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Remittances Capital and Economic Growth: A Simple Model with Endogenous Growth

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Abstract

In view of the growing importance of remittances flows to emerging nations, now rivaling or surpassing FDI inflows, this short paper develops a simple neoclassical growth model with remittances capital as an additional input in the production process. The inclusion of remittances capital is justified because the extant literature suggests that, as opposed to inward FDI, it is primarily channeled to investments in education, health, and economic infrastructure. In addition, it is not associated with reverse flows (often massive in absolute and relative terms) back to the parent companies, often residing in developed countries. The paper shows how in the presence of exogenous growth or diminishing returns, the economy's long-term growth rate is unaffected, but its steady-state level of income per efficient worker can be increased as a result of changing the savings and/or tax rate. In the endogenous case, it is shown that the economy's long-term growth rate can be permanently raised by pursuing policies that improve the financial payments infrastructure and thus enhance the remittances capital elasticity, β. The paper also shows that conditional convergence can be retained in the endogenous case via a hybrid model. Insofar as future empirical research is concerned, this simple model provides a framework for explaining the growth rate in per capita income in both cross-sectional and panel data using appropriate proxies for the regressors of interest, namely s, n, x, δ, and τ.

Keywords

Convergence, Economic Growth, Endogenous Growth, Foreign Direct Investment (FDI), Net Reverse Flows, Remittances Capital

1. Introduction

Much like foreign direct investment (FDI) flows, remittance flows can have either positive or negative effect on the long-term growth prospects of a country (emerg-

ing nation). These flows can contribute to the financing of private capital formation in the host nation, augmenting both the stock of private capital and the productivity of labor, thus enhancing the country's long-term economic growth (see Guiliano & Ruiz-Arranz, 2006; Kumar, 2013; Mundaca, 2009; Ratha, 2013; Sharma & Ramirez, 2009; Ramirez, 2023; Rodriguez-Sanchez, 2023)[1]. Unlike inward FDI flows, however, remittance flows do not give rise to net reverse flows of profits and dividends to the parent companies, often residing in developed countries, which divert resources away from the financing of private capital formation (see Goldfajn et al., 2021; Cypher, 2020; Ramirez, 2025)[2]. On the other hand, if remittances are primarily channeled to finance current consumption, then they reduce current investment spending, thus reducing the stock of private capital and the country's long-term growth prospects (see Acosta et al., 2008; Gapen et al., 2009; Chami et al., 2005; Sutradhar, 2020). In this connection, the literature suggests that remittance flows are more likely to be used by family members to finance expenditures on education and/or vocational training, and to the extent that they do, they contribute to the formation of human capital and future economic growth (see Ratha, 2013; Mora Rivera & Arellano González, 2016; Salahuddin & Gow, 2015). Aside from these direct positive effects of remittances, they may also generate positive spillover effects via added expenditures on education (vocational training), health, and the induced "learning-by-doing" as domestic firms, often small, accumulate capital, which, incidentally, generates new knowledge. Finally, investments in human capital, by raising the overall quality and skill of the workforce, *complement* and enhance physical capital's overall effectiveness. In this note, we focus on the positive effects of remittances in a standard growth model, keeping in mind the aforementioned potential (and actual) negative effects documented in the literature[3]. The next section presents the modified simple growth model, followed by a short discussion of convergence (or its absence) towards the steady-state income rate. The last section is the conclusion.

2. Economic Growth Model with Remittances Capital as an Additional Input

Following the lead of Barro and Sala-I-Martin (1985), Escot and Galindo (1999), and Ramirez (2024), remittance flows can be treated as a form of foreign capital

[1]For example, remittance flows to Latin American and the Caribbean have increased steadily from US $ 21.3 bn in 2001 to US $ 61.5 bn in 2006 and an estimated US $ 134.7 bn in 2022, up 40 percent from 2019. These flows have surpassed FDI inflows during the 2019-2023 period, and represent a significant percentage of the GDP for even the larger countries of the region (3 to 5 percent)—including Mexico and Brazil—not to mention the smaller countries, such as El Salvador and Honduras, where these flows represent at least 26 percent of their GDP (see World Bank, 2022; Ramirez, 2023; Rodriguez-Sanchez, 2023).

[2]ECLAC (2023) reports that net payments of profit and interest for Chile averaged about $ 11.2 bn for the 2015-2022 period, while those for Mexico averaged $ 32.4 bn, or almost three times bigger. These reverse flows are not only large in absolute terms but relative to GDP and GFCF as well (see Ramirez, 2023).

[3]The negative effect of remittances capital formation can be incorporated into the model by setting $\beta < 0$.

that generates positive or negative externality effects to the domestic economy. The impact of remittances capital can be explicitly incorporated in a standard Cobb-Douglas production function as follows:

$$Y = K^{\alpha} R^{\beta} \left(AL\right)^{1-\alpha-\beta} \tag{1}$$

where Y is real output (income), K is the private domestic capital stock, and R is the remittances capital stock, L is the labor force, and A is a "Harrod-neutral" technology variable. When A increases over time, a unit of labor becomes more productive. It is also assumed, at first, that α and β are less than one, such as there are diminishing returns to the stocks of domestic and foreign capital. "Harrod neutral" technological progress implies that $\dot{L}/L = n$ and $\dot{A}/A = x$, where n is the constant growth rate in the labor force and x is the constant technological and exogenous growth rate (Solow's "manna from heaven").

Dividing Equation (1) by AL, the effective amount of labor used in production, results in:

$$y = k^{\alpha} r^{\beta} \tag{2}$$

where y denotes output per effective unit of labor, k is private domestic capital per effective unit of labor, and r denotes remittances capital per efficient worker[4].

Taking logs of Equation (2) and differentiating, the dynamics of the economy over time are:

$$\dot{y}/y = \alpha\left(\dot{k}/k\right) + \beta\left(\dot{r}/r\right) \tag{3}$$

The growth of private domestic capital is determined by the propensity to save, s, the tax rate, τ, and the rate of depreciation of private capital, δ_k, as follows:

$$\dot{K} + \delta_k K = s\left(1-\tau\right)Y \tag{4}$$

Remittance flows to emerging nations and their role in financing private capital formation are primarily driven by individual decisions by migrants, their families, and home town organizations in the source country that collectively pool and channel funds to their respective countries (see Ellerman, 2003; Orozco, 2004); however, they are also determined by the actions of the recipient government, in the form of government expenditures (and policies) designed to attract this type of investment to the country. For example, the Mexican government's Three-For-One Collective Remittance Program aimed to direct funds toward community projects, economic infrastructure, and vocational (technical) education that generate long-term economic growth and development. In this program, which was discontinued by the administration of Manuel Lopez Obrador (2016-2024), each

[4]In this note we have focused on the supply side of the economy, but the demand side can be incorporated into the model via the following intertemporal utility maximization framework:

$\text{Max } u(t) = \int_0^{\infty} u\left(c(t)\right)\mathrm{e}^{-\rho t} L(t)\,\mathrm{d}t$, where, for convenience, lower-case letters are defined in per capita terms and ρ is the discount rate (assumed to be greater than zero and n), $L(t) = \mathrm{e}^{nt}$ is the size of the family, $c(t)$ is per capita consumption, and δ represents the rate of depreciation. We also assume that $u(c(t))$ satisfies the Inada conditions: $u'(c) \to \infty$ as $c \to 0$, and $u'(c) \to 0$ as $c \to \infty$.
s.t. $\dot{k} = k^{\alpha} r^{\beta} - c - \delta k$ and $k(0) \geq 0$

peso contributed by migrants was matched by the federal, state, and local governments, multiplying the beneficial impacts for the recipient states and rural communities (see Rodriguez-Sanchez, 2023). The Mexican government has in recent years also promoted policies designed to foster greater competition in the banking system in order to lower the high fees charged by wire transfer companies; it has established bilateral agreements with the U.S. to expand access to capital in less developed parts of Mexico, such as the U.S.-Mexico Partnership for Prosperity, and it has eased banking and identification regulations to facilitate remittance transfers for immigrants and bring the unbanked into the formal banking system (see Sanchez et al., 2024). In this admittedly simple model, government expenditures (and policies) designed to attract remittances capital (G_r) are totally financed by taxes which are proportional to income (output) as follows:

$$\dot{R} + \delta_r R = G_r = \tau Y \tag{5}$$

where δ_r is the rate of depreciation of remittances capital and τ is the proportional tax rate. Thus, proportional taxes on income directly finance government expenditures intended to attract or induce remittance flows, and thus indirectly finance remittances capital formation in the recipient economy. The dynamics of this simple economy with private domestic and remittances capital per efficient worker are given by the following dynamic equations:

$$\dot{k} = s(1-\tau)k^{\alpha}r^{\beta} - k(n + x + \delta_k) \tag{6}$$

and

$$\dot{r} = \tau k^{\alpha} r^{\beta} - r(n + x + \delta_r) \tag{7}$$

Equations (6) and (7) can be solved to determine the long-run or steady-state growth rates as follows:

$$\dot{k}/k = s(1-\tau)k^{\alpha-1}r^{\beta} - (n + x + \delta_k) \tag{8}$$

and

$$\dot{r}/r = \tau k^{\alpha} r^{\beta-1} - (n + x + \delta_r) \tag{9}$$

For simplicity, assume that the depreciation rates for remittances and domestic private capital are equal, then we can solve this dynamic system for the exogenous growth or diminishing returns case ($\alpha + \beta < 1$); the steady-state growth rates are:

$$\dot{y}/y = \dot{k}/k = \dot{r}/r = 0 \tag{10}$$

In this case, Equations (8) and (9) are set = 0 and noting that $k = [s(1 - \tau)/\tau]r$, the long-run equilibrium values for r^*, k^*, and y^* (via the production function) are:

$$r^* = \left\{\tau^{1-\alpha}\left[s(1-\tau)\right]^{\alpha} / (n + x + \delta)\right\}^{1/(1-\alpha-\beta)} \tag{11}$$

and the steady-state quantity of private capital per efficient worker:

$$k^* = s(1-\tau)/\tau\left\{\tau^{1-\alpha}\left[s(1-\tau)\right]^{\alpha} / (n + x + \delta)\right\}^{1/(1-\alpha-\beta)} \tag{12}$$

and the steady-state quantity of output per efficient worker:

$$y^* = \left[s(1-\tau)/\tau\right]^{\alpha+\beta}\left\{\tau^{1-\alpha}\left[s(1-\tau)\right]^{\alpha}/(n+x+\delta)\right\}^{\alpha+\beta/(1-\alpha-\beta)} \tag{13}$$

While in the case of endogenous growth ($\alpha+\beta=1$), the steady-state growth rates are:

$$\dot{y}/y = \dot{k}/k = \dot{r}/r = \tau^{1-\alpha}\left[s(1-\tau)\right]^{\alpha} - (n+x+\delta) \tag{14}$$

That is, when output per efficient worker is linear in k due to a positive externality (via investments in education and health) in the manner of Romer (1986, 1990) generated by remittances capital formation, then there are no diminishing returns to private domestic capital in the long run and the model generates growth that depends on the propensity to save, *s*, and the tax rate, τ. Equation (14) also suggests that in both the case of exogenous and endogenous technical progress, the government can directly influence the long-term income level or economic growth rate per efficient worker by varying the tax rate for a given savings rate (see **Figure 1** below). Barro and Sala-I-Martin (1995) and Escot and Galindo (1999) have shown that the optimal tax rate is given by:

$$\tau = \beta/(\alpha+\beta) \tag{15}$$

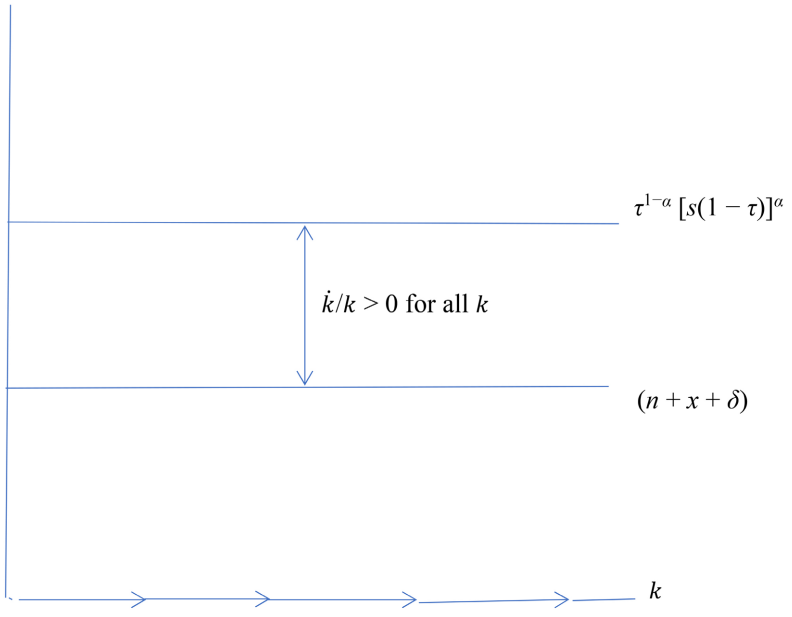

Figure 1. Perpetual growth of k and y in the case of endogenous growth.

In the case of endogenous growth, the optimal tax rate, τ, is just equal to the elasticity of output with respect to remittances capital, β, since $(\alpha+\beta)=1$. The government can influence and increase β by pursing policies that improve the financial payments system infrastructure (e.g., by promoting mobile payments and e-banking, fostering greater competition from banks, microfinance institutions, and credit unions to lower the high fees charged by wire transfer companies such

as Western Union and Money Gram, and promoting the use of alternative forms of identification to help taxpaying immigrants to open bank accounts in the US and Mexico, such as the Taxpayer Identification Number (ITIN) and the foreign government issued identification Mexican *Matricula Consular* card)[5].

3. Convergence Dynamics

Turning to the transition dynamics towards the steady-state income y^*, we use the standard convergence equation:

$$\mathrm{d}\ln y/\mathrm{d}t = \dot{y}/y = -\rho\left(\ln y - \ln y^*\right) \tag{16}$$

where y^* is given by Equation (13) and $\rho = (1-\alpha-\beta)(n+x+\delta)$. ρ is obtained as a result of a log-linear Taylor expansion of Equation (8) around the steady state (k^*) which, in turn, determines the speed of convergence from k to k^* (and from y to y^*) (see Barro & Sala-i-Martin, 1995). In the case of exogenous growth, the transition dynamics of Equation (16) imply that the further an economy is below its steady-state value y^*, the faster is its growth rate; and the further the economy is above its steady-state value y^*, the faster its growth rate declines. The $\ln y^*$ is given by:

$$\ln y^* = \left[\alpha+\beta/(1-\alpha-\beta)\right]\ln\left\{\tau^{1-\alpha}\left[s(1-\tau)^{\alpha}\right]/(n+x+\delta)\right\} \tag{17}$$

In the case of endogenous growth, there is no absolute or conditional convergence towards the steady state because the velocity convergence parameter $\rho = 0$, since $(\alpha + \beta = 1)$. That is, in the absence of diminishing returns due to the spillovers of knowledge resulting from expenditures on education (health) and the adoption of better technologies engendered by remittances capital, the economy's long-term growth rate can be permanently raised by varying the savings rate and/or tax rate, as depicted in **Figure 1** below. In other words, countries with similar structural parameters (s, τ, n, etc.) will only differ in terms of their initial capital stock per person.

However, conditional convergence, as opposed to absolute convergence, is observed in the real world, and it would be a desirable feature to retain it in the model. That is, developing countries such as Mexico will converge to their *own* unique steady-state level of per capita income, determined by their specific institutions, savings rate, tax rate, and technology. Following the lead of Barro and Sala-Martin (1995) and Jones and Manuelli (1990), it is possible to restore convergence to the model via the following modified production function that converges asymptotically to the linear AK form:

$$y = k^{\alpha}r^{\beta} + k^{\alpha} \tag{18}$$

and its average product is given by,

[5]The *Matricula Consular* card is an identification card issued by the Mexican consulate to individuals of Mexican nationality who live in the United States and legally recognized by the U.S. government. It is estimated that 4 million *Matricula* cards have been issued in the United States (see Sanchez et al., 2024: pp. 1-8).

$$y/k = \tau^{1-\alpha}\left[s(1-\tau)\right]^{\alpha} + k^{-(1-\alpha)} \tag{19}$$

which is decreasing in k, but approaches $\tau^{1-\alpha}\left[s(1-\tau)\right]^{\alpha}$ as k tends to infinity[6]. The dynamics of the model can be analyzed via the following equation:

$$\dot{k}/k = \tau^{1-\alpha}\left[s(1-\tau)\right]^{\alpha} + s(1-\tau)k^{-(1-\alpha)} - (n+x+\delta) \tag{20}$$

It can be shown via Figure 2 below where it is readily seen that as $k \to \infty$, the average product of capital approaches $\tau^{1-\alpha}\left[s(1-\tau)\right]^{\alpha}$ [assumed to be above ($n + x + \delta$)] rather than zero. Thus, this hybrid model generates endogenous growth while retaining conditional convergence. The latter arises as a result of the inverse relation between the average product of capital and its level per efficient worker. In this case, as opposed to the earlier one, if nations differ in their initial capital stocks, $k(0)$, then the one with the smaller capital stock per worker will grow faster in per capita terms and converge to a positive steady state growth rate as depicted in Figure 2.

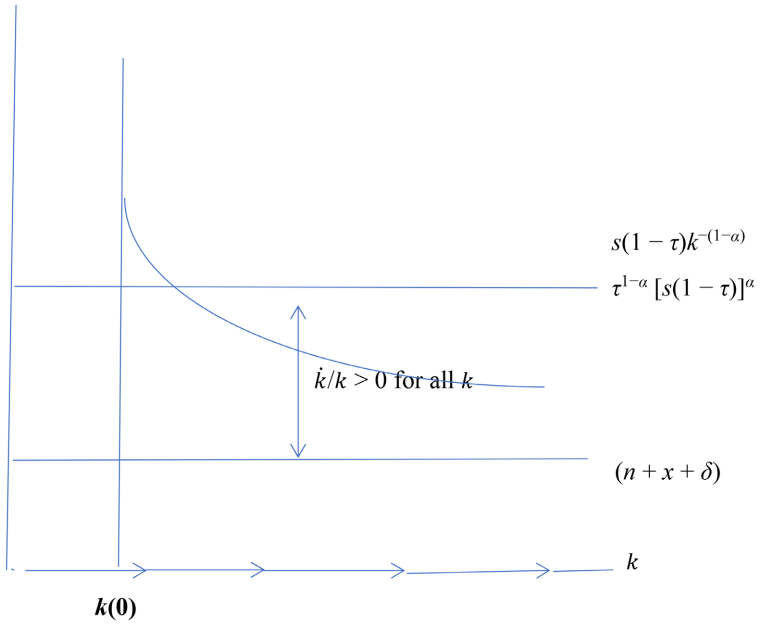

Figure 2. Endogenous growth with transitional dynamics.

4. Conclusion

In view of the growing importance of remittances flows to emerging nations, now rivaling or surpassing FDI inflows, this short paper developed a simple neoclassical growth model with remittances capital as an additional input in the production process. The inclusion of remittances capital is justified because the extant literature suggests that, as opposed to inward FDI, it is primarily channeled to invest-

[6]The modified production function can exhibit diminishing returns to k when k is low, but the marginal product of capital must be bounded from below when k becomes large; that is, one of the standard Inada conditions is violated because its limit is not zero as k approaches infinity (see Barro and Sala-i-Martin, 1995).

ments in education, health, and economic (physical) infrastructure. In addition, it is not associated with reverse flows (often massive in absolute and relative terms) back to the parent companies, often residing in developed countries. The paper showed how, in the presence of exogenous growth or diminishing returns, the economy's long-term growth rate is unaffected, but its steady-state level of income per efficient worker can be increased as a result of changing the savings and/or tax rate. In the endogenous case, it was shown that the economy's long-term growth rate can be permanently raised by pursuing policies that improve the country's financial and banking infrastructure, thus enhancing the remittances capital elasticity, β. The paper also showed that conditional convergence can be retained in the endogenous case via a hybrid model. Insofar as future empirical research is concerned, this simple model provides a framework for explaining the growth rate in per capita income in both cross-sectional and panel data using appropriate proxies for the regressors of interest, namely s, n, x, δ, and τ (see Jones & Vollrath, 2013).

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

Acosta, P. A. et al. (2008). *Remittances and the Dutch Disease* (pp. 1-22). Federal Reserve Bank of Atlanta, Working Paper 2007-8a.

Barro, R. J., & Sala-i-Martin, X. (1995). *Economic Growth.* McGraw-Hill, Inc.

Chami, R., Fullenkamp, C., & Jahjah, S. (2005). Are Immigrant Remittance Flows a Source of Capital for Development? *IMF Staff Papers, 52,* 55-81. https://doi.org/10.2307/30035948

Cypher, J. M. (2020). *The Process of Economic Development* (5th ed.). Routledge.

ECLAC (2023). *Economic Surveys of Latin America and the Caribbean 2023.* United Nations.

Ellerman, D. (2003). *Policy Research on Migration and Development. World Bank Policy Research Working Paper, No. 3117.* The World Bank.

Escot, L., & Galindo, M. (1999). Fiscal Policy Effects, Convergence, and Growth. *International Advances in Economic Research, 5,* 48-55. https://doi.org/10.1007/bf02295030

Gapen, M. T., Chami, R., Montiel, P., Barajas, A., & Fullenkamp, C. (2009). Do Workers' Remittances Promote Economic Growth? *IMF Working Papers, 9,* 1-22. https://doi.org/10.5089/9781451873009.001

Goldfajn, I., Martínez, L., & Valdés, R. O. (2021). Washington Consensus in Latin America: From Raw Model to Straw Man. *Journal of Economic Perspectives, 35,* 109-132. https://doi.org/10.1257/jep.35.3.109

Guiliano, P., & Ruiz-Arranz, M. (2006). *Remittances, Financial Development, and Growth.* IMF Working Papers, No. 05-234.

Jones, C. I., & Vollrath, D. (2013). *Economic Growth.* W.W. Norton & Company, Inc.

Jones, L. E., & Manuelli, R. (1990). A Convex Model of Equilibrium Growth: Theory and Policy Implications. *Journal of Political Economy, 98,* 1008-1038. https://doi.org/10.1086/261717

Kumar, R. R. (2013). Remittances and Economic Growth: A Study of Guyana. *Economic Systems, 37,* 462-472. https://doi.org/10.1016/j.ecosys.2013.01.001

Mora Rivera, J. J., & Arellano González, J. (2016). Las remesas como determinantes del gasto en las zonas rurales de México. *Estudios Fronterizos, 17,* 231-259. https://doi.org/10.21670/ref.2016.33.a09

Mundaca, G. (2005). *Can Remittances Enhance Economic Growth? The Role of Financial Market Development.*

Mundaca, B. G. (2009). Remittances, Financial Market Development, and Economic Growth: The Case of Latin America and the Caribbean. *Review of Development Economics, 13,* 288-303. https://doi.org/10.1111/j.1467-9361.2008.00487.x

Orozco, M. (2004). *Remittances to Latin America and the Caribbean: Issues and Perspectives on Development.* Report Commissioned by the Organization of American States (OAS).

Ramirez, M. D. (2023). Do Remittances Promote Labor Productivity in Mexico? A DOLS and FMOLS Analysis, 1970-2017. *Bulletin of Applied Economics, 10,* 115-131. https://doi.org/10.47260/bae/1016

Ramirez, M. D. (2024). A Note on Foreign Capital, Economic Growth, and Convergence: A Simple Model with Endogenous Growth. *International Advances in Economic Research, 30,* 413-420. https://doi.org/10.1007/s11294-024-09914-0

Ramirez, M. D. (2025). Net Reverse Transfers from Latin America and the Caribbean: A Critical Note. *Applied Economics and Finance, 12,* 62-73. https://doi.org/10.11114/aef.v12i1.7530

Ratha, D. (2013). *Workers' Remittances: An Important and Stable Source of External Development Finance. Global Development Finance.* The World Bank.

Rodriguez-Sanchez, J. I. (2023). *An Economic Lifeline? How Remittances from the U.S. Impact Mexico's Economy.* Research Paper, Baker Institute for Public Policy. Rice University.

Romer, P. M. (1986). Increasing Returns and Long-Run Growth. *Journal of Political Economy, 94,* 1002-1037. https://doi.org/10.1086/261420

Romer, P. M. (1990). Endogenous Technological Change. *Journal of Political Economy, 98,* S71-S102. https://doi.org/10.1086/261725

Salahuddin, M., & Gow, J. (2015). The Relationship between Economic Growth and Remittances in the Presence of Cross-Sectional Dependence. *The Journal of Developing Areas, 49,* 207-221. https://doi.org/10.1353/jda.2015.0007

Sanchez, A. R., Ayres, J. A., & Kiser, S. L. (2024). *Linking International Remittance Flows to Financial Services: Tapping the Latino Immigrant Market. Supervisory Insights, Winter* (pp. 1-8). Federal Reserve Bank of Atlanta.

Sharma, H., & Ramirez, M. D. (2009). Remittances and Growth in Latin America: A Panel Unit Root and Panel Cointegration Analysis. *Estudios Economicos de Desarrollo Internacional, 91,* 5-32.

Sutradhar, S. R. (2020). The Impact of Remittances on Economic Growth in Bangladesh, India, Pakistan and Sri Lanka. *International Journal of Economic Policy Studies, 14,* 275-295. https://doi.org/10.1007/s42495-020-00034-1

World Bank (2022). *Migration and Development Brief, Various Issues.* Migration and Remittances Unit.