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# Could migrant families encourage the adoption of CBDCs in developing countries?

Dominique TORRE\* Qing XU†

January 2025

## Abstract

We examine the potential of upcoming Central Bank Digital Currencies (CBDCs) to be used as a means of transferring remittances. In a simple theoretical model, CBDCs compete with traditional channels provided by specialized intermediaries and with digital transfer options already offered by fintech companies. Their success depends on factors such as anonymity, potential conversion into cash, and the network effects generated by CBDC transactions among recipients' families.

*JEL Classification:* E42, D85, E58.

*Keywords:* Central Bank Digital Currencies, cross-border payments, fintech.

## 1 Introduction

While recent literature has discussed CBDC implementation projects ([Agur et al., 2022](#); [Williamson, 2022](#); [Rojas-Breu, 2022](#); [Bhaskar et al., 2022](#); ?), and [Minesso et al. \(2022\)](#) studied it in an international context, the impact of CBDCs on remittance transfers remains unexplored. This paper fills this gap by examining the potential role of CBDCs in cross-border remittances.

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Remittances are monetary transfers from emigrants to their relatives, families, or friends in their home countries. In 2019, they became the largest source of capital inflows to developing economies, overtaking foreign direct investment, private capital flows, and aid (Batiz-Lazo and González-Correa, 2022). According to the World Bank, they have increased by 1.6% from USD 843 billion in 2022 to USD 857 billion in 2023 and are projected to grow by another 3% in 2024. In many countries, the ratio of received remittances to GDP exceeds 20%, helping to reduce poverty and to fuel economic growth.

Remittances can be transferred in cash by specialized companies, or digitally by telephone operators (especially in Africa) or fintech companies (in Latin America and Asia). Central Bank Digital Currencies (CBDCs) could candidate as another solution when they will be available and transferable (BIS, 2021; Bilotta and Botti, 2021; Batiz-Lazo and González-Correa, 2022; Padhi, 2022) since they will “enabl[e] faster, cheaper, more transparent and more inclusive payments for wholesale and retail alike” (BIS, 2021, p. 8).

Each method has advantages and weaknesses. Cash transfers are costly but do not require any conversion when cash payments are needed in the recipient country. Telephone operators and fintechs are less expensive, more secure, and offer access to online services, but recipients need to convert digital funds into cash in case of need. The use of CBDCs should be secure and free of transaction costs. However, CBDC anonymity and the conditions of their conversion into cash will be determined by Central Banks and governments in the recipients’ countries. Our simple model tests their potential use for remittances and examines their capacity to compete with other channels. Sections 2 and 3 outline our model and results. Section 4 concludes.

## 2 The model

Two theoretical settings are used to explore CBDC adoption in a national context. Search theoretic models<sup>1</sup> offer rich microeconomic foundations, with potential applications for cross-border payments (Chiu and Keister, 2022). More presentations use DSGE models Assenmacher et al. (2023), Xin and Jiang (2023), and Magin et al. (2023) examine the consequences for monetary policy and financial stability

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<sup>1</sup>see the special issue of the Journal of Economic Dynamics and Control, Vol. 142(C), 2022

of introducing CBDCs. [Minesso et al. \(2022\)](#) extend the framework proposed by [Eichenbaum et al. \(2021\)](#) and study, in an open economy, the international transmission of shocks and the impact of monetary policy when CBDC is used as a substitute for cash deposits. They refer in some cases to [Agur et al. \(2022\)](#), who elaborate on the trade-off between security and anonymity when considering an alternative between CBDC and another means of payment.

Like [Agur et al. \(2022\)](#), we consider anonymity and security as two important properties for migrants’ means of transfer. However, the context we analyze requires new considerations. Our agents are a population of families, not individuals: each ‘family’ includes a migrant and a domestic component (labeled recipient) remaining in the home country. Fintechs are already established and offering transfer services before the potential introduction of CBDCs. We assume that there are no particular constraints on migrants in the country she works in terms of possession and use of CBDCs.<sup>2</sup> Transaction and conversion costs play a role as well. Finally, the spatial distribution of recipients in the home countries matters. This assumption reflects the tendency of immigrants to choose destinations based on their regions or sub-regions of origin, creating clusters of migrant families.<sup>3</sup>

There are  $n$  heterogeneous families, and 3 means of transfer: traditional cash services, fintech digital transfers, and CBDC transfers. Families have all the same gross multiplicative utility function  $xy$  where  $x$  figures the consumption of the migrant and  $y$  the consumption of the recipient, both expressed in monetary term.<sup>4</sup> Families are identified by two indexes,  $i$  and  $j$ . Family  $\{ij\}$  ( $i, j = 1, 2, \dots, n$ ) is characterized by

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<sup>2</sup>As pointed out by [Auer and Böhme \(2020\)](#) and [Minesso et al. \(2022\)](#), Central banks could in some cases limit the use of their digital issues or reserve them for residents. In other cases, more relevant to the context studied in this paper, central banks could, on the contrary, favor the use of their CBDCs for international payments, and thus encourage non-residents to hold them.

<sup>3</sup>Sociologists point out that migrants from certain cities or regions often share similar geographical origins due to strong and weak ties that influence their migration. In some cases, this results in a “high level of endogamy between migrants and families” ([Chort et al., 2012](#)) or “networks of businesses owned by migrants from the same origin” ([Garip and Asad, 2015](#)). Several examples of such clusters have been observed in Africa ([Failler and Binet, 2010](#); [Liu, 2013](#)), Latin America ([Mines, 1981](#); [Garip and Asad, 2016](#)), and Asia ([Shah and Menon, 1999](#); [Piotrowski, 2006](#)).

<sup>4</sup>The use of a Mas-Collel quasi linear utility function of the form  $u(x, y) = \alpha x + \beta \ln(1 + y)$  does not change for the most the results. The unit of expression of values is indifferently the monetary unit of the sender or the receiver country.

- a parameter  $\theta_i$ , uniformly distributed on the segment  $[0, 1]$ . The closer  $\theta_i$  is to 0, the more the family values the anonymity of the transfer and the less it considers security important,
- a parameter  $\alpha_j$ , uniformly distributed on the segment  $[0, \bar{\alpha}]$ , which captures the advantages provided for family by online services offered by fintechs.

The distributions of  $\theta_i$  and  $\alpha_j$  are independent.

The unit prejudices for security are respectively  $s_c$  and  $s_f$  for cash and for fintechs, and 0 for CBDC, with  $s_c > s_f > 0$ . The unit prejudice for anonymity are 0 for cash,  $a_f$  and  $\lambda$ , with  $(\min\{a_f, \lambda\} > 0)$  respectively for fintechs and CBDC.  $\lambda$  could be considered as a control variable of the recipient country. The condition  $a_f > s_f$  will be admitted (all things equal, the risk of holding fintech digital balances is low and could even be neglected).

Transfers costs are  $t_c$  and  $t_f$ , ( $t_f < t_c$ ) for cash transfers and fintech transfers, and 0 for CBDC. Unit conversion costs are 0 for cash,  $\gamma_f$  and  $\gamma_d$  for fintech and CBDC transfers, with  $\min\{\gamma_f, \gamma_d\} > 0$ .

Finally, 2 additional parameters relate only on CBDC transfers. The parameter  $\mu$ , ( $0 \leq \mu < 1$ ), captures the general acceptance of CBDC in the migrants' country of origin, excluding the migrants' families. Like  $\lambda$ ,  $\mu$  can be controlled to some extent by monetary and political authorities of the recipients country. This parameter vanishes when there is no tendency, except for migrants families, to use CBDC in payments, then to accept payments in CBDC. The parameter  $\beta$  captures the "level of clusterisation" of recipients previously defined.

Net utility of family  $\{ij\}$  then writes as following, when it uses respectively cash transfers (1), fintech services (2), or CBDC transfers (3):

$$u_{ij} = x(\bar{x} - x)(1 - t_c) - s_c\theta_i \quad (1)$$

$$v_{ij} = x(\bar{x} - x)(1 - t_f - \gamma_f) - s_f\theta_i - a_f(1 - \theta_i) + \alpha_j \quad (2)$$

$$w_{ij} = x(\bar{x} - x)[(\mu + \beta\frac{n^e}{n}) + (1 - \gamma_d)(1 - \mu - \beta\frac{n^e}{n})] - \lambda(1 - \theta_i) \quad (3)$$

where  $\bar{x}$  figures the initial endowment of the migrant.  $n^e$  in the utility function **3** figures for each recipient, the expected number of other recipients accepting transfers in CBDC around her.

### 3 Results

We first characterize the distribution of families among the 3 means of transfer according the values of  $i$  and  $j$ , considering that in the short term, the expected value  $n^e$  is not perfect.

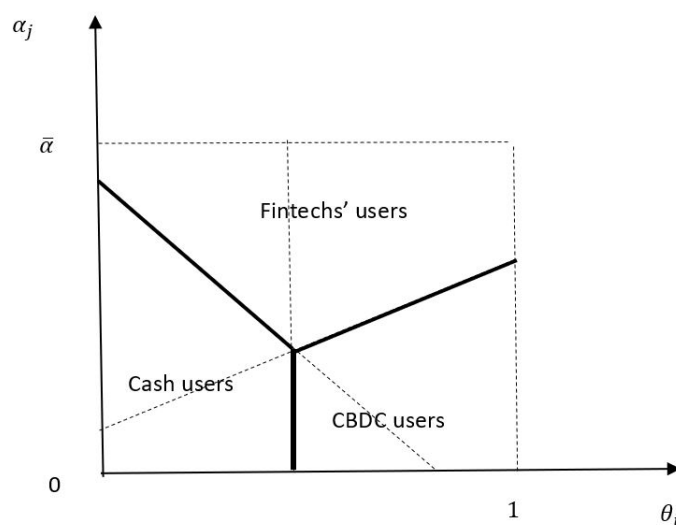


Figure 1: Distribution of families among the three means

**Proposition 1** *At the short term equilibrium, agents are distributed among the three possibilities to transfer remittances. Agents with a relative preference for anonymity over security and little interest in online services choose cash, those with a relative preference for security choose CBDC and the remainder use fintech services.*

*Proof:* First order conditions applied to expression (3) gives  $x = \frac{\bar{x}}{2}$ , then  $w_{ij} = \frac{\bar{x}^2}{4} [(\mu + \beta \frac{n^*}{n}) + (1 - \gamma_d)(1 - \mu - \beta_d \frac{n^*}{n})] - \lambda(1 - \theta_i)$ . Comparison with  $u_{ij}$  provides the frontier equation  $\theta_i^* = \frac{\frac{\bar{x}^2}{4}(-t_c - M\gamma_d + \gamma_d) + \lambda}{\lambda + s_c}$ , where  $M = \mu + \beta \frac{n^e}{n}$ . Comparison with

$v_{ij}$  provides the frontier  $\alpha_j = (\lambda + s_f - a_f)\theta_i + \frac{\bar{x}^2}{4}(M\gamma_d - \gamma_d + t_f + \gamma_f) + a_f - \lambda$ . Families  $ij$  such that  $\alpha_j \geq -(s_c - s_f + a_f)\theta_i - \frac{\bar{x}^2}{4}(t_f - t_c + \gamma_f) + a_f$  are such that  $v_{ij} \geq u_{ij}$ . Once the conditions for qualification are satisfied for each frontier, families distribute as in figure 1 on the rectangle determined by the values of  $\theta_i$  and  $\alpha_j$   $\square$

Figure 1 illustrates the short term distribution of families.

Expectations  $n^e$  change over time. Suppose that they are extrapolative, *e.g.* that expected number of CBDC users for next period is given by current observed number. At perfect expectations equilibrium expectations are confirmed by the distribution of migrants and families among the three means of transferring remittances. This equilibrium is stationary but not always stable. Stable stationary equilibria are studied in Lemma 1 according values of parameters (including possible controls of government and monetary authorities over  $\lambda$  and  $\mu$ ).

**Lemma 1** *There is always at least one stationary equilibrium, which is stable with extrapolative expectations. The nature and number of stable equilibria depend on the parameters relating to the characteristics of the CBDC. Still depending parameters, CBDC could be used or not at stable equilibrium(a).*

*Proof:* We introduce the following notations:  $A = (\lambda + s_f - a_f)$ ,  $B = \gamma_d \frac{\bar{x}^2}{4} \mu$ ,  $C = \gamma_d \frac{\bar{x}^2}{4} \frac{\beta}{n}$ ,  $D = \frac{\bar{x}^2}{4}(-\gamma_d + t_f + \gamma_f)$ ,  $E = a_f - \lambda$ ,  $F = \frac{\bar{x}^2(-t_c - \mu\gamma_d + \gamma_d) + \lambda}{4(\lambda + s_c)}$ ,  $G = \frac{\bar{x}^2}{4(\lambda + s_c)} \frac{\beta\gamma_d}{n}$ , write  $H = B + D + E$ , and note that  $H$  does not depend on  $\alpha_j$  and  $\theta_i$ . Given figure 2, at stationary equilibrium, the effective number of migrants and families using CBDC to send remittances can be written as  $n^* = \min(\max[0, n \int_{\theta_i = \max(0, \theta_i^*)}^1 A\theta_i + Cn^* + H], n)$ , with  $\theta_i^* = F - Gn^*$ . Given that  $C$  and  $G$  are positive, there are 5 possible configurations depending on  $\mu$  and  $\lambda$ . They are represented in Figure 2. Only in cases 2, 3, 4 and 5, CBDC could be adopted at stationary equilibrium, with 2 stable equilibria in case 2 and 4. In case 2, the adoption is conditioned to initial ‘optimist’ expectations on its future adoption  $\square$

Lemma 1 attests to the conditional adoption of CBDCs as a means of transferring remittances. Without incentives from political and monetary authorities ( $\lambda$  high,  $\mu$  small), cases 1 or 2 appear (no transfer with CBDC, except with exceptional clustering of recipients and optimistic initial expectations in case 2). Without any initiative from the public authorities, the adoption of CBDCs in terms of transfers therefore seems doubtful. Let’s now consider the case where public authorities

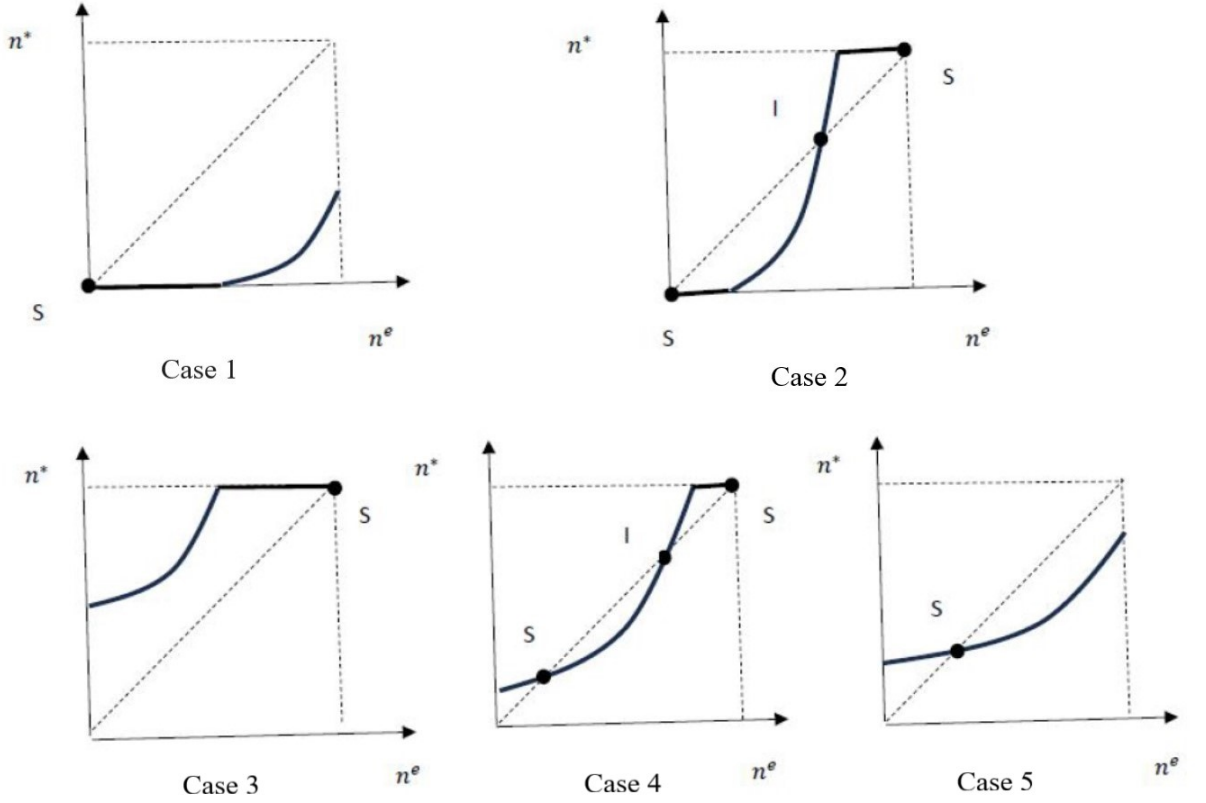


Figure 2: Possible configurations of stationary equilibria of the developed model (number of CBDC users among migrants/families)

encourage this adoption, by increasing on the anonymity of CBDC holdings or by paying civil servants in part in CBDC.

**Proposition 2** *All things equal, weak incentives to use CBDC combined with a level of anonymity and conversion possibilities equivalent to those offered by fin-techs ensure CBDC adoption as a mean to remit, even when recipients are poorly clusterized.*

*Proof:* When  $n^e = 0$ , then  $n^* = \min(\max(0, \int_{\theta_i^*}^1 A\theta_i + Cn^e + H), n)$ , with  $\theta_i^* = F - Gn^e$ , i.e.,  $n^* = \min(\max(0, n(\frac{A}{2}(1 - F^2) + H(1 - F))), n)$ . When  $\mu$  increases,  $F$  decreases and  $H$  increases. Then, all things being equal,  $n^*$  increases with  $\mu$  when  $n^e = 0$ . Also and again, all things being equal we can derive that, when

$n^e = 0$  and  $\mu = 1$ ,  $n^* = 0$ , then  $\forall \mu, n^* = 0$  when  $n^e = 0$ . Conversely, imagine that  $\gamma_f = \gamma_d$ , and  $\lambda \leq a_f$ , then for sufficiently high values of  $\bar{x}$ ,  $(1 - F)$  and  $H$  are both positive, if  $\mu$  is close to 1 even if  $n^e = 0$ . Then  $n^* = 0$  is not a stationary equilibrium, and case 1 and case 2 represented in the first line of figure 2 are no longer relevant  $\square$

Once the prejudice of CBDCs' non-anonymity is reduced, and if their conversion into cash is facilitated, their advantages in terms of transaction cost and security enable them to compete with other digital transfer methods, even if these offer advantages such as access to online resources. In this case, recipients' clustering can improve their adoption but is no longer a necessary condition of their adoption. The question now is whether, for fiscal reasons for example, it is in the interest of the authorities to increase the anonymity of CBDC holdings.

## 4 Conclusion

Our exercise assumes a central bank decides to make a CBDC available to non-residents. The objective could be to enhance trade with partners, to facilitate labour mobility, or simply to propose an international means of payment able to compete with major international currencies. We test both the interest of migrants to use this CBDC to transfer remittances, and the capacity of recipient country monetary authority to develop local use or this CBDC convertible in the local currency or able to circulate in parallel of it.

Two scenarios emerge from this exercise. The first is that “clustered migrants families” could autonomously adopt more rapidly CBDC than the rest of the population of recipients' countries, like it has been observed for ICT adoption (Ali et al., 2024), the use of deposit accounts (Anzoategui et al., 2014) and other forms of financialization (Ambrosius and Cuecuecha, 2016; Azizi, 2020). The second is that local political and monetary authorities encourage the adoption of CBDC to increase financial transparency or reduce the size of informal sector. In this case, the natural advantages of CBDC in terms of security and transfer costs would no longer be hampered by poor acceptability within the recipients' countries.

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