Strategic Remittances, Asymmetric Information, and Efficiency Wages

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Abstract

By assuming an economy that consists of labour-sending and labour-receiving countries, we investigate whether immigrants can actually improve their welfare by strategic remittances under asymmetric information, when wages are determined according to the efficiency wage hypothesis. For this purpose, we assume two types of workers in the sending country: workers with high effort and high productivity, and workers with low effort and low productivity. We also assume that information on effort and productivity of individual immigrants is symmetric between immigrants and firms in the receiving country if only one kind of worker in the sending country migrates, whereas such information is asymmetric if both kinds of workers migrate simultaneously. We show that there are cases in which both kinds of workers have incentives for migration and strategic remittances, and thereby, neither of them can obtain higher wages. Therefore, incentives for migration and remittances may prevent both types of immigrants from improving their welfare. This result is in marked contrast with that by Stark (1995), which assumed that wages are determined according to productivity. It showed that only skilled immigrants have incentives for migration and strategic remittances and thereby they can realize higher wages. Our results suggest whether immigrants can improve their welfare depends on how their wages are determined.

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1. Introduction

This paper discusses how immigrant welfare is related to immigrant incentives for strategic remittances under asymmetric information, and investigates whether incentives for migration and strategic remittances always lead to higher immigrant welfare when wages are determined according to the efficiency wage hypothesis. We assume an economy that consists of labour-sending and labour-receiving countries. We also assume that there are two kinds of workers in the sending country: workers with high effort and high productivity, and workers with low effort and low productivity. We show that there exist cases in which both kinds of workers simultaneously have incentives to migrate and to send remittances strategically, and as a result neither of them can realize higher welfare. In other words, migration and strategic remittances may lower immigrant welfare.

Workers' remittances, i.e. current transfers by migrants who are employed in, and considered as residents of, the countries that host them, have been growing rapidly around the world.[1] They have been increasing for over three decades, from US$6 billion in the early 1970s, to US$50 billion in the mid-1990s, to US$180 billion in 2006 (Chami et al. 2008, IMF 2008).

In response to this development, concern has grown regarding what causes remittances and how they are used.[2] One of the main debates on these problems is about whether remittances are made for investment and development purposes, or for consumption and non-development purposes.

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[1] Other categories in the balance of payments that are highlighted when compiling statistics on remittances are employee compensation and migrants' transfers. According to Chami et al. (2008), workers' remittances most closely conform to the notion that researchers and policy makers have in mind when discussing remittance flows.

[2] Lucas and Stark (1985) is a representative study that tried to find motivations for remittances.

Some empirical studies favour the former argument. They find that a significant part of remittances is devoted to investment, in order to improve the life of the immigrant families or their own life after they return to their home countries.[3] Other empirical studies are in favour of the latter argument. According to their findings, most remittances are spent on consumption, and for purposes that are not directly related to the development of the immigrant home countries.[4]

This debate is likely to remain inconclusive since the arguments made by each author depend on the region and the period under study. In addition, it is not easy for us to distinguish investment spending from consumption spending, and investment does not always lead to the development and consumption sometimes contributes to the development.[5] Accordingly, we cannot easily

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[3] According to Durand et al. (1996), migrants in America do not engage in unrestrained consumer spending. Rather, these immigrants do what they can to improve their own and their families' well being, given their social and economic constraints. Taylor (1999) argued that a number of empirical studies from diverse regions support the new economics of labour migration hypothesis, that migration and remittances may set in motion a development dynamic, by easing capital and risk constraints faced by households in an imperfect market environment, and creating income growth linkages. Woodruff and Zenteno (2001) found that remittances are responsible for almost 20% of the capital invested in microenterprises throughout urban Mexico.

[4] Massey and Parrado (1994) found that most of the money sent by Mexican migrants in America to their home country is spent on consumption. According to the study on Turkish migrants by Koc and Onan (2004), migrant savings are generally used to satisfy basic consumption needs. Semyonov and Gorodzeisky (2008) revealed, by data drawn from four major labour-sending areas in the Philippines, that remittances are used mostly for consumption purposes.

[5] For example, spending on foodstuffs is usually considered to be consumption. However, a more

divide motives for remittances distinctively into investment and development purposes and consumption and non-development purposes.

This paper focuses instead on a theoretical issue regarding the strategic motive for remittances under asymmetric information, as discussed by Stark (1995).[6] He explained immigrant remittances not by investment or consumption purposes, but by the strategic motive.

Stark (1995) assumed a two-country economy consisting of a labour-sending country and a labour-receiving country. There are two kinds of workers in the sending country. Skilled workers are those who have high productivity. Some of them migrate to the receiving country, where they are called skilled immigrants. Unskilled workers are those who have low productivity. Some of them migrate to the receiving country, where they are called unskilled immigrants. Firms in the sending country are perfectly aware of the individual productivities of workers, but firms in the receiving country are not necessarily perfectly aware of the individual productivities of immigrants.

When only skilled (unskilled) workers migrate to the receiving country, firms in the receiving country know perfectly that all immigrants are skilled (unskilled). Accordingly, in the receiving country, information on the individual productivities of immigrants is symmetric between immigrants and firms. In this case, immigrant wages are determined to be equal to their actual productivities. Therefore, whatever productivity workers have, workers in the sending country experience no gains and no losses by migrating to the receiving country.

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nutritious diet makes workers healthier and more productive. In this case, consumption will lead to the development.

[6] The issues related to international migration under asymmetric information are also treated by Katz and Stark (1986, 1987, 1989) and Stark (1991, part 4).

On the other hand, when skilled and unskilled workers migrate to the receiving country simultaneously, firms in the receiving country are not perfectly aware of the individual productivities of immigrants. Accordingly, in the receiving country, information on the individual productivities of immigrants is asymmetric between immigrants and firms. In this case, firms set immigrant wages at the average of skilled and unskilled immigrant productivities. This is because firms in the receiving country cannot distinguish skilled immigrants from unskilled immigrants.

As a result, under asymmetric information, skilled immigrants are paid less than their productivity, whereas unskilled immigrants are paid more than their productivity. In other words, skilled immigrants lose, whereas unskilled immigrants gain.

In such circumstances, skilled immigrants may try to dissuade unskilled workers from migrating to the receiving country since, in this way, information in the receiving country will become symmetric, and thereby skilled workers will be paid wages that correspond to their actual productivity. For this purpose, skilled workers may migrate to the receiving country, and may send part of their wages to unskilled workers for strategic reasons: to make them stay in the sending country.

On the other hand, even in the same circumstance, unskilled immigrants have no incentives to send strategic remittances. This is because, as explained already, due to the asymmetry of information, they are paid higher wages than their actual productivity if they are with skilled immigrants. Their wages would be reduced to those that conform to their actual productivity if they had dissuaded skilled workers from migrating to the receiving country by making strategic remittances to them.

Therefore, in Stark's (1995) model, there is no possibility that both skilled and unskilled workers in the sending country simultaneously have incentives to migrate to the receiving country and to make remittances strategically.

Stark's analysis is very interesting, in that remittances are made only to satisfy immigrant present pecuniary interests. The reasons for remittances are not directly related either to present or future gains to immigrant families arising from investment or consumption, or to future gains for the immigrants themselves arising from investment.

In his analysis, as mentioned, wages are set equivalent to the actual productivity of workers under symmetric information, and it is natural to assume that wages are determined by the average of different immigrant productivities under asymmetric information. However, how wages and employment are determined is not modelled formally. Accordingly, it is not necessarily clear whether workers are maximizing their utilities, or whether firms are maximizing their profits.

In this paper, we adopt the efficiency wage hypothesis to model the labour market formally. We assume explicitly that firms determine wages in such a manner as to maximize their profits, even under asymmetric information.

By doing so, we try to show that there are cases in which skilled and unskilled workers simultaneously have incentives for migration and strategic remittances. In such cases, neither skilled nor unskilled immigrants can earn higher wages than those under asymmetric information, since both types of workers migrate to the receiving country simultaneously, and as a result information becomes asymmetric between immigrants and firms. Therefore, under efficiency wages, incentives for strategic remittances themselves can prevent all immigrants from improving their welfare.

The remainder of this paper is organized as follows: Section 2 models a two-country economy. Section 3 determines immigrant wages under asymmetric information and symmetric information. Section 4 examines whether incentives for strategic remittances always increase immigrant welfare. Section 5 presents concluding comments.

2. The Model

In this section, we model an economy that consists of labour-sending and labour-receiving countries in which wages are determined according to the efficiency wage hypothesis.

We assume that there are two types of workers in the sending country: workers with high effort and high productivity, and workers with low effort and low productivity. Workers of one type are substitutes for workers of another type as factors of production. Both types of workers are not voluntarily unemployed in the sending country. Since both types of workers in the sending country can obtain higher wages by migrating to the receiving country and being employed there, some of workers of each type are willing to migrate to the receiving country. However, even if workers migrate to the receiving country, they exert the same level of effort and productivity there as they do in the sending country.[7] All native workers in the receiving country exert the same level of effort and productivity. They are assumed not to migrate. In both countries wages are determined according to the efficiency wage hypothesis. We assume that, due to insufficient labour availability in the receiving country, it accepts immigrants. The two countries are connected through labour migration. They may also be related through remittances from workers of one type who are native to the sending country and migrated to the receiving country to workers of another type who remain in the sending country.

Workers in the sending country whose effort and productivity are high, exert effort as much as e_H if they do not shirk, and their per capita effective labour is also equal to e_H, which is assumed to be a constant. Workers in the sending country whose effort and productivity are low

[7] Of course this is a simplifying assumption. In general, effort and productivity depend on the place where labour is supplied. Workers may exert high effort and high productivity in the receiving country if the working conditions there are better than in the sending country.

exert effort as much as e_L if they do not shirk, and their per capita effective labour is also equal to e_L, which is assumed to be a constant.

In the sending country, there is no asymmetry of information on workers' effort and productivity between workers and firms, in the sense that firms are perfectly aware of effort and productivity of individual workers, and they can distinguish workers with high effort and high productivity from workers with low effort and low productivity.[8] As a result, workers with different levels of effort and productivity are always treated as different inputs by firms in the sending country.

The firms in the sending country produce goods according to the following production function:

$$A^*(e_H M_H^* + e_L M_L^*)^{a^*}, \quad A^* > 0, \quad 1 > a^* > 0,$$

where A^* is a constant, M_H^* is employment of workers with high effort and high productivity in the sending country, and M_L^* is employment of workers with low effort and low productivity in the sending country. Physical capital is fixed and does not appear explicitly in the production function.

The profits of the firms in the sending country π^* are defined as follows:

$$\pi^* \equiv A^*(e_H M_H^* + e_L M_L^*)^{a^*} - w_H^* M_H^* - w_L^* M_L^*,$$

where w_H^* is wages for workers with high effort and high productivity employed in the sending country, and w_L^* is wages for workers with low effort and low productivity employed in the sending country. Throughout the analysis the product price in the sending country is assumed to be one.

Demand functions for workers are derived in a manner such that, the profits of the firms in the sending country are maximized.

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[8] This is not true for firms in the receiving country.

$$w_H^* = e_H A^* a^* (e_H M_H^* + e_L M_L^*)^{a^*-1}. \quad (1H)$$

$$w_L^* = e_L A^* a^* (e_H M_H^* + e_L M_L^*)^{a^*-1}. \quad (1L)$$

As mentioned already, we determine wages according to the efficiency wage hypothesis of Shapiro and Stiglitz (1984). In particular, wages for workers with effort e_i, where $i = H, L,$ in the sending country, are determined so as to prevent shirking by these workers.

We represent the expected lifetime utility of a representative worker with effort e_i who is employed and shirks in the sending country, by $V_{E_i}^{*S}$,

$$rV_{E_i}^{*S} = w_i^* + (\beta + \rho)(V_{U_i}^* - V_{E_i}^{*S}),$$

where β is the separation rate, which is defined as a ratio of separation of employed workers with effort e_i in the sending country due to reasons other than shirking to the number of employed workers with effort e_i in the sending country, ρ is the detection rate, which is a probability for an employed worker with effort e_i in the sending country of being detected and fired by firms in the sending country due to shirking, and r is the discount rate. The separation rate, the detection rate and the discount rate are assumed to be the same for both types of workers and even after migration, and they do not change throughout the analysis. The first term on the right-hand side represents the instantaneous utility under shirking. The second term represents the changes in the expected lifetime utility arising from being unemployed due to shirking, or for reasons other than shirking.[9] $V_{U_i}^*$ is the expected lifetime utility of a representative unemployed worker in the sending country with effort e_i, which is given by

$$rV_{U_i}^* = \alpha_i (V_{E_i}^{*S} - V_{U_i}^*),$$

where α_i is the accession rate for unemployed workers with effort e_i, which is defined as the

[9] This equation corresponds to Equation (1) in Shapiro and Stiglitz (1984), i.e. it is the fundamental asset equation for a shirker.

ratio of new hires of unemployed with effort e_i in the sending country to the number of the unemployed with effort e_i in the sending country. Unemployment benefits are assumed to be 0 to simplify the analysis. The right-hand side represents the changes in the expected lifetime utility arising from being reemployed.[10] In steady state, the accession rate α_i is determined to equalize the number of workers with effort e_i who flow into unemployment in the sending country to the number of workers with effort e_i who flow out of unemployment in the sending country. We also represent the expected lifetime utility of a representative worker with effort e_i who is employed, and does not shirk, in the sending country, by $V_{E_i}^{*N}$,

$$rV_{E_i}^{*N} = w_i^* - e_i + \beta(V_{U_i}^* - V_{E_i}^{*N}).$$

The first and second terms on the right-hand side represent the instantaneous utility under non-shirking, and the third term represents the changes in the expected lifetime utility arising from being unemployed for reasons other than shirking.[11]

When workers in the sending country do not migrate to the receiving country, steady state wages for workers with effort e_i in the sending country that satisfy their respective non-shirking conditions $V_{E_i}^{*N} = V_{E_i}^{*S}$ are derived as follows:

$$W(M_H^*, \overline{M}_H^*) \equiv 1 + [\{\overline{M}_H^* / (\overline{M}_H^* - M_H^*)\}\beta + r] / \rho,$$

$$W(M_L^*, \overline{M}_L^*) \equiv 1 + [\{\overline{M}_L^* / (\overline{M}_L^* - M_L^*)\}\beta + r] / \rho,$$

where $\overline{M}_H^*$ is the number of workers with high effort and high productivity who are initially endowed in the sending country, and $\overline{M}_L^*$ is the number of workers with low effort and low productivity who are initially endowed in the sending country. They are given exogenously. These

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[10] This equation corresponds to Equation (6) in Shapiro and Stiglitz (1984).

[11] This equation corresponds to Equation (2) in Shapiro and Stiglitz (1984), i.e. it is the fundamental asset equation for a non-shirker.

equations can be rewritten as follows:

$$w_H^* = e_H W(M_H^*, \overline{M}_H^*), \quad M_H^* \le \overline{M}_H^*, \tag{2H}$$

$$w_L^* = e_L W(M_L^*, \overline{M}_L^*), \quad M_L^* \le \overline{M}_L^*, \tag{2L}$$

where $\partial w_i^* / \partial M_i^* > 0$ and $\partial w_i^* / \partial \overline{M}_i^* < 0$ for $i = H, L$.

We assume that the initial endowments of workers in the sending country do no differ between the two types, i.e. $\overline{M}_H^* = \overline{M}_L^* (\equiv \overline{M}^*)$.

Under this assumptions, from the equilibrium conditions of the labour markets in the sending country, which are provided by Equations (1H) and (2H) and Equations (1L) and (2L), the employment of workers with high effort and high productivity and the employment of workers with low effort and low productivity are derived to be the same, i.e. $M_H^* = M_L^* (\equiv M^*)$ to satisfy,

$$A^* a^* (e_H + e_L)^{a^*-1} M^{*a^*-1} = W(M^*, \overline{M}^*). \tag{3}$$

By substituting M^*, which satisfies Equation (3), into Equations (2H) and (2L), equilibrium wages for workers with high effort and high productivity in the sending country when none of these workers migrate and equilibrium wages for workers with low effort and low productivity in the sending country when none of these workers migrate are determined as follows:

$$w_H^* = e_H W(M^*, \overline{M}^*). \tag{4H}$$

$$w_L^* = e_L W(M^*, \overline{M}^*). \tag{4L}$$[12]

[12] In the following sections, we deal with cases in which some of workers in the sending country migrate to the receiving country. In such cases, equilibrium wages in the sending country are different from Equations (4H) and (4L) because the number of workers of each type remaining in the sending country is smaller than $\overline{M}^*$. However, to determine the amount of remittances needed to dissuade workers in the sending country from migration, we have to know how much money they can earn in the sending country when none of them migrate.

Both types of workers in the sending country can obtain higher wages by migrating to the receiving country and being employed there. Accordingly, among the same type of workers, $s^*\overline{M}^*$, where $0 < s^* < 1$, are willing to migrate to the receiving country.[13] They are not voluntarily unemployed in the receiving country.

As for the patterns of migration from the sending to receiving countries, there are two possibilities. One possibility is that workers of different types migrate to the receiving country at the same time. Another possibility is that workers of one type migrate to the receiving country, and workers of another type do not migrate, but stay in the sending country.

When workers of different types migrate to the receiving country simultaneously, we assume that firms in the receiving country are not perfectly aware of effort and productivity of individual immigrants, and that they cannot distinguish immigrants with high effort and high productivity from immigrants with low effort and low productivity. In this case, asymmetry of information prevails between immigrants and firms in the receiving country with regard to effort and productivity of individual immigrants. As a result, firms in the receiving country have no alternative but to treat all immigrants, even with different levels of effort and productivity, as the same input. In such a case, immigrant wages that satisfy their non-shirking condition do not necessarily correspond to their actual effort and productivity.

On the other hand, when only workers of the same type migrate to the receiving country, firms

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[13] Even if wages are higher in the receiving country and employment probability does not differ across immigrants, not all workers in the sending country will migrate to the receiving country since, for example, migration costs differ among workers. Some workers may have experiences of living abroad. It will be easy for such workers to migrate than those who have no experiences of living abroad.

in the receiving country have perfect information on effort and productivity of individual immigrants. Accordingly, there is no asymmetry of information between immigrants and firms with regard to effort and productivity of individual immigrants. As a result, in this case immigrant wages are determined in a manner that reflects their actual effort and productivity. However, for this case to happen, workers of another type have to be provided with some incentives to stay in the sending country because, as the analysis by Stark (1995) shows, some of them may be able to earn higher wages by moving to the receiving country and finding a job there.

3. Immigrant Wages in the Receiving Country under Asymmetric Information and under Symmetric Information

In this section, we determine immigrant wages in the receiving country in the case in which both types of worker in the sending country migrate to the receiving country simultaneously, and therefore information on effort and productivity of individual immigrants is asymmetric between immigrants and firms in the receiving country; and in the case in which only workers of the same type migrate, and information is therefore symmetric.

First, we deal with a case in which both types of workers migrate to the receiving country simultaneously. In this case, workers in the sending country migrate to the receiving country by $2s^*\overline{M}^*$. As already assumed, firms in the receiving country do not know whether an individual immigrant has high effort and high productivity or low effort and low productivity. As a consequence, firms treat all immigrants as the same input.

In order to employ immigrants, firms have to set their effort and productivity at a certain level. This is because firms cannot determine immigrant employment and wages without assuming their effort and productivity.

Firms in the receiving country set immigrant effort and productivity to e_H or e_L to maximize profits. They do not choose other values for immigrant effort and productivity. This can be

explained as follows: If firms consider immigrant effort and productivity to be lower than e_L and determine their wages accordingly, all immigrants will shirk. Even in this case firms pay wages, but nothing is produced. If firms consider immigrant effort to be between e_L and e_H, and determine their wages accordingly, immigrants with e_H will shirk and immigrants with e_L will be overpaid.[14] Firms can produce the same amount of output at lower cost if they assume immigrant effort and productivity to be e_L. If firms consider immigrant effort to be higher than e_H and determine their wages accordingly, no immigrants will shirk, but all of them will be overpaid.[15] Firms can produce the same amount of output at lower cost if they assume immigrant effort and productivity to be e_H.

In one case, in which firms in the receiving country take immigrant effort and productivity to be high and determine immigrant wages accordingly, we assume that the production function takes the following form:

$$\tilde{N}_H^{a_1}(e_H\tau_H\tilde{M}_H + e_L\tau_L\tilde{M}_H)^{a_2}, \quad a_1, a_2 > 0, \quad a_1 + a_2 < 1, \quad 0 < \tau_L, \tau_H < 1, \quad \tau_H + \tau_L = 1,$$

where $\tilde{N}_H$, $\tilde{M}_H$ are the numbers of native workers and immigrants employed in this case, τ_H is the ratio of employed immigrants with high effort and high productivity among all employed immigrants, which is a constant and given independently of how firms assume immigrant effort and productivity; and τ_L is the ratio of employed immigrants with low effort and low productivity among all employed immigrants, which is also a constant and given independently of how firms assume immigrant effort and productivity. Per capita effective labour of native workers

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[14] Even if immigrants with e_L are overpaid, their effort and productivity do not increase, and production does not increase.

[15] Even if all immigrants are overpaid, their effort and productivity do not increase, and production does not increase.

in the receiving country is one. Although employed immigrants with low effort and low productivity are overpaid, as already assumed, their effort and productivity remain unchanged. No employed immigrants shirk in this case. Accordingly, the total effective input of immigrants is $e_H\tau_H\tilde{M}_H + e_L\tau_L\tilde{M}_H$. As expressed by the production function, native workers and immigrants are assumed to be complements as factors of production, in the sense that the marginal product of one input is positively related to the employment of the other input. As in the sending country, physical capital is fixed and does not appear explicitly in the production function. Accordingly, the profits of firms in this case are defined as follows:

$$\tilde{\pi}_H \equiv \tilde{N}_H^{a_1}(e_H\tau_H\tilde{M}_H + e_L\tau_L\tilde{M}_H)^{a_2} - \tilde{w}_{N_H}\tilde{N}_H - \tilde{w}_{M_H}\tilde{M}_H,$$

where $\tilde{w}_{N_H}$ is native worker wages in this case and $\tilde{w}_{M_H}$ is immigrant wages in this case. Throughout the analysis, the product price in the receiving country is assumed to be one.

Firms demand native workers and immigrants in such a manner as to maximize profits. We have already assumed that there are insufficient native workers in the receiving country.[16] Accordingly, it would be better for us to assume that the initial endowment of native workers in the receiving country $\overline{N}$ is not large, so that $\partial\tilde{\pi}_H/\partial\tilde{N}_H > 0$ for $\tilde{N}_H \le \overline{N}$. Consequently, native worker employment is determined to be $(1-v)\overline{N}$, where v, $0 < v < 1$, is the ratio of native workers who prefer to be voluntarily unemployed among native workers initially existent in the receiving country. On one hand, we assume that firms can choose $\tilde{M}_H$, such that $\partial\tilde{\pi}_H/\partial\tilde{M}_H = 0$ for $\tilde{M}_H \le 2s^*\overline{M}^*$. Under these assumptions, firms demand immigrants in the

[16] If a country does not have enough skilled labour, it will try to accept skilled immigrants. However, in actual economies, it is not easy to accept skilled immigrants as much as needed. Under such a circumstance, in order to increase production, the country will accept immigrants that are complements to skilled native workers.

following manner:

$$\tilde{w}_{M_H} = (1-v)^{a_1} \overline{N}^{a_1} (e_H \tau_H + e_L \tau_L)^{a_2} a_2 \tilde{M}_H^{a_2 - 1}. \quad (5)$$

On the other hand, steady state wages for immigrants, which satisfy their non-shriking condition when firms take their effort to be high, are

$$\tilde{w}_{M_H} = e_H W(\tilde{M}_H / 2, s^* \overline{M}^*), \quad (6)$$

where the separation rate, the detection rate and the discount rate for immigrants are assumed to be the same as those in the sending country.

Utilizing Equations (5) and (6), immigrant employment is determined to satisfy the following condition:

$$(1-v)^{a_1} \overline{N}^{a_1} (e_H \tau_H + e_L \tau_L)^{a_2} a_2 \tilde{M}_H^{a_2 - 1} = e_H W(\tilde{M}_H / 2, s^* \overline{M}^*). \quad (7)$$

By substituting $\tilde{M}_H$, which satisfies Equation (7), into Equation (6), we can derive immigrant wages in the case in which firms take their effort and productivity to be high.

In the other case, in which firms in the receiving country take immigrant effort and productivity to be low and determine immigrant wages accordingly, we assume that the production function takes the following form:

$$\tilde{N}_L^{a_1} (e_L \tau_L \tilde{M}_L)^{a_2},$$

where $\tilde{N}_L$, $\tilde{M}_L$ are the numbers of native workers and immigrants employed in this case. Since, in this case, immigrants with high effort shirk, the total effective input of immigrants is $e_L \tau_L \tilde{M}_L$. Accordingly, the profits of firms in this case are defined as follows:

$$\tilde{\pi}_L \equiv \tilde{N}_L^{a_1} (e_L \tau_L \tilde{M}_L)^{a_2} - \tilde{w}_{N_L} \tilde{N}_L - \tilde{w}_{M_L} \tilde{M}_L,$$

where $\tilde{w}_{N_L}$ is native worker wages in this case and $\tilde{w}_{M_L}$ is immigrant wages in this case.

Native worker employment is the same as in the case where immigrant effort and productivity are taken to be high, and $\tilde{M}_L$ is determined to satisfy $\partial \tilde{\pi}_L / \partial \tilde{M}_L = 0$. Firms demand immigrants in the following manner:

$$\tilde{w}_{M_L} = (1-v)^{a_1} \overline{N}^{a_1} (e_L \tau_L)^{a_2} a_2 \tilde{M}_L^{a_2-1}. \quad (8)$$

On the other hand, steady state wages for immigrants that satisfy their non-shriking condition when firms take their effort to be low are,

$$\tilde{w}_{M_L} = e_L W(\tilde{M}_L/2, s^* \overline{M}^*). \quad (9)$$

Utilizing Equations (8) and (9), immigrant employment is determined to satisfy the following condition:

$$(1-v)^{a_1} \overline{N}^{a_1} (e_L \tau_L)^{a_2} a_2 \tilde{M}_L^{a_2-1} = e_L W(\tilde{M}_L/2, s^* \overline{M}^*). \quad (10)$$

By substituting $\tilde{M}_L$, which satisfies Equation (10), into Equation (9), we can derive immigrant wages in the case where firms take their effort to be low.

In the former case, where immigrant effort and productivity is taken to be high by firms, both types of immigrants are exerting their effort, but immigrants with low effort and low productivity are overpaid. Whereas, in the latter case, in which firms take immigrant effort and productivity to be low, immigrants with low effort and low productivity are paid corresponding to their actual effort and productivity, but immigrants with high effort and high productivity are not exerting their efforts. Since we cannot determine a priori in which case firms can obtain higher profits, we must examine both cases.

We now turn to another situation, in which only workers of the same type migrate to the receiving country. In this case, the number of immigrants is $s^* \overline{M}^*$. As already assumed, under symmetric information, firms in the receiving country are perfectly aware of effort and productivity of individual immigrants.

If only workers with high effort and high productivity migrate, the production function of firms in the receiving country is

$$N_H^{a_1} (e_H M_H)^{a_2},$$

where N_H, M_H are the numbers of native workers and immigrants employed in this case. The

total effective input of immigrants is $e_H M_H$ since immigrants do not shirk.

Firms demand native workers and immigrants in such a way as to maximize profits:

$$\pi_H \equiv N_H^{a_1}(e_H M_H)^{a_2} - w_{N_H} N_H - w_{M_H} M_H,$$

where w_{N_H} is native worker wages in this case and w_{M_H} is immigrant wages in this case. They are employed to satisfy $N_H = (1-v)\overline{N}$ and $\partial \pi_H / \partial M_H = 0$.

Therefore, in the case in which only the workers with high effort and high productivity migrate, immigrants are demanded in the following manner:

$$w_{M_H} = (1-v)^{a_1} \overline{N}^{a_1} e_H^{a_2} a_2 M_H^{a_2 - 1}. \tag{11}$$

On the other hand, their steady state wages that satisfy their non-shriking condition are

$$w_{M_H} = e_H W(M_H, s^* \overline{M}^*). \tag{12}$$

Utilizing Equations (11) and (12), immigrant employment is determined to satisfy the following condition:

$$(1-v)^{a_1} \overline{N}^{a_1} e_H^{a_2} a_2 M_H^{a_2 - 1} = e_H W(M_H, s^* \overline{M}^*). \tag{13}$$

By substituting M_H, which satisfies Equation (13), into Equation (12), we can derive immigrant wages in the case in which all of them are with high effort and high productivity.

Similarly, if only workers with low effort and low productivity migrate, their steady state wages that satisfy their non-shirking condition are

$$w_{M_L} = e_L W(M_L, s^* \overline{M}^*), \tag{14}$$

where w_{M_L}, M_L are immigrant wages and employment in this case. Immigrant employment in this case is determined to satisfy the following condition:

$$(1-v)^{a_1} \overline{N}^{a_1} e_L^{a_2} a_2 M_L^{a_2 - 1} = e_L W(M_L, s^* \overline{M}^*). \tag{15}$$

By substituting M_L, which satisfies Equation (15), into Equation (14), we can derive immigrant wages in the case in which all of them are with low effort and low productivity.

Summarizing the results derived in this section, under asymmetric information, immigrant

wages are determined to satisfy Equations (6) and (7) or Equations (9) and (10). Under symmetric information, wages for immigrants with high effort and high productivity are determined to satisfy Equations (12) and (13), and wages for immigrants with low effort and low productivity are determined to satisfy Equations (14) and (15).

4. Strategic Remittances

In this section, we show that there are cases in which both types of workers in the sending country have incentives for migration and strategic remittances simultaneously, and that, as a result, neither of these workers can improve their welfare.

First, we consider the case in which firms in the receiving country can obtain higher profits by assuming high effort and high productivity for immigrants under asymmetric information. In this case, as shown by Equations (6) and (7), immigrant wages are $\tilde{w}_{M_H}$.

Let us assume that $\tilde{w}_{M_H}$ are higher than w_{M_H}. If this is so, the right-hand side of Equation (7) must be larger than the right-hand side of Equation (13), i.e.

$$e_H W(\tilde{M}_H/2, s^*\overline{M}^*) > e_H W(M_H, s^*\overline{M}^*).$$

This suggests that $\tilde{M}_H/2 > M_H$. At the same time, the left-hand side of Equation (7) also must be larger than the left-hand side of Equation (13), i.e.

$$(1-v)^{a_1}\overline{N}^{a_1}(e_H\tau_H + e_L\tau_L)^{a_2} a_2 \tilde{M}_H^{a_2-1} > (1-v)^{a_1}\overline{N}^{a_1} e_H^{a_2} a_2 M_H^{a_2-1}.$$

We can rewrite this as $\{\tau_H + (e_L/e_H)\tau_L\}^{a_2/(1-a_2)} > \tilde{M}_H/M_H$. Since $\{\tau_H + (e_L/e_H)\tau_L\}^{a_2/(1-a_2)} < 1$, $\tilde{M}_H/M_H < 1$. However, this contradicts $\tilde{M}_H/2 > M_H$, since $\tilde{M}_H/M_H < 1$ implies $\tilde{M}_H < M_H$, whereas $\tilde{M}_H/2 > M_H$ implies $\tilde{M}_H > M_H$. Therefore, in the case where firms take immigrant effort and productivity to be high, immigrants with high effort and high productivity can obtain higher wages when only these workers migrate to the receiving country, i.e.

$$w_{M_H} > \tilde{w}_{M_H}.$$

This suggests that workers with high effort and high productivity in the sending country can earn higher wages in the receiving country if they are able to prevent the migration of workers with low effort and low productivity. In this way, they are able to make information symmetric between themselves and firms in the receiving country.

Let us also assume that $\tilde{w}_{M_H}$ are higher than w_{M_L}. If this is so, the right-hand side of Equation (7) must be larger than the right-hand side of Equation (15), i.e.

$$e_H W(\tilde{M}_H/2, s^*\overline{M}^*) > e_L W(M_L, s^*\overline{M}^*).$$

If the difference between e_H and e_L is sufficiently small, $\tilde{M}_H/2 > M_L$. At the same time, the left-hand side of Equation (7) must also be larger than the left-hand side of Equation (15), i.e.

$$(1-v)^{a_1}\overline{N}^{a_1}(e_H\tau_H + e_L\tau_L)^{a_2} a_2 \tilde{M}_H^{a_2-1} > (1-v)^{a_1}\overline{N}^{a_1} e_L^{a_2} a_2 M_L^{a_2-1}.$$

We can rewrite this as $\{(e_H/e_L)\tau_H + \tau_L\}^{a_2/(1-a_2)} > \tilde{M}_H/M_L$. If a_2 is sufficiently small, $\{(e_H/e_L)\tau_H + \tau_L\}^{a_2/(1-a_2)}$ is approximately equal to one. In such a case, $\tilde{M}_H/M_L$ is likely to be smaller than one. However, this contradicts $\tilde{M}_H/2 > M_L$. Therefore, in this case again, immigrants with low effort and low productivity are likely to obtain higher wages when only these workers migrate to the receiving country, i.e.

$$w_{M_L} > \tilde{w}_{M_H}.$$

This suggests that workers with low effort and low productivity in the sending country are likely to earn higher wages in the receiving country if they can prevent the migration of workers with high effort and high productivity. In this way, they can make information symmetric between themselves and firms in the receiving country.

Summarizing the results derived in the case in which firms in the receiving country take immigrant effort and productivity to be high under asymmetric information, it is possible that not only for immigrants with high effort and high productivity, but also for immigrants with low effort

and low productivity, to obtain higher wages under symmetric information, i.e.

$$w_{M_H}, w_{M_L} > \tilde{w}_{M_H}. \tag{16}$$

Equation (16) is in contrast to the relation derived by Stark (1995). In his model, as mentioned already, only skilled workers can obtain higher wages under symmetric information. Equation (16) suggests that workers of one type may be able to realize higher wages in the receiving country if they can make workers of another type stay in the sending country.

We now turn to another case, in which firms in the receiving country can obtain higher profits by assuming low effort and low productivity for immigrants under asymmetric information. In this case, as shown by Equations (9) and (10), immigrant wages are $\tilde{w}_{M_L}$.

Let us assume that $\tilde{w}_{M_L}$ are higher than w_{M_H}. If this is so, the right-hand side of Equation (10) must be larger than the right-hand side of Equation (13), i.e.

$$e_L W(\tilde{M}_L/2, s^* \overline{M}^*) > e_H W(M_H, s^* \overline{M}^*).$$

This suggests that $\tilde{M}_L/2 > M_H$. At the same time, the left-hand side of Equation (10) must also be larger than the left-hand side of Equation (13), i.e.

$$(1-v)^{a_1} \overline{N}^{a_1} (e_L \tau_L)^{a_2} a_2 \tilde{M}_L^{a_2-1} > (1-v)^{a_1} \overline{N}^{a_1} e_H^{a_2} a_2 M_H^{a_2-1}.$$

We can rewrite this as $(e_L \tau_L / e_H)^{a_2/(1-a_2)} > \tilde{M}_L / M_H$. Since $(e_L \tau_L / e_H)^{a_2/(1-a_2)} < 1$, $\tilde{M}_L / M_H < 1$. However, this contradicts $\tilde{M}_L/2 > M_H$. Therefore, in the case in which firms take immigrant effort and productivity to be low, immigrants with high effort and high productivity can obtain higher wages when only these workers migrate to the receiving country, i.e.

$$w_{M_H} > \tilde{w}_{M_L}.$$

This suggests that workers with high effort and high productivity in the sending country can earn higher wages in the receiving country if they are able to prevent the migration of workers with low effort and low productivity. In this way, they are able to make information symmetric between themselves and firms in the receiving country.

Let us also assume that $\tilde{w}_{M_L}$ are higher than w_{M_L}. If this is so, the right-hand side of Equation (10) must be larger than the right-hand side of Equation (15), i.e.

$$e_L W(\tilde{M}_L/2, s^* \overline{M}^*) > e_L W(M_L, s^* \overline{M}^*).$$

This suggests that $\tilde{M}_L/2 > M_L$. At the same time, the left-hand side of Equation (10) must be larger than the left-hand side of Equation (15), i.e.

$$(1-v)^{a_1} \overline{N}^{a_1} (e_L \tau_L)^{a_2} a_2 \tilde{M}_L^{a_2-1} > (1-v)^{a_1} \overline{N}^{a_1} e_L^{a_2} a_2 M_L^{a_2-1}.$$

We can rewrite this as $\tau_L^{a_2/(1-a_2)} > \tilde{M}_L/M_L$. Since $\tau_L^{a_2/(1-a_2)} < 1$, $\tilde{M}_L/M_L < 1$. However, this contradicts $\tilde{M}_L/2 > M_L$. Therefore, in this case too, immigrants with low effort and low productivity can obtain higher wages when only these workers migrate to the receiving country, i.e.

$$w_{M_L} > \tilde{w}_{M_L}.$$

This suggests that workers with low effort and low productivity can also earn higher wages in the receiving country if they are able to prevent the migration of workers with high effort and high productivity. In this way, they are able to make information symmetric between themselves and firms in the receiving country.

Summarizing the results derived in the case where the firms in the receiving country take immigrant effort and productivity to be low under asymmetric information, it is possible that not only immigrants with high effort and high productivity, but also immigrants with low effort and low productivity, can obtain higher wages under symmetric information, i.e.

$$w_{M_H}, w_{M_L} > \tilde{w}_{M_L}. \tag{17}$$

Equation (17) also contrasts with the relation derived by Stark (1995). Equation (17) suggests that workers of one type may be able to realize higher wages in the receiving country if they can make workers of another type stay in the sending country.

Whether firms maximize profits by assuming immigrant effort and productivity to be high or to

be low, workers with high effort and high productivity will try to dissuade workers with low effort and low productivity from migrating to the receiving country. At the same time, workers with low effort and low productivity will try to dissuade workers with high effort and high productivity from migrating to the receiving country.

Strategic remittances may make this possible. In particular, if workers with high effort and high productivity (workers with low effort and low productivity) earn sufficiently high wages in the receiving country when they are there alone, workers with high effort and high productivity (workers with low effort and low productivity) may send part of their wages to workers with low effort and low productivity (workers with high effort and high productivity) to induce them to stay in the sending country.

To explain this possibility more concretely, we show that workers with high effort and high productivity are likely to prevent the migration of workers with low effort and low productivity, by making remittances to the latter workers. Wages for the former workers excluding remittances will be even higher than those earned under asymmetric information.

As Equations (16) and (17) show, the difference between immigrant wages with high effort and high productivity under symmetric information and under asymmetric information, i.e. $w_{M_H} - \tilde{w}_{M_i}$, where $i = H, L,$ is positive. Each employed immigrant with high effort and high productivity can earn more by this amount by preventing the migration of potential immigrants with low effort and low productivity.[17] It goes without saying that the number of employed

[17] Of course, as we mention below, the net gain for an employed immigrant due to prevention of the migration of workers with low effort and low productivity is smaller than $w_{M_H} - \tilde{w}_{M_i}$ since, to do so, immigrants with high effort and high productivity have to send part of their wages to workers with low effort and low productivity.

immigrants with high effort and high productivity is smaller than the number of those immigrants existent in the receiving country, i.e. $M_H < s^* \overline{M}^*$. However, the difference between immigrant wages under asymmetric information and wages for workers with low effort and low productivity in the sending country, i.e. $\tilde{w}_{M_i} - w_L^*$, which is equal to the cost needed to make each potential immigrant with low effort and low productivity stay in the sending country, can be positive and sufficiently small for an appropriate choice of A^*. Accordingly, the total gain for employed immigrants with high effort and high productivity due to the prevention of the migration of potential immigrants with low effort and low productivity, i.e. $(w_{M_H} - \tilde{w}_{M_i})M_H$, may be larger than its total cost, which is equal to or smaller than $(\tilde{w}_{M_i} - w_L^*)s^* \overline{M}^*$.[18]

$$(w_{M_H} - \tilde{w}_{M_i})M_H > (\tilde{w}_{M_i} - w_L^*)s^* \overline{M}^*. \quad (18)$$

If Equation (18) holds, workers with high effort and high productivity will remit part of their wages to potential immigrants with low effort and low productivity in the sending country. This is because, even if they make remittances, employed immigrants with high effort and high productivity can earn higher wages, which are equal to $w_{M_H} - (\tilde{w}_{M_i} - w_L^*)s^* \overline{M}^* / M_H$, than those earned under asymmetric information, which are equal to $\tilde{w}_{M_i}$. Accordingly, by migration and remittances, workers with high effort and high productivity can obtain higher welfare. At the same time, by receiving remittances, potential immigrants employed in the sending country exerting

[18] $(\tilde{w}_{M_i} - w_L^*)s^* \overline{M}^*$ is the amount of remittances that is necessary in the case in which all potential immigrants with low effort and low productivity are employed in the sending country and will be employed in the receiving country. However, all potential immigrants with low effort and low productivity will not be employed in either country. In case they are employed at the same probability in the two countries, the amount of money needed to prevent migration will be smaller than $(\tilde{w}_{M_i} - w_L^*)s^* \overline{M}^*$.

low effort and low productivity can earn higher wages in the sending country, which are equal to those earned in the receiving country.[19] Accordingly, without migrating, they can attain higher welfare in the sending country by receiving remittances. Therefore, it is likely that they lose motivation to migrate.[20]

All these suggest that under Equation (18), workers with high effort and high productivity have incentives for both migration and remittances.

We next show that workers with low effort and low productivity are likely to prevent the migration of workers with high effort and high productivity, by making remittances to the latter workers. Wages for the former workers excluding remittances will be even higher than those earned under asymmetric information.

As Equations (16) and (17) show, the difference between immigrant wages with low effort and low productivity under symmetric information and under asymmetric information, i.e. $w_{M_L} - \tilde{w}_{M_i}$, where $i = H, L,$ is positive. Each employed immigrant with low effort and low productivity can earn more by this amount by preventing the migration of potential immigrants

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[19] The total earnings of a potential immigrant with low effort and low productivity are $\tilde{w}_{M_i} - w_L^*$ if he is not employed in the sending country.

[20] By receiving remittances, the total earnings of an employed potential immigrant with low effort and low productivity become $\tilde{w}_{M_i}$. Accordingly, without moving to the receiving country, he can earn the same wages in the sending country as he would earn if employed in the receiving country under asymmetric information. Similarly, by receiving remittances, the total earnings of an unemployed potential immigrant with low effort and low productivity become $\tilde{w}_{M_i} - w_H^*$. Accordingly, without moving to the receiving country, he can earn money without supplying labour.

with high effort and high productivity.[21] It goes without saying that the number of employed immigrants with low effort and low productivity is smaller than the number of those immigrants existent in the receiving country, i.e. $M_L < s^* \overline{M}^*$. However, since the difference between immigrant wages under asymmetric information and wages for workers with high effort and high productivity in the sending country, i.e. $\tilde{w}_{M_i} - w_H^*$, which is equal to the cost needed to make each potential immigrant with high effort and high productivity stay in the sending country, can be positive and sufficiently small for an appropriate choice of A^*. Accordingly, the total gain for employed immigrants with low effort and low productivity by preventing the migration of workers with high effort and high productivity, i.e. $(w_{M_L} - \tilde{w}_{M_i})M_L$ may be larger than its total cost, which is equal to or smaller than $(\tilde{w}_{M_i} - w_H^*)s^* \overline{M}^*$.[22]

$$(w_{M_L} - \tilde{w}_{M_i})M_L > (\tilde{w}_{M_i} - w_H^*)s^* \overline{M}^*. \quad (19)$$

If Equation (19) holds, workers with low effort and low productivity will remit part of their wages to potential immigrants with high effort and high productivity in the sending country. This

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[21] Of course, as we mention below, the net gain for an employed immigrant due to prevention of the migration of workers with high effort and high productivity is smaller than $w_{M_L} - \tilde{w}_{M_i}$ since, to do so, immigrants with low effort and low productivity have to send part of their wages to workers with high effort and high productivity.

[22] $(\tilde{w}_{M_i} - w_H^*)s^* \overline{M}^*$ is the amount of remittances that is necessary in the case in which all potential immigrants with high effort and high productivity are employed in the sending country and will be employed in the receiving country. However, all potential immigrants with high effort and high productivity will not be employed in either country. In case they are employed at the same probability in the two countries, the amount of money needed to prevent migration will be smaller than $(\tilde{w}_{M_i} - w_H^*)s^* \overline{M}^*$.

is because, even if they make remittances, employed immigrants with low effort and low productivity can earn higher wages, which are equal to $w_{M_L} - (\tilde{w}_{M_i} - w_H^*)s^*\overline{M}^*/M_L$, than those earned under asymmetric information, which are equal to $\tilde{w}_{M_i}$. Accordingly, by migration and remittances, workers with low effort and low productivity can obtain higher welfare. At the same time, by receiving remittances, potential immigrants employed in the sending country exerting high effort and high productivity can earn higher wages in the sending country, which are equal to those earned in the receiving country.[23] Accordingly, without migrating, they can attain higher welfare by receiving remittances.[24]

All these suggest that under Equation (19), workers with low effort and low productivity also have incentives for both migration and remittances.

As explained already, Equations (18) and (19) hold simultaneously for an appropriate choice of A^*.[25] This suggests that it is possible that not only workers with high effort and high productivity,

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[23] The total earnings of a potential immigrant with high effort and high productivity are $\tilde{w}_{M_i} - w_H^*$ if he is not employed in the sending country.

[24] By receiving remittances, the total earnings of an employed potential immigrant with high effort and high productivity become $\tilde{w}_{M_i}$. Accordingly, without moving to the receiving country, he can earn the same wages in the sending country as he would earn if employed in the receiving country under asymmetric information. Similarly, by receiving remittances, the total earnings of an unemployed potential immigrant with high effort and high productivity become $\tilde{w}_{M_i} - w_L^*$. Accordingly, without moving to the receiving country, he can earn money without supplying labour.

[25] We have already shown that Equation (16) holds if the difference between e_H and e_L is sufficiently small and a_2 is also sufficiently small. Moreover, if the difference between e_H and

but also workers with low effort and low productivity, have incentives for migrating to the receiving country and making remittances simultaneously.

However, in such a case, since both kinds of workers migrate to the receiving country simultaneously, information on effort and productivity of individual immigrants becomes asymmetric between immigrants and firms in the receiving country. Since firms do not know effort and productivity of individual immigrants perfectly, they set immigrant wages to be equal to $\tilde{w}_{M_i}$, where $i = H, L$. As a result, neither immigrants with high effort and high productivity nor immigrants with low effort and low productivity can earn wages higher than $\tilde{w}_{M_i}$. This suggests that incentives for migration and strategic remittances may prevent the improvement of all immigrant welfare.

This result is in stark contrast with that derived by Stark (1995). As mentioned already, in Stark's model, skilled and unskilled immigrants do not, at the same time, have incentives for migration and remittances. Therefore, there is no possibility at all that incentives for migration and strategic remittances do more harm than good to all immigrants.

Summarizing the results derived in this section, if we assume efficiency wages and firms determine wages to maximize their profits then even under asymmetric information, there are cases in which incentives for migration and strategic remittances make it impossible for both immigrants with high effort and high productivity, and immigrants with low effort and low productivity, to improve their welfare. Therefore, incentives for migration and remittances prevent both types of immigrants from improving their welfare. This result is contrasted with the one

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e_L is sufficiently small, w_L^* and w_H^* are approximately equal. Accordingly, by choosing A^* appropriately, we can make the left-hand side of Equation (18) larger than its right-hand side, and the left-hand side of Equation (19) larger than its right-hand side, simultaneously.

derived by Stark (1995).

5. Conclusions

This paper investigated the role of remittances in improving immigrant welfare, assuming a two-country economy in which wages are determined according to the efficiency wage hypothesis. In particular, we sought to clarify whether strategic remittances always lead to higher immigrant welfare under different wage settings.

We demonstrated that, under efficiency wages, it is possible that not only workers with high effort and high productivity but also workers with low effort and low productivity, have incentives for migration to the receiving country and making strategic remittances, and, as a result, neither of these two types of workers can obtain higher wages than those obtainable under asymmetric information in the receiving country. Therefore, incentives for migration and strategic remittances may prevent all immigrants from obtaining higher welfare. Our result contrasts with that of Stark (1995), in which wages are set equal to productivity, and incentives for migration and remittances can lead to higher welfare of skilled immigrants.

Our results suggest that incentives for strategic remittances do not always improve immigrant welfare, which depends on how immigrant wages are determined.

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