for remittances sent to people back home. The level of private efforts is optimally chosen by the immigrant. We consider two scenarios. In the first scenario, the immigrant can borrow as much as it wants at a given interest rate, and in the second the immigrant is subject to a binding borrowing constraint. In this framework, we shall examine if restrictions on borrowing by the immigrants does indeed affect private efforts at assimilation adversely. We shall also examine if the effect of public support on private efforts at assimilation is lower in the presence of a binding borrowing constraint facing the immigrant than in the absence of it.

2 The Theoretical Framework

We develop a two-period model of a small open economy. A number of immigrants arrive in the country at the beginning of period 1. We shall treat this number as exogenous and, without any loss of generally, assume it to be unity. The number of hours available to each immigrant is assumed to be exogenous and once again, without loss of any generality, taken to be unity. In period 1, the immigrant makes some effort to assimilate in the adopted country and this costs him/her e (≤ 1) hours. The immigrant succeeds in assimilation with probability p which depends on e and the level of public support for the assimilation program, denoted by g. We shall treat g as a public good.

$$p = p(e, g), \tag{1}$$

where we assume:[4]

Assumption 1 $p_1 > 0,\ p_2 > 0$ *and* $p_{12} > 0$.

The assumption $p_{12} > 0$ implies complementarity between private efforts in, and public support of, assimilation.

For simplicity and without any loss of generality we assume that there is one good in each period, the price of which is normalized to unity. Denoting by c_i the consumption of the good in period i, the utility of the immigrant, u_I, depends not only on his/her consumption of the good, but also on the amount repatriated to its country of origin.[5] The levels of repatriations or remittances in the two periods are denoted by T^1 and T^2 respectively, and the the level of utility from repatriated income (in the absence of assimilation) is $f(T^1, T^2)$. Implicitly, we assume that the immigrant cares about the family (direct or extended) left behind. We assume that

Assumption 2 $f_1 > 0,\ f_2 > 0,\ f_{11} < 0,\ f_{22} < 0$ *and* $f_{12} > 0$.

The first-order effects f_1 and f_2 can be different for a variety of reasons. For example, if the family at the source country is subject of credit constraints, an extra income in period 1 would reduce the family's demand for loan and therefore reduce the rate of interest it faces. An extra income in period 2 will have exactly the opposite effect.[6] Thus, the same amount of (real) income from repatriation would have different effect on the family's utility.

We assume that assimilation has two effects on the immigrant. First, it increases his/her income in period 2. Second, it reduces the immigrant's 'link' with his/her country of origin. The 'link' can be reduced for many reasons. For example, an assimilated immigrant may have more commitments in the adopted country and therefore its *relative* preference

[4]For any function $f(\cdot)$, we denote by f_i as its partial derivative with respect to the ith argument.

[5]Gaytan-Fregoso and Lahiri (2000) provide a micro-foundation for this formulation by explicitly modeling the source country.

[6]See Jafarey and Lahiri (2005) for an explanation, albeit in a different context.

(weight) for own consumptions may go up. Denoting by θ ($\theta \leq 1$) the weight it puts on utility from remittances after assimilation, the immigrant's expected utility from repatriated income is $(1-p)f + p\theta f$. We assume that the utility from consumption and that from remittances to be additively separable. That is, the expected utility u_I of the immigrant is given by

$$u_i = v_I(c_1, c_2) + [1 - (1-\theta)p(e,g)]f(T^1, T^2). \tag{2}$$

From (2), the expenditure function of the immigrant is derived as $E^I(1, 1/(1+r^I), u_I - [1-(1-\theta)p(\cdot)]f(\cdot))$ where r^I is the interest rate the immigrant faces. As is well know, the partial derivative of the expenditure function with respect to a price of a good gives the compensated demand for that good, and the partial derivative with respect to the utility is the reciprocal of the marginal utility of income.[7] The expenditure function for the natives are denoted by $E(1, 1/(1+r^N), u_N)$ where r^N is the interest rate facing natives and u_N their utility level.

Turning to the production side, the revenue functions in the two periods are $R^1(1, 1-e, g)$ and $R^2(1, 1-p+\lambda p)$ respectively, where λ ($\lambda \geq 1$) is the amount of 'effective' labor of the immigrant if assimilation succeeds. The partial derivative of the revenue functions with respect to an endowment of factor of production gives the rate of return to that factor (see, Dixit and Norman (1980)). The function $R^1(\cdot)$ is in fact the 'restricted' revenue function in period 1, representing total value of production in the *private* sector when the level of public good provision is g. Since all other endowments do not vary, they are omitted from the arguments of the revenue functions. It is well known that the unit cost of production of the public good is $-R_3$.[8]

We assume that the cost of production of the public good is paid for by a lump-sum taxation of natives and that it production only uses factors that belong to natives.

[7] It is also true that $E_{11} < 0$, $E_{22} < 0$, $E_{12} > 0$, $E_{33} > 0$ and if the goods are normal, then $E_{13} > 0$ and $E_{23} > 0$. For these and other properties of an expenditure function see, for example, Dixit and Norman (1980).

[8] For the derivation and properties of a restricted revenue function, please see, for example, Hatzipanayotou et al. (2002).

With these assumption, the budget-balance equations for the government, the immigrant and natives are given respectively by

$$-R_3^1 g = T, \tag{3}$$

$$E^I\left(1, \frac{1}{1+r^I}, u_I - [1-(1-\theta)p]f\right) = (1-e)R_2^1 + \frac{[1-p+\lambda p]R_2^2}{1+r^I} - T^1 - \frac{T^2}{1+r^I}, \tag{4}$$

$$E\left(1, \frac{1}{1+r^N}, u_N\right) = R^1 + \frac{R^2}{1+r^N} - (1-e)R_2^1 - \frac{[1-p+\lambda p]R_2^2}{1+r^N} - R_3^1 g - T. \tag{5}$$

Equation (3) states that the total cost of producing the public good (the left-hand side) is equal to the amount of lump-sum tax levied on natives (right-hand side). The left-hand sides of (4) and (5) are the discounted present value of expenditures on consumption by the immigrant and natives respectively. The first term on the right-hand side of (4) is the wage income of the immigrant in period 1. The second term is the discounted present value of the second-period expected wage income. The third and the fourth terms are the present value of the repatriated amounts sent back to the country of origin. The first four terms on right-hand side of (5) together give the income of the natives from private sector (the total factor income in the economy minus the factor income of the immigrant). The fifth terms is natives' income from the public sector, and the last term is the lump-sum tax that is levied on them.

The borrowing by the immigrant in period 1, B, is given by

$$B = E_1^I - (1-e)R_2^1 + T^1, \tag{6}$$

which is the excess of expenditure over income of the immigrant in period 1.

We shall make the Heckscher-Ohlin assumption that that factor endowments do not affect factor prices, i.e., the factor endowments lie within the cone of diversification and there are no factor intensity reversals (see Dixit and Norman (1980) for details). That is,

Assumption 3 $R_{22}^1 = R_{33}^1 = R_{23}^1 = R_{22}^2 = 0.$

It now remains to describe how e, T^1 and T^2 are determined. For this we differentiate (1)-(4) to obtain.

$$E_3^I \, du^I = \left[-R_2^1 + \frac{(\lambda-1)R_2^2}{1+r^I} - E_3^I(1-\theta)fp_1\right] de + \left[\frac{R_2^2(\lambda-1)p_2}{1+r^I} - E_3^I(1-\theta)fp_2\right] dg \quad (7)$$

$$+ \left[-1 + \{1-p(1-\theta)\}E_3^I f_1\right] dT^1 + \left[-\frac{1}{1+r^I} + \{1-p(1-\theta)\}E_3^I f_2\right] dT^2 - \frac{B}{1+r^I} \cdot dr^I.$$

An increase in the efforts to assimilate has two costs: (i) reduction in wage income in period 1 (R_2^1), and (ii) a reduction in utility because of caring less for the family back home (the third term in the coefficient for de). It benefits the immigrant by increasing its wage income in period 2 ($(\lambda-1)R_2^2$). An increase in g also has also the same costs and benefits associated with an increase in e, but it does not reduce wage income in period 1. An increase in either T^1 or T^2 has direct costs (the first terms in the coefficients of dT^1 and dT^2), but they also benefits the immigrant by increasing the utility from repatriating income (the second terms in the coefficients of dT^1 and dT^2). Finally, an increase in the interest rate reduces the utility of immigrant since it is a net borrower (the so-called intertemporal terms-of-trade effect).

The immigrant decides on the levels of e, T^1 and T^2 by maximizing u_I for a given value of the interest rates. The first-order conditions for the immigrant's optimization problem are given by

$$\frac{\partial u_I}{\partial e} = 0 \Rightarrow R_2^1 + E_3^I p_1 f(1-\theta) = \frac{p_1(\lambda-1)R_2^2}{1+r^I}, \quad (8)$$

$$\frac{\partial u_I}{\partial T^1} = 0 \Rightarrow 1 = E_3^I\{1-p(1-\theta)\}f_1, \quad (9)$$

$$\frac{\partial u_I}{\partial T^2} = 0 \Rightarrow \frac{1}{1+r^I} = E_3^I\{1-p(1-\theta)\}f_2. \quad (10)$$

The marginal costs and benefits associated with the three choice variables have been explained after (7). The left-hand sides of the above three equations are the marginal costs of the three variables, and the right-hand sides are the marginal benefits.

From (9) and (10), we find

$$f_1 = (1 + r^I)f_2. \tag{11}$$

Note that, equation (11) implies that in equilibrium we must have $f_1 > f_2$, a property that is consistent with our discussion after the statement of assumption 2.

This completes the description of our theoretical framework. We shall assume r^N to be exogenous. However, we start with the assumption that r^I is also constant. But, later we shall assume that the immigrant is subject to a binding borrowing constraint so that its demand for loan, given by (6), is equal to an exogenously given supply of the loan $\bar{B}$, i.e.,

$$B = \bar{B}. \tag{12}$$

When (12) holds, the interest rate facing the immigrant, r^I, becomes an endogenous variable.

3 Public Support and Private Assimilation

In this section we shall examine the effect of an increase in the provision of the public good on the level of assimilation of the immigrant.[9] we shall do so under two scenarios: (i) the immigrant can borrow as much it wants at the given interest rate r^I, and (ii) it faces a binding borrowing constraint so that r^I is endogenous, and then we shall examine how the existence of the borrowing constraint affects the results.

Using the optimality conditions (8)-(10), equation (7) reduces to

$$E_3^I du_I = -\frac{B}{1 + r^I} \cdot dr^I + \frac{p_2 R_2^1}{p_1} \cdot dg. \tag{13}$$

We also find that $du_N = 0$.

That is, an increase in g unambiguously increases the utility of the immigrant when e, T^1 and T^2 are optimally chosen. The latter three variables do not affect u_I directly as these

[9]The actual policy is the lump-sum taxation of natives for the public support of assimilation. However, since the unit cost of providing public service is constant in our analysis, there is no analytical difference between the two.

are optimally chosen (the envelope property). The effect of r^I on u_I is as before. The utility of natives are unaffected as the public good is produced using factors owned by natives, and factor prices are assumed not to be influenced by factor endowments (assumption 3).

Differentiation of (8), (9), (11) and (12), the and use of (8)-(10) and (13), give us

$$\left[\frac{R_2^1 p_{11}}{p_1} - f^2(1-\theta)^2(p_1)^2 E_{33}^I\right] de = -\left[\frac{R_2^1 p_{12}}{p_1} - f(1-\theta)p_2 E_{33}^I\left\{f(1-\theta)p_1 + \frac{R_2^1}{E_3^I}\right\}\right] dg +$$

$$\left[\frac{p_1(\lambda-1)R_2^2}{(1+r^I)^2} - \frac{p_1 f(1-\theta)E_{32}}{(1+r^I)^2} - \frac{f(1-\theta)E_{33}^I p_1 \bar{B}}{E_3^I(1+r^I)}\right] dr^I + p_1(1-\theta)\alpha[f_1 dT^1 + f_2 dT^2], \quad (14)$$

$$\frac{1}{(1+r^I)^2}\left[-E_{12}^I - \frac{E_{13}^I \bar{B}}{E_3^I}\right] dr^I = d\bar{B} - \left[R_2^1 + E_{13}^I f(1-\theta)p_1\right] de \quad (15)$$

$$+E_{13}^I\{1-p(1-\theta)\}[f_1 dT^1 + f_2 dT^2] - E_{13}^I p_2\left[\frac{R_2^1}{p_1 E_3^I} + f(1-\theta)\right] dg$$

$$\left[E_3^I f_{11} - \{1-p(1-\theta)\}(f_1)^2 E_{33}^I\right] dT^1 + \left[E_3^I f_{12} - \{1-p(1-\theta)\}f_1 f_2 E_{33}^I\right] dT^2 \quad (16)$$

$$= \frac{p_1 f_1(1-\theta)\alpha}{1-p(1-\theta)} \cdot de + \frac{p_2 f_1 \beta}{1-p(1-\theta)} \cdot dg + \frac{f_1}{1+r^I}\left[\frac{E_{32}^I}{1+r^I} + \frac{E_{33}^I \bar{B}}{E_3^I}\right] dr^I,$$

$$[(1+r^I)f_{12} - f_{11}]dT^1 + [(1+r^I)f_{22} - f_{12}]dT^2 = -f_2 dr^I, \quad (17)$$

where

$$\alpha = E_3^I - f E_{33}^I\{1-p(1-\theta)\},$$

$$\beta = E_3^I(1-\theta) - \{1-p(1-\theta)\}E_{33}^I\left[f(1-\theta) + \frac{R_2^1}{p_1 E_3^I}\right].$$

Note that the coefficient of de on the left-hand side of (14) is negative, and this is consistent with the second-order condition for the immigrants optimization problem. There are two opposite effects of an increase in g on e for given levels of T^1, T^2 and r^I. First, it increases both the marginal cost and the marginal benefit of increasing e (the second term on the left-hand side, and the term on the right-hand side, of (8)), but, at the equilibrium, the increase in marginal benefit dominates the increase in marginal costs. This effect is given by the first term in the coefficient of dg on the right-hand side of (14). The second effect of an increase in g on e appears in terms of an income effect: an increase in g increases real income of the immigrants (see (13)) and this reduces their marginal utility of income, and this in turn increases the marginal cost of increasing e (the second term on the left-hand side of (8)). An increase in either T^1 or T^2, for a given level of e and r^I, increases the marginal cost of increasing e by increasing the value of $f(\cdot)$ and this effect will tend to reduced the value of e. However, an increase in either T^1 or T^2 also increases the marginal utility of income and reduces the marginal cost of increasing e. This effect will tend to increase the value of e. The net effect will be positive if the value of α is negative. An increase in r^I has two positive and one negative effect on e for given levels of T^1 and T^2. The negative effect is due to the fact that an increase in r^I reduces the marginal benefit of increasing e (the term on the right-hand side of (14)). The positive effects come via income effects: (i) an increase in r^I reduces the utility of the immigrant via the inter-temporal terms-of-trade effect (see (13)) and this reduces the marginal cost of increasing e, and (ii) an increase in r^I reduces the present value of the second-period price and this increases the marginal utility of income and thus reduces the marginal cost of increasing e.

An increase in the borrowing limit reduces the interest rate facing the immigrant by increasing its supply, for given levels of e, T^1 and T^2. An increase in e, for given levels of T^1 and T^2, reduces income in the first period and increases that in the second period. Both these effects increases the demand for loan in the first period, increasing the interest rate. An increase in g raises the probability of success in attempts to assimilate and thus the expected income in the second period. This will increase the demand for loan in the first period, increasing the interest rate. An increase in either T^1 or T^2, for a given level of e, will reduce the direct utility from consumption (given by the third argument in $E^I(\cdot)$) and thus reducing the demand for consumption and loan in the first period. This will reduce the interest rate.

As for the effects of e, r^I and g on the equilibrium levels of T^1 and T^2, from (16) and

(17) we find,

$$\Delta\frac{\partial T^1}{\partial e} = \frac{p_1 f_1(1-\theta)\alpha}{1-p(1-\theta)}[f_{22}(1+r^I) - f_{12}],\ \Delta\frac{\partial T^2}{\partial e} = -\frac{p_1 f_1(1-\theta)\alpha}{1-p(1-\theta)}[f_{12}(1+r^I) - f_{11}],$$

$$\Delta\frac{\partial T^1}{\partial r^I} = \frac{f_1}{1+r^I}\left[\frac{E^I_{32}}{1+r^I} + \frac{E^I_{33}\bar{B}}{E^I_3}\right][(1+r^I)f_{22} - f_{12}] + f_2\left[E^I_3 f_{12} - \{1-p(1-\theta)\}(f_1)^2 E^I_{33}\right],$$

$$\Delta\frac{\partial T^2}{\partial r^I} = \frac{f_1}{1+r^I}\left[\frac{E^I_{32}}{1+r^I} + \frac{E^I_{33}\bar{B}}{E^I_3}\right][f_{11} - (1+r^I)f_{12}] - f_2\left[E^I_3 f_{11} - \{1-p(1-\theta)\}f_1 f_2 E^I_{33}\right],$$

$$\Delta\frac{\partial T^1}{\partial g} = \frac{p_2 f_1\beta}{1-p(1-\theta)}[(1+r^I)f_{22} - f_{12}],\ \Delta\frac{\partial T^2}{\partial g} = \frac{p_2 f_1\beta}{1-p(1-\theta)}[f_{11} - (1+r^I)f_{12}], \quad (18)$$

where

$$\begin{aligned}\Delta &= \left[E^I_3 f_{11} - \{1-p(1-\theta)\}(f_1)^2 E^I_{33}\right][(1+r^I)f_{22} - f_{12}] \\ &\quad -[(1+r^I)f_{12} - f_{11}]\left[E^I_3 f_{12} - \{1-p(1-\theta)\}f_1 f_2 E^I_{33}\right].\end{aligned}$$

Note that Δ must be positive to satisfy the second-order conditions for the immigrant's optimization problem.

An increase in e increases the probability of success in assimilation p and thus reduces the marginal benefit of increasing either T^1 or T^2. However, an increase in e increases the direct utility of consumption and thus reduces the marginal utility of income. This will raise the marginal benefit of increasing either T^1 or T^2. The net effect is positive if and only if α is positive. The same argument goes for the effect of an increase in g on either T^1 or T^2. The net effect this time is positive if and only if β is positive. The effect of an increase in r^I on T^1 is a little different than that on T^2. This is because an increase in r^I reduces the marginal cost of increasing T^2, but not that of increasing T^1. An increase in r^I reduces the marginal benefit of increasing either T^1 or T^2 by increasing marginal utility of income because of a reduction in utility and in the present value of the second period income. There are other effects that occur indirectly because of the interdependence in T^1 and T^2.

Having discussed discussed the partial effects, we now look at the total effects. For this, we simultaneously solve (14)-(17) to get

$$A_{ee}de = A_{eg}dg + A_{er}dr^I, \tag{19}$$

$$L_r dr^I = d\bar{B} + L_g dg, \tag{20}$$

where

$$\begin{aligned}
A_{ee} &= \frac{R_2^1 p_{11}}{p_1} - f^2(1-\theta)^2(p_1)^2 E_{33}^I - p_1(1-\theta)\alpha)\left[f_1\frac{\partial T^1}{\partial e} + f_2\frac{\partial T^2}{\partial e}\right],\\
A_{eg} &= -\frac{R_2^1 p_{12}}{p_1} + f(1-\theta)p_2 E_{33}^I\left\{f(1-\theta)p_1 + \frac{R_2^1}{E_3^I}\right\} + p_1(1-\theta)\alpha\left[f_1\frac{\partial T^1}{\partial g} + f_2\frac{\partial T^2}{\partial g}\right],\\
A_{er} &= \frac{p_1(\lambda-1)R_2^2}{(1+r^I)^2} - \frac{p_1 f(1-\theta)E_{32}}{(1+r^I)^2} - \frac{f(1-\theta)E_{33}^I p_1\bar{B}}{E_3^I(1+r^I)} + p_1(1-\theta)\alpha\left[f_1\frac{\partial T^1}{\partial r^I} + f_2\frac{\partial T^2}{\partial r^I}\right],\\
L_r &= \frac{1}{(1+r^I)^2}\left[-E_{12}^I - \frac{E_{13}^I\bar{B}}{E_3^I}\right] - E_{13}^I\{1-p(1-\theta)\}\left[f_1\frac{\partial T^1}{\partial r^I} + f_2\frac{\partial T^2}{\partial r^I}\right] + \frac{\partial T^1}{\partial r^I}\\
&\quad + \left[R_2^1 + E_{13}^I f(1-\theta)p_1 - E_{13}^I\{1-p(1-\theta)\}\left(f_1\frac{\partial T^1}{\partial e} + f_2\frac{\partial T^2}{\partial e}\right)\right]\cdot\frac{A_{er}}{A_{ee}},\\
L_g &= -E_{13}^I p_2\left[\frac{R_2^1}{p_1 E_3^I} + f(1-\theta)\right] + E_{13}^I\{1-p(1-\theta)\}\left(f_1\frac{\partial T^1}{\partial g} + f_2\frac{\partial T^2}{\partial g}\right) - \frac{\partial T^1}{\partial g}\\
&\quad - \left[R_2^1 + E_{13}^I f(1-\theta)p_1 - E_{13}^I\{1-p(1-\theta)\}\left(f_1\frac{\partial T^1}{\partial e} + f_2\frac{\partial T^2}{\partial e}\right)\right]\cdot\frac{A_{eg}}{A_{ee}}.
\end{aligned}$$

Note that A_{ee} has to be negative for the second-order condition of the immigrant's optimization problem to be satisfied. Also L_r is the slope of the excess demand for loan function and this has be negative as well for the system to be Walrasian stable.

We shall now examine the effect of a change in g on the equilibrium value of e under two scenarios: (i) the immigrant faces no credit constraint, i.e., it can borrow as much as it wants at the interest rate at the exogenously given r^I, and (ii) the immigrant faces a binding borrowing constraint (equation (12)) and the rate of interest r^I is endogenous. These scenarios will now be considered in turn.

Case 1: No Credit Constraint:

In this case $dr^I = 0$ in equation (19) and equation (20) is not applicable. Therefore,

$$\left.\frac{de}{dg}\right|_{dr^I=0} \gtreqless 0 \quad \Longleftrightarrow \quad A_{eg} \lesseqgtr 0.$$

First of all note that when $\theta = 1$, i.e., when assimilation does not reduce the immigrant's degree of altruism toward its family back home, $de/dg > 0$. The complementarity between private effort and public support for assimilation implies that an increase in public support for assimilation increases both the marginal cost and marginal benefit of increasing private efforts (see (8)). However, the increase in marginal benefit dominates that in marginal costs and the net effect is positive. When $\theta < 1$, the effect is generally ambiguous. However, if the marginal utility of income of the immigrant is more or less constant, i.e., $E^I_{33} \simeq 0$, then once again $de/dg > 0$. If the marginal utility of income is constant, then the marginal benefit of increasing T^1 or T^2 decreases with g and therefore the the optimal values of both T^1 and T^2 decrease as g is increased. These reductions in T^1 and T^2 reduces the marginal costs of increasing e and thus reinforcing the positive effect on e of an increase in g because of the complementarity between private effort and public support for assimilation. These results are formally stated in the following proposition.

Proposition 1 *In the absence of any credit constraint facing immigrants, an increase in the level of public support for assimilation increases the level of private efforts in assimilation if either $\theta \simeq 1$ or $E^I_{33} \simeq 0$.*

Turning to the effect of an increase in the interest rate on the equilibrium level of e, it is to be noted that the effect works through many channels: some positive, some negative. However, when either $\theta \simeq 1$ or E^I_3 is constant, it is easy to verify that $de/d\bar{B} > 0$. When $\theta \simeq 1$, a reduction in r^I increases the marginal benefit of increasing e (the right-hand side of (8)) and thus raise the equilibrium level of e. When $\theta < 1$, there is an additional effect via induced changes in T^1 and T^2. When E^I_3 is constant, a reduction in r^I increases the marginal cost of increasing T^2 (the left-hand side of (10)) and thus reduces the optimal value of T^2

and thus that of T^1. This reduction in T^1 and T^2 reduces the marginal cost of increasing e (the left-hand side of (8)), reinforcing the increase in marginal benefits. Formally,

Proposition 2 *A reduction in the interest rate r^I increases the equilibrium level of private efforts in assimilation if either $\theta \simeq 1$ or $E^I_{33} \simeq 0$ and $E^I_{32} \simeq 0$.*

Case 2: Binding Credit Constraint:

Having identified sufficient conditions under which an increase in g increases the equilibrium value of e in the absence of any credit constraint facing the immigrant, we shall now examine what the existence of a binding borrowing constraint does to this comparative static result: is it more likely or less likely that an increase on g will increase the equilibrium value of e under a borrowing constraint than in the absence of it? We shall also examine the effect of a relaxation of the borrowing constraint on the equilibrium value of e.

Turning to the second issue first, a relaxation of the borrowing constraint ($d\bar{B} > 0$) unambiguously reduces the equilibrium level of the interest rate r^I. The intuition is very straightforward. An increase in $\bar{B}$ shifts the supply function to the right and does not affect the demand function, resulting in a reduction of the equilibrium price (interest rate). A reduction in r^I however affects the equilibrium level of e via many channels: some positive and some negative, as shown before. Therefore, in general, the sign of $de/d\bar{B}$ is ambiguous. However, using proposition 2, we find

Proposition 3 *A relaxation of the borrowing constraint facing immigrants increases the level of private efforts in assimilation if either $\theta \simeq 1$ or $E^I_{33} \simeq 0$ and $E^I_{32} \simeq 0$.*

Finally, turning to the effect of a change in g on the equilibrium level of e under a borrowing constraint, it is to be noted that g affects the demand for loan in many ways. It affects consumption in the first period via an increase in utility, via an induced changes in remittances, and via an induced change in private efforts in assimilation, and via a change in the probability of success in assimilation because of an increase in g. It also affects first-period incomes because of induced changes in e and T^1. The net effect is ambiguous even when either $\theta \simeq 1$ or E_3^I is constant. We need an additional condition to sign dr^I/dg. Suppose that public support for assimilation, *on its own*, does not have a significant effect on the probability of success in assimilation, but has a significant effect on the marginal probability of private efforts, i.e., $p_2 \simeq 0$, but $p_{12} > 0$. In this case, g will have no effects on either first-period consumption directly or via induced changes in T^1 or T^2, for given level of e. It will only affect first-period income via an induced change in e. Under the conditions in proposition 1, i.e., when either $\theta \simeq 1$ or $E_{33}^I \simeq 0$, we know from that proposition that an increase in g will increase the equilibrium value of e. This increase in turn will reduce the first-period income of the immigrant and therefore increase the demand for loan and thus the equilibrium value of r^I. Using proposition 2, we can then conclude that, under the conditions stipulated, an increase in g will have a lower impact on the equilibrium level of private efforts in assimilation under a borrowing constraint than in the absence of it. Formally,

Proposition 4 *Suppose that $p_2 \simeq 0$. Furthermore suppose that either $\theta \simeq 1$ or $E_{33}^I \simeq 0$. Then, an increase in g will have a lower impact on the equilibrium level of private efforts in assimilation under a borrowing constraint than in the absence of it.*

We conclude this section by drawing a number of policy implications of our results. In the preceding analysis we have found that while an increase in public support for immigrant assimilation is likely to increase private efforts by immigrants to assimilate, a binding borrowing constraint reduces this effect. Furthermore, a relaxation of the borrowing constraint is likely to increase private efforts. Therefore, it seems that public support for immigrant assimilation should be strengthened and restrictions for credits for immigrants should be reduced in order for public support to have the necessary impact.

4 Conclusion

The assimilation of immigrants, or the lack of it, in their new adopted country has been receiving a lot of attention of late in the literature on international migration. Since with assimilation immigrants are very likely to improve their wellbeing, the lack of efforts on their part to assimilate is somewhat puzzling. Many factors which stops immigrants from making adequate efforts at assimilation, have been identified. Hostility of natives because of perceived adverse effect of immigration on their wages and employment is one such factor. A lack of public support in the assimilation process is another factor. The existence of networks among the immigrants is yet another factor. However, one factor that has not been analyzed in the literature is the lack of credits facing newly arrived immigrants. Since the costs of private efforts at assimilation are incurred upfront, and benefits in the form of higher wages come in the future, credits have an obvious role to play in the determination of private efforts at assimilation. It is surprising therefore that this issue remains unexamined in the literature. In this paper, we have tried to fill this void in the literature.

We have developed a two-period model in which immigrants make an effort at assimilation in the first period, and , if they succeed, enjoy a higher wage rate in the second period. The probability of success at assimilation not only depends on the level of efforts that immigrants make, but also on the level of public support for it. Successful assimilation also affect their preference for remittances to people at their country of origin. In this framework, we examined the effect of public support on the level private efforts at assimilation. We also analyzed if the above effect is smaller when immigrants face a binding a borrowing constraint. We have found that the presence of a binding borrowing constraint can indeed reduce the beneficial effect of public support for private assimilation. The broad policy prescription of this research is that restrictions for credits for immigrants should be reduced in order for the public supports to have the necessary impact.

References

[1] Altonji, J. G. and R. M. Blank, 1999, "Race and Gender in the Labor Market," in O. Ashenfelter and D.Card (eds.), *Handbook of Labor Economics*, vol. 3C, Elsevier Science B.V.:Amsterdam, 3143-3259.

[2] Bauer, Thomas, Gil S. Epstein and Ira N. Gang, 2005, "Enclaves, Language and the Location Choice of Migrants," *Journal of Population Economics*, 18 (4), 649 662.

[3] Bhagwati, Jagdish N., and Wilson, John D. (eds.), 1989, *Income Taxation and International Mobility*, Cambridge, MA: M.I.T. Press.

[4] Bhaumik, Sumon K., Ira N. Gang, and Myeong-Su Yun, 2006, "Ethnic Conflict and Economic Disparity: Serbians and Albanians in Kosovo," *Journal of Comparative Economics*, 34(4), 754-773.

[5] Blau, F. D. and L. M. Kahn, 1997, "Swimming Upstream: Trends in the Gender Wage Differential in the 1980s," *Journal of Labor Economics*, 15 (1), 1- 42.

[6] Chiswick BR, Miller PW, 1996, "Ethnic Networks and Language Proficiency among Immigrants," *Journal of Population Economics* 9: 19-36.

[7] Constant, A., Gataullina L. and K.F. Zimmermann, 2008, "Ethnosizing Immigrants" *Journal of Economic and Behavioral Organization*, forthcoming.

[8] Epstein, Gil S. and Ira Gang, 2006, "Ethnic Networks and International Trade", in *Labor Mobility and the World Economy*, Federico Foders and Rolf J. Langhammer (eds.) Springer (Berlin, Heidelberg), 85-103.

[9] Epstein, Gil S. and Ira Gang, 2009, "Ethnicity, Assimilation and Harassment in the Labor Market," forthcoming in *Research in Labor Economics.*

[10] Fajnzylber, P. and J. H. López (eds.), 2008, *Remittances and Development Lessons from Latin America*, The World Bank.

[11] Fan, C. Simon and Stark, Oded, 2007, "A Social Explanation of the Reluctance to Assimilate," *Kyklos* 60 (1): 55-63.

[12] Friedberg, R.M. and J. Hunt, 1995, "The Impact of Immigrants on Host Country Wages, Employment and Growth," *The Journal of Economic Perspectives*, 9(2), 23-44.

[13] Gama, R., D. Medrano and L. Medrano, 2010, "Tandas and Cundinas: Mexican-American and Latino-American Rotating Credit Associations in Southern California," in Anthropology of Money in Southern California, http://www.anthro.uci.edu/html/Programs/Anthr_Money/Tandas.htm

[14] Gang, Ira N. and Rivera-Batiz, Francisco, 1994, "Labor Market Effects of Immigration in the United States and Europe: Substitution vs. Complementarity," *Journal of Population Economics*, 7, 157-175.

[15] Gang, Ira N., Francisco Rivera-Batiz and, Myeong-Su Yun, 2002, "Economic Strain, Ethnic Concentration and Attitudes Towards Foreigners in the European Union," IZA Discussion Paper 578 (www.iza.org).

[16] Gaytan-Fregoso, H. and S. Lahiri, 2000, "Foreign Aid and Illegal Immigration," *Journal of Development Economics*, 63, 515-527.

[17] Hanson, G., 2010, "International Migration and the Developing World," In Dani Rodrik and Mark Rosenzweig, editors: *Handbook of Development Economics*, Vol. 5, The Netherlands: North-Holland, pp. 4363-4414.

[18] Hatton, T.J. and A.L. Leigh, 2010, "Immigrants Assimilate as Communities, Not Just as Individuals," forthcoming in *Journal of Population Economics*.

[19] Hatzipanayotou, P., S. Lahiri, and M.S. Michael, 2002, "Can cross-border pollution reduce pollution?," *Canadian Journal of Economics* 35, 805-818.

[20] Jafarey, S.S. and S. Lahiri, 2005, "Food for Education and Funds for Education Quality: Policy Options to Reduce Child Labor," *Canadian Journal of Economics*, 38, 394-419.

[21] Laguerre, M.S., 1998, "Rotating Credit Association and the Diasporic Economy, *Journal of Development Entrepreneurship*, 3,.

[22] Light, I., I. J. Kwuon and D. Zhong, 1990, "Korean Rotating Credit Associations in Los Angeles, *Amerasia Journal*, 16, 35-54.

[23] OECD, 2005, *Migration, Remittances and Development*, OECD Publishing.

[24] Stark, Oded, 2004, "Rethinking the Brain Drain," *World Development*, 32(1), 15-22.

[25] Tilghman, S. M., 2003, "Dealing with Foreign Students and Scholars in the Age of Terrorism: Visa Backlogs and Tracking Systems," Testimony presented to the U.S. House of Representatives Committee on Science, March 26, 2003.

[26] Velez-Ibanez, Carlos G., 1983, Bonds of Mutual Trust: The Culture System of Rotating Credit Associations Among Urban Mexicans and Chicanos. Rutgers University Press, New Brunswick.