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By ODED STARK and AGNIESZKA DORN

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Do family ties with those left behind intensify or weaken migrants' assimilation?

Oded Stark [a,b,c,d,e,*], Agnieszka Dorn [d]

[a] University of Bonn, Germany
[b] University of Klagenfurt, Austria
[c] University of Vienna, Austria
[d] Warsaw University, Poland
[e] Warsaw School of Economics, Poland

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ABSTRACT

Strong ties with the home country and with the host country can coexist. An altruistic migrant who sends remittances to his family back home assimilates more the more altruistic he is, and also more than a non-remitting migrant.

1. Introduction

Summarizing the cross-cultural psychology literature, Nekby and Rödin (2010, p. 36) list the four acculturation strategies identified in that literature: "the first, integration, implies a strong sense of belonging to the ethnic group together with a strong identification to the dominant society. Assimilation implies a strong identification to the majority culture but weakened ties to the culture of origin, while separation is the opposite, a strong affiliation to the ethnic group but weak ties to the majority. Finally, marginalization implies weak ties to both the ethnic group and the majority."[1] Perhaps the most intriguing "strategy" is the first of these four; after all, it is a widely held perception that strong links with the ethnic group and the home country hinder identification with the majority culture and the host country.

In this paper we present a model that yields the "integration" strategy as an optimal choice of migrants, namely, we provide conditions under which the intensity of integration (the strength of the links with the host country, which is our measure of the "identification [with] the dominant society") is correlated *positively and causally* with the strength of the links with the home country (which is our measure of "the sense of belonging to the ethnic group").

In public debate, strong links with the ethnic community and the home country are often viewed as a hindrance to assimilation. Huntington (2004) expresses concern about migration without assimilation, and considers links with the home country to be one of the root causes of non-assimilation. Huntington (2004, p. 14) states: "Massive migrations, …, have increasingly intermingled peoples of various races and cultures … . As a result of modern communications and transportation, these migrants have been able to remain part of their original culture and community. … For the United States, these developments mean that the high levels of immigration from Mexico and elsewhere in Latin America could have quite different consequences for assimilation than previous waves of immigration."

* Correspondence to: University of Bonn, Walter-Flex-Strasse 3, D-53113 Bonn, Germany.
E-mail address: ostark@uni-bonn.de (O. Stark).

[1] In what follows, we do *not* use the term "assimilation" as referring to one of the acculturation identities. Rather, we use the term to indicate the process by which a migrant acquires the culture, norms, and productive attributes of the host country. Specifically, in Section 2 we refer to assimilation as the acquisition of destination-specific human capital.

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In the past two decades, the perception in the sociology and anthropology literature that, in the current era, migrants might simultaneously belong to more than one society and maintain strong links with their home country, has evolved into the concept of transnationalism.[2] In the discourse on assimilation,[3] transnationalism is perceived as "an alternative form of adaptation of immigrants to receiving societies that was at variance from what these traditional concepts [assimilation, acculturation, and incorporation] suggested" (Portes et al., 2002, p. 279).

Strong ties with those left behind affect, as well as reflect, the nature of migration (permanent versus temporary), and have an impact on any subsequent decision whether or not to return to the home country. If a migrant has strong ties with the family left behind and considers migration to be temporary, then his incentive to assimilate (for example, to accumulate human capital that is specific to the country of destination, to acquire "language capital") will presumably be weak. Put differently, ties with the family left behind in the home country might affect the intended duration of the migrant's stay and thereby his effort to assimilate. This reasoning too could lead us to expect a negative causal relationship between the strength of the links with those left behind and the degree of assimilation.

Our framework also identifies an association between two themes in migration research that, by and large, have been studied independently of each other: assimilation and remittances. Interestingly, a factor that for quite some time now has been recognized as motivating remittance behavior, viz. altruism, is shown in this paper also to motivate assimilation behavior.

2. Analysis

Consider a migrant whose utility depends on the income that he spends in his host country, and on the income of his family in the home country. Correspondingly, we assume that the migrant's income can be divided between a part spent in the destination country, and a part remitted. The migrant adds to his initial endowment of labor by means of the acquisition of destination-specific human capital, to which we refer henceforth as "assimilation." The migrant's income depends on the prevailing wage rate per efficiency unit of labor, and on his assimilation-augmented labor endowment.[4] Specifically, because we take the wage rate and the initial labor endowment as given, the migrant's income, $Y(x)$, is a function of his effort to assimilate, x. We assume that the function $Y(x)$ is twice differentiable, increasing, and strictly concave.

Although a migrant's assimilation into the mainstream culture of his host country is likely to increase his productivity and earnings, it is costly: it requires acquisition of human capital that is specific to the country of destination (McManus et al., 1983; Lazear, 1999), and it intensifies contacts with the natives whose higher incomes give rise to a sense of relative deprivation (Fan and Stark, 2007; Stark and Jakubek, 2012). A migrant's assimilation might require him to undertake actions and assume behavioral patterns that are not in accord with his preformed identity, as in Akerlof and Kranton (2000), causing him distress.[5] We take the function $C(x)$, which we assume to be twice differentiable, increasing, and strictly convex, to encompass all the costs associated with expending effort to assimilate.

The share of the migrant's income that he remits is denoted by $s \in [0,1]$. The extent to which the migrant derives utility from the wellbeing of his family is measured by the parameter $\alpha \geq 0$. The wellbeing of the migrant's family depends on its income, $\bar{Y}$, and on remittances received, $sY(x)$.

The migrant chooses his optimal effort, x^*, and the optimal share of his income to be remitted, s^*, so as to maximize the function

$$U(x,s,\alpha) = V((1-s)Y(x)) + \alpha W(\bar{Y} + sY(x)) - C(x) \tag{1}$$

over $(x,s) \in [0,\infty) \times [0,1]$ for a given α. The utility that the migrant derives from income spent in the host country is represented by $V((1-s)Y(x))$, and the utility of the migrant's family in the home country is represented by $W(\bar{Y}+sY(x))$. We assume that the functions V and W are twice differentiable, increasing, and strictly concave.

In the specification of the utility function $U(x,s,\alpha)$ in (1) we represent the intensity of altruism by a weight α attached to the wellbeing of the family. When α increases, the marginal utility from remitting increases, whereas the marginal utility derived from own consumption remains constant. While we would expect the migrant to remit more when α is higher, the increase in remittances need not come about from the exertion of more effort.[6]

We assume that there exists an M such that $U(x,s,\alpha) < 0$ for $x > M$ and all $s \in [0,1]$, and that $U(x,s,\alpha) \geq 0$ for some (x,s), which assures us that the utility function in (1) has global maxima.[7] To ensure that at any maximum effort is positive, we also assume that $Y(0) = 0$, and that the derivative of the utility function in (1) with respect to x when $s = 0$ is strictly positive in the neighborhood of zero, namely, that $\lim_{x\to 0}\left[Y'(x)V'(Y(x)) - C'(x)\right] > 0$; exerting no effort whatsoever to assimilate is not optimal. To exclude the possibility that the migrant remits his entire income, we assume that $\alpha W'(\bar{Y}) < \lim_{z\to 0} V'(z)$.[8] We next formulate two preparatory lemmas.

Lemma 1. *The optimal effort to assimilate exerted by the migrant, $x^* = x^*(\alpha)$, as well as the optimal share of income to be remitted, $s^* = s^*(\alpha)$, are functions of the weight that the migrant attaches to the wellbeing of his family, α. If $s^* > 0$, then the maximum of the utility function in (1) is obtained as a unique solution, (x^*, s^*), to the equations*

$$U_x(x^*,s^*,\alpha) = (1-s^*)Y'(x^*)V'((1-s^*)Y(x^*)) + \alpha s^* Y'(x^*)W'(\bar{Y}+s^*Y(x^*)) - C'(x^*) = 0 \tag{2}$$

[2] See, for example, Glick-Schiller et al. (1992), Portes et al. (1999), Waldinger and Fitzgerald (2004), and Vertovec (2009).

[3] Vertovec (2009), especially Chapter 3, discusses and summarizes views on the relationship between transnationalism and assimilation.

[4] Mason (2001) assesses the impact of variables associated with assimilation, such as English fluency and self-identity, on the earnings of individuals of Mexican origin in the US.

[5] See also Davis (2007). Bénabou and Tirole (2011) attend to the tension between identities, and to how investment in "identity-specific capital" might interfere with assimilation.

[6] Building on Stark (1999, Chapter 1), we can consider an alternative specification of the utility function $U(x,s,\alpha)$ with weights $1-\alpha$ and α attached to $V((1-s)Y(x))$ and $W(\bar{Y}+sY(x))$, respectively. Namely, the migrant chooses (x^*,s^*) so as to maximize the utility function $U(x,s,\alpha) = (1-\alpha)V((1-s)Y(x)) + \alpha W(\bar{Y}+sY(x)) - C(x)$ over $(x,s) \in [0,\infty) \times [0,1]$ for a given $\alpha \in [0,1)$. Under this alternative utility specification, when α increases, the relative weight on the utility from spending income in the host country, $V((1-s)Y(x))$, decreases, and remittances of a given amount, $sY(x)$, confer higher utility. It turns out that under this alternative utility function we can derive results akin to the ones reported in this paper, albeit under more stringent conditions. A detailed analysis of this case is available on request.

[7] These assumptions enable us to restrict the maximization of $U(x,s,\alpha)$ with respect to (x,s) to a compact set $[0,M] \times [0,1]$.

[8] From the assumption $\alpha W'(\bar{Y}) < \lim_{z\to 0} V'(z)$ it follows that $\alpha W'(\bar{Y}+sY(x)) \leq \alpha W'(\bar{Y}) < \lim_{z\to 0} V'(z)$ for all x and s which, when the migrant remits his entire income, that is, when $s=1$, implies that decreasing s will yield marginal gains in the utility that the migrant derives from income spent in the host country that are larger than his marginal loss from lowering the utility of his family. Therefore, remitting the entire income cannot be optimal.

and

$$U_s(x^*,s^*,\alpha)=-Y(x^*)V'((1-s^*)Y(x^*))$$
$$+\alpha Y(x^*)W'(\bar{Y}+s^*Y(x^*))=0. \quad (3)$$

If $s^*=0$, then x^* is the unique solution to the equation

$$U_x(x^*,0,\alpha)=U_x(x^*,0,0)=Y'(x^*)V'(Y(x^*))-C'(x^*)=0, \quad (4)$$

and such that $x^*\equiv x^*(0)$.

Proof. See the Appendix. □

Lemma 2. *For $\alpha>\bar{\alpha}$, where $\bar{\alpha}=\inf\{\alpha: s^*(\alpha)>0\}$, $s^*=s^*(\alpha)>0$; for $\alpha<\bar{\alpha}$, $s^*=s^*(\alpha)=s^*(0)=0$.*[9]

Proof. See the Appendix. □

We are now in a position to present our main result.

Claim 1. *The optimal effort exerted to assimilate, $x^*(\alpha)$, is a non-decreasing function of the weight that the migrant attaches to the wellbeing of his family, α. If the migrant is not altruistic enough to remit, namely if $\alpha<\bar{\alpha}$, then his effort to assimilate is a constant function of α. A migrant who is altruistic enough to remit exerts more effort to assimilate than a non-remitting migrant. Over the interval $[\bar{\alpha},\infty)$, the optimal effort to assimilate exerted by a migrant is a strictly increasing function of α.*

Proof. We consider $\alpha\in\{\alpha_1,\alpha_2\}$, where α_1,α_2 are some values such that $\alpha_2>\alpha_1$. If $s^*(\alpha_1)=s^*(\alpha_2)=0$, then, from Lemma 1, $x^*(\alpha_1)=x^*(\alpha_2)=x^*(0)$. We show that if $s^*(\alpha_2)>s^*(\alpha_1)=0$, or if $s^*(\alpha_1)>0$, then $x^*(\alpha_2)>x^*(\alpha_1)$. Lemma 2 already excludes the possibility that $s^*(\alpha_1)>s^*(\alpha_2)=0$.

We proceed in two steps. First, suppose that $s^*(\alpha_1)=0$ and that $s^*(\alpha_2)>0$. Assume that $x^*(\alpha_1)\geq x^*(\alpha_2)$. From the strict concavity of Y, V, and $-C$ it follows that

$$Y'(x^*(\alpha_1))V'(Y(x^*(\alpha_1)))-C'(x^*(\alpha_1))$$
$$<Y'(x^*(\alpha_2))V'((1-s^*(\alpha_2))Y(x^*(\alpha_2)))-C'(x^*(\alpha_2)). \quad (5)$$

The left-hand side of (5) is equal to $U_x(x^*(\alpha_1),0,\alpha_1)$ and thus, to zero (cf. (4)). From (3) we know that $\alpha W'(\bar{Y}+s^*Y(x^*))=V'((1-s^*)Y(x^*))$, which together with (2) implies that the right-hand side of (5) is also equal to zero. But then, inequality (5) cannot hold, which implies that $x^*(\alpha_1)<x^*(\alpha_2)$.

Second, we assume that $s^*(\alpha_1)>0$. In Lemmas 1 and 2, we established that then, the maximum of the utility function in (1) for $\alpha\in[\alpha_1,\alpha_2]$ is obtained as a unique solution of Eqs. (2) and (3), so now we only need to show that $x^*_\alpha=x^*_\alpha(\alpha)>0$ for all $\alpha\in[\alpha_1,\alpha_2]$.

Differentiation of (2) and (3) with respect to α yields, respectively,

$$x^*_\alpha U_{xx}(x^*,s^*,\alpha)+s^*_\alpha U_{xs}(x^*,s^*,\alpha)+U_{x\alpha}(x^*,s^*,\alpha)=0 \quad (6)$$

and

$$x^*_\alpha U_{sx}(x^*,s^*,\alpha)+s^*_\alpha U_{ss}(x^*,s^*,\alpha)+U_{s\alpha}(x^*,s^*,\alpha)=0. \quad (7)$$

Multiplication of (6) by

$$U_{ss}(x^*,s^*,\alpha)=Y^2(x^*)[V''((1-s^*)Y(x^*))$$
$$+\alpha W''(\bar{Y}+s^*Y(x^*))] \quad (8)$$

and multiplication of (7) by

$$U_{sx}(x^*,s^*,\alpha)=U_{xs}(x^*,s^*,\alpha)=Y'(x^*)\frac{U_s(x^*,s^*,\alpha)}{Y(x^*)}$$
$$+Y(x^*)Y'(x^*)[-(1-s^*)V''((1-s^*)Y(x^*))$$
$$+\alpha s^*W''(\bar{Y}+s^*Y(x^*))] \quad (9)$$

(where (8) and (9) are derived from (3)), and subtraction of the resulting equations by sides yields

$$x^*_\alpha=\frac{A(x^*,s^*,\alpha)}{H(x^*,s^*,\alpha)}, \quad (10)$$

where

$$A(x^*,s^*,\alpha)=U_{s\alpha}(x^*,s^*,\alpha)U_{sx}(x^*,s^*,\alpha)$$
$$-U_{x\alpha}(x^*,s^*,\alpha)U_{ss}(x^*,s^*,\alpha), \quad (11)$$

and

$$H(x^*,s^*,\alpha)=U_{xx}(x^*,s^*,\alpha)U_{ss}(x^*,s^*,\alpha)$$
$$-U_{xs}(x^*,s^*,\alpha)U_{sx}(x^*,s^*,\alpha). \quad (12)$$

Because $\frac{U_s(x^*,\,s^*,\,\alpha)}{Y(x^*)}=-V'((1-s^*)Y(x^*))+\alpha W'(\bar{Y}+s^*Y(x^*))$ (cf. (3)), it follows straightforwardly that $(1-s^*)V'((1-s^*)Y(x^*))+\alpha s^*W'(\bar{Y}+s^*Y(x^*))=V'((1-s^*)Y(x^*))+s^*\frac{U_s(x^*,\,s^*,\,\alpha)}{Y(x^*)}$, and then, from (2), we have that

$$U_{xx}(x^*,s^*,\alpha)=\left[(1-s^*)Y'(x^*)\right]^2V''((1-s^*)Y(x^*))$$
$$+\alpha\left[s^*Y'(x^*)\right]^2W''(\bar{Y}+s^*Y(x^*))$$
$$+Y''(x^*)\left[V'((1-s^*)Y(x^*))+s^*\frac{U_s(x^*,s^*,\alpha)}{Y(x^*)}\right]-C''(x^*). \quad (13)$$

We draw on (3), (8), (9), and (13) (and on the strict concavity of Y, $-C$, V, and W) to establish that

$$H(x^*,s^*,\alpha)=\alpha\left[Y'(x^*)Y(x^*)\right]^2V''((1-s^*)Y(x^*))$$
$$\times W''(\bar{Y}+s^*Y(x^*))$$
$$+Y^2(x^*)\left[V'((1-s^*)Y(x^*))\right.$$
$$\left.\times Y''(x^*)-C''(x^*)\right]\left[V''((1-s^*)Y(x^*))\right.$$
$$\left.+\alpha W''(\bar{Y}+s^*Y(x^*))\right]>0. \quad (14)$$

Thus, the sign of x^*_α is the same as the sign of $A(x^*,s^*,\alpha)$ which, using

$$U_{x\alpha}(x^*,s^*,\alpha)=s^*Y'(x^*)W'(\bar{Y}+s^*Y(x^*)) \quad (15)$$

and

$$U_{s\alpha}(x^*,s^*,\alpha)=Y(x^*)W'(\bar{Y}+s^*Y(x^*)), \quad (16)$$

and due to (3), (8), and (9) simplifies to $-Y'(x^*)Y^2(x^*)\times V''((1-s^*)Y(x^*))W'(\bar{Y}+s^*Y(x^*))$ and which, in turn, is positive due to the properties of the functions Y, V, and W. □

Claim 1 informs us that the effort to assimilate exerted by a migrant never declines in the weight that he attaches to the wellbeing of his family, and that for large enough values of this weight, the effort to assimilate exerted by a remitting migrant is an increasing function of the weight. Moreover, we can reason that of two remitting migrants who differ only in the weight that they attach to the wellbeing of their families back home, the migrant who cares more about his family will make a greater effort to

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[9] We do not exclude though the possibility that the migrant does not remit even for very high α (as usual, $\inf\{\varnothing\}=\infty$).

assimilate. Also, a remitting migrant will assimilate more than a migrant who is not motivated to remit (or who has no one to remit to in the home country).

3. Implications

We provide a causal foundation for a positive correlation between a strong attachment to the ethnic group and a strong attachment to the majority culture when the former attachment is conceptualized as a link with the home country, and the latter attachment is conceptualized as a link with the host country. In addition, our analysis has several testable implications. First, consider two migrants who are similar in all relevant respects, except that one is more altruistic than the other and remits more. Then, Claim 1 informs us that the more altruistic migrant expends a greater effort to assimilate than the less altruistic migrant. A further testable implication is that for a subset of migrants, their degree of assimilation (as measured, for example, by participation in language courses or acquired language skills) will be higher for migrants who send remittances than for migrants who do not. These predictions are somewhat perplexing because it would be intuitively plausible to expect that strong ties with the families who are left behind would diminish the incentive to assimilate. Our results suggest that the opportunity (or facility) to send remittances may induce migrants to generate more income, so that the net extra resources effect (or the tax revenue effect) for the host country could well be positive, even if a fraction of the migrants' income is disposed of elsewhere. More generally, assimilation can be approximated by the extent to which migrants learn, acquire, and abide by the culture, norms, and customs of the host country. Our analysis suggests that these measurable aspects of assimilation will be higher for remitting than for non-remitting migrants.

In this paper we have looked at the remittances issue from a new perspective. Whereas earlier work largely sought to unravel the economic repercussions at origin of the receipt of remittances (see, for instance, Lucas and Stark, 1985; Rosenzweig and Stark, 1989; Lucas, 1997; and Stark, 2009), here we have highlighted a manner in which the aspiration to remit could impact on economic behavior at destination, potentially shaping the susceptibility of migrants to policies aimed at boosting their assimilation. And, as already noted, we have explicitly linked assimilation and remittances, with altruism acting as the intervening variable: an altruism-motivated inclination to remit encourages assimilation, and more intensive assimilation yields higher remittances.

There is an analogy in our model between an increase in the weight that the migrant attaches to the wellbeing of his family, and a decrease in the family's income as both these factors increase the marginal gain from remitting. Our model enables us to conclude that when the income of the family left in the home country is below a specific threshold, the migrant's optimal effort to assimilate is a strictly decreasing function of his family's income and, also, that his optimal effort is higher than the optimal effort to assimilate of a non-remitting migrant.

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Appendix

Proof of Lemma 1. We already noted that $x^*>0$ and that $s^*<1$ in any local maximum (x^*,s^*). The candidates for local maxima are of two types: (x^*,s^*) that solves (2) and (3) such that $s^*>0$; and (x^*,s^*) with x^* that solves (4) such that $s^*=0$. We show that for each α, there is at most one (x^*,s^*) that solves (2) and (3) and which can be a local maximum, and at most one x^* that solves (4) which can constitute a local maximum. Additionally, if (4) has a solution that is a local maximum, then Eqs. (2) and (3) do not have a solution that can be a local maximum. Thus, the utility function in (1) has at most one local maximum, and because this utility function attains its global maximum, that maximum is unique.

Eq. (3) and $Y(x^*)>0$ imply that for (x^*,s^*) of the first type

$$V'((1-s^*)Y(x^*))=\alpha W'(\bar{Y}+s^*Y(x^*)), \tag{A.1}$$

which can be used to obtain from (2) that

$$Y'(x^*)V'((1-s^*)Y(x^*))-C'(x^*)=0. \tag{A.2}$$

Armed with these observations, we proceed in three steps. First, suppose that there are two different solutions to (2) and (3), say (x_1^*,s_1^*) and (x_2^*,s_2^*). Because U is strictly concave as a function of s,[10] $(x_1^*,s_1^*)\neq(x_2^*,s_2^*)$ implies that $x_1^*\neq x_2^*$. Without loss of generality, we assume that $x_1^*<x_2^*$. Then, due to (A.2) and because $C'(x_1^*)<C'(x_2^*)$,

$$\begin{aligned} Y'(x_1^*)V'((1-s_1^*)Y(x_1^*))&=C'(x_1^*)<C'(x_2^*)\\ &=Y'(x_2^*)V'((1-s_2^*)Y(x_2^*)), \end{aligned} \tag{A.3}$$

which together with $Y'(x_1^*)>Y'(x_2^*)$ implies that

$$V'((1-s_1^*)Y(x_1^*))<V'((1-s_2^*)Y(x_2^*)). \tag{A.4}$$

Combining (A.4) with (A.1) implies

$$\begin{aligned} \alpha W'(\bar{Y}+s_1^*Y(x_1^*))&=V'((1-s_1^*)Y(x_1^*))\\ &<V'((1-s_2^*)Y(x_2^*))\\ &=\alpha W'(\bar{Y}+s_2^*Y(x_2^*)). \end{aligned} \tag{A.5}$$

For (A.4) and (A.5) to hold simultaneously, both $(1-s_1^*)Y(x_1^*)>(1-s_2^*)Y(x_2^*)$ and $\bar{Y}+s_1^*Y(x_1^*)>\bar{Y}+s_2^*Y(x_2^*)$ must be true. But then it is necessary that $Y(x_1^*)>Y(x_2^*)$, which contradicts the assumption that $x_1^*<x_2^*$.

Second, because for fixed $s=0$, U is strictly concave as a function of x, there can be no more than one x^* that solves (4).[11]

Third, suppose that x_1^* solves (4) and that it is a local maximum, and suppose that (x_2^*,s_2^*) solves (2) and (3), and that $s_2^*>0$. For $(x_1^*,0)$ to constitute a local maximum, it is necessary that $U_s(x_1^*,0,\alpha)\leq 0$, which together with (A.1) implies that

$$\begin{aligned} V'(Y(x_1^*))&\geq\alpha W'(\bar{Y})>\alpha W'(\bar{Y}+s_2^*Y(x_2^*))\\ &=V'((1-s_2^*)Y(x_2^*)). \end{aligned} \tag{A.6}$$

Combining (A.6) with (4) and (A.2) implies

$$\frac{C'(x_1^*)}{Y'(x_1^*)}=V'(Y(x_1^*))>V'((1-s_2^*)Y(x_2^*))=\frac{C'(x_2^*)}{Y'(x_2^*)}. \tag{A.7}$$

For (A.7) to be satisfied, it is necessary that $x_1^*>x_2^*$, which in turn implies that $Y(x_1^*)>(1-s_2^*)Y(x_2^*)$ and thus, that $V'(Y(x_1^*))<V'((1-s_2^*)Y(x_2^*))$, which contradicts (A.6).

In sum: there is at most one local maximum of the utility function in (1), which thus is the unique global maximum. $\square$

[10] The expression $U_{ss}(x,s,\alpha)=Y^2(x)\left[V''((1-s)Y(x))+\alpha W''(\bar{Y}+sY(x))\right]$ is negative for all (x,s).

[11] The expression $U_{xx}(x,0,\alpha)=Y''(x)V'(Y(x))+\left[Y'(x)\right]^2V''(Y(x))-C''(x)$ is negative for all x.

Proof of Lemma 2. We show that if for some value of α the migrant remits, then he will also remit for larger values of α.

Suppose that $s^*(\alpha) > 0$ for some $\alpha = \tilde{\alpha}$. Then, necessarily,

$$U(x^*(\tilde{\alpha}), s^*(\tilde{\alpha}), \tilde{\alpha}) > U(x^*(0), 0, \tilde{\alpha}). \tag{A.8}$$

For $\alpha > \tilde{\alpha}$, drawing on $(\alpha - \tilde{\alpha})W(\bar{Y} + s^*(\tilde{\alpha})Y(x^*(\tilde{\alpha}))) > (\alpha - \tilde{\alpha}) \times W(\bar{Y})$, we get that

$$\begin{aligned} &U(x^*(\tilde{\alpha}), s^*(\tilde{\alpha}), \alpha) - U(x^*(\tilde{\alpha}), s^*(\tilde{\alpha}), \tilde{\alpha}) \\ &\quad > U(x^*(0), 0, \alpha) - U(x^*(0), 0, \tilde{\alpha}), \end{aligned} \tag{A.9}$$

and then, we obtain

$$U(x^*(\tilde{\alpha}), s^*(\tilde{\alpha}), \alpha) > U(x^*(0), 0, \alpha). \tag{A.10}$$

Thus, for $\alpha > \tilde{\alpha}$ we cannot have that $x^*(\alpha) = x^*(0)$.

Therefore, for $\bar{\alpha} = \inf\{\alpha\colon s^*(\alpha) > 0\}$, we have that for $\alpha > \bar{\alpha}$, $s^*(\alpha) > 0$, and that for $\alpha < \bar{\alpha}$, $s^*(\alpha) = 0$. □

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