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Crisis Relief in Cash: How Remittances Drive Bank Lending in a Global Pandemic*

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Abstract

This paper shows, by means of a difference-in-difference approach, that remittance inflows to Honduras during the COVID-19 pandemic had a positive causal impact on credit supply. For identification, we exploit bank branches' indirect exposure to remittance inflows across regions. The results highlight that the deposit channel of remittances plays an important role for the positive link between remittance inflows and credit. We document that remittances have a significant and positive effect on commercial and industrial loans as well as loans to consumers. We also find that the impact of remittances on credit seems to be channeled via banks with higher deposit dollarization and share of short-term deposits. Finally, our findings suggest that remittances help to attenuate credit risk.

Keywords: Remittances, Deposits, Credit, Financial Stability

JEL Codes: F24, F30, G21, O54

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1 Introduction

Remittances play a critical role for developing countries to stabilize the economy during times of crisis. In 2022, remittances from abroad to low- and middle-income countries amounted to 626 billion US dollars exceeding foreign direct investment flows and official development aid. Remittances are typically targeted individual transfers and have several beneficial effects for developing countries. First, remittance inflows are particularly important for the poorest households alleviating poverty, increasing savings, enhancing educational outcomes and improving resilience after natural disasters (Malpass, 2022). For richer households, remittance inflows can help in providing essential capital required for investments by small firms (Ratha, 2005). At the macroeconomic level, remittances attenuate volatility in growth and facilitate adjustment to shocks due to their countercyclical nature (Malpass, 2022).

However, the literature also shows that remittances are associated with several challenges for the receiving country. Developing countries receiving remittances could face labour shortages or incur costs from the emigration of high skilled workers. Moreover, remittance inflows could also be associated with other adverse consequences such as dependency or lower incentives to work. In addition, remittances could lead to an appreciation of the exchange rate reducing the competitiveness of the tradeable sector often referred to as the Dutch disease (Ratha, 2005).

In this study we document for the first time the causal impact of remittances on credit during a global crisis. Our results indicate that the exogenous positive shock to remittances in Honduras during the COVID-19 pandemic induced banks to provide more credit both to firms and households. Bank lending is the most important source of firms' external financing and plays a key role for economic growth in developing countries (Weisbrod and Rojas-Suárez, 1995). Our robust and economically sizeable findings suggest that remittances contribute to stabilizing the economy during a crisis.

Whether remittances are intermediated by the financial sector acting as a substitute or complement for credit is not clear a priori. There are several reasons for why remittance inflows could substitute for credit. First, remittances relax households' financing constraints which lowers the need to borrow and the literature shows that remittances have been used to pay off previous loans (see for example Rapoport and Docquier, 2006; Yang, 2011; Clemens and Tiongson, 2017). Second, if banks are reluctant to lend and prefer to hold liquid assets remittances are not expected to affect credit growth. Last but not least, if remittances are immediately consumed, or if remittance recipients do not trust financial institutions, then remittances may not lead to more deposits (Aggarwal et al., 2011).

On the other hand, remittances could be an important complement to credit. Banks are induced to lend more if remittances reduce households' financing constraints by mitigating informational asymmetries and increasing the creditworthiness of households. Moreover, if remittance recipients decide to deposit the money in the financial system then banks' liquidity will increase making them more inclined to lend (Jaume et al., 2022). Given that sending remittances is associated with fixed costs implies that the remittance inflows are lumpy and households will experience excess cash temporarily. The excess cash provides an incentive for households to keep their money in a deposit account (Aggarwal et al., 2011). Finally, banks acting as intermediaries of remittances are advantageously placed to offer financial services also to unbanked households (Demirgüç-Kunt et al., 2011).

We explore the deposit channel of remittances on credit by means of a difference-in-difference approach during the COVID-19 pandemic. Remittances to Honduras experienced a sharp increase at the onset of the pandemic whereas economic activity contracted precipitously in 2020. The unfolding of the COVID-19 pandemic provides a quasi-experimental setting allowing us to examine the causal effect of remittances on credit. This study differs from earlier literature in that the research design effectively alleviates concerns of endogeneity. Our study is made possible by the availability of unique and confidential regulatory

data covering the universe of remittances, deposits, and credit in Honduras provided by the national financial supervision authority[1].

Albeit the World Bank predicted a sharp decline in remittances due to the COVID-19 pandemic, Honduras and other Central American countries experienced a positive shock to remittance inflows (Sieff, 2020, August 6). According to our data, remittance inflows to Honduras increased by 71 percent between 2019q4 and 2020q1 which was five times larger compared to the same period for the previous year (14 percent). This confirms that the magnitude of remittance inflows to Honduras at the onset of the pandemic was both noteworthy and unexpected[2].

The ratio of remittances to GDP was 27 percent for Honduras in 2022 which ranks it highest in Latin America. In addition, remittance inflows were approximately eight times larger than foreign direct investment and the largest source of foreign currency. Consequently, Honduras provides an ideal testing ground for assessing the role of remittances for financial development.

Empirically examining the effect of remittances on credit is particularly challenging given the potential influence of endogeneity from reverse causation, omitted variables, and measurement errors. A higher level of financial development or increased local demand for credit is likely to affect remittance inflows from abroad. Moreover, the trend for both credit and remittances could potentially be explained by common omitted factors which may lead to biased coefficients. Finally, measurement errors from remittances that are not formally recorded could be an important source of endogeneity (Aggarwal et al., 2011).

We address reverse causality primarily by exploiting the exogenous shock to remittances

[1]National Commission of Banks and Insurance Companies (CNBS).

[2]Figure 1 illustrates the remittance inflows to Honduras between 2017-2022. Since the exchange rate of the Honduran Lempira vis-a-vis the US Dollar was similar in 2019q4-2020q1 and 2018q4-2019q1, the increase in remittances was not driven by a depreciation of the exchange rate. In fact, the Honduran Lempira experienced a nominal appreciation versus the US Dollar in 2020.

from the COVID-19 pandemic. The unexpected and sudden increase in remittances to Honduras in the first quarter of 2020, combined with the drop in GDP growth, makes it plausible that remittance inflows were not driven by higher demand for credit. By examining the indirect effect of remittances to all other regions on credit in the local region further attenuates endogeneity concerns. The identification strategy enables us to saturate our specification with quarter-region and branch fixed effects effectively absorbing local demand and other omitted factors. In addition, concerns about measurement errors are mitigated by the fact that travel restrictions during the pandemic were hampering the effective functioning of informal remittance channels.

We find that remittance inflows are positively linked to aggregate deposits in the same region in Honduras during the COVID-19 pandemic. Next, we show that remittances to other regions have a positive causal effect on total credit locally suggesting that remittances act as a complement rather than as a substitute. Furthermore, the magnitude of this finding is economically significant, a one standard deviation increase in the indirect remittance exposure is associated with a rise in total credit of 9 percent which is equivalent to 3 percent of the standard deviation of total credit. This result is not expected given the reasons for remittances acting as a substitute for credit outlined above and the ambiguous results found in the literature (see for example Brown et al., 2013, Ambrosius and Cuecuecha, 2016, and Aggarwal et al., 2011). The findings corroborate the importance of the deposit funding channel for the link between remittances and credit. In addition, our results show that remittance inflows do not have an impact on interest rates. We further contribute to the literature by showing that remittances have an effect on the volume of credit, but not the price, suggesting that credit primarily goes to new borrowers.

Once we have established that remittances are linked to total credit, we investigate whether remittances have disparate effects on different types of credit. Similar to Jaume et al. (2022) we find that remittances have a positive effect on consumer credit. Commercial

and industrial (C&I) loans are also found to be positively linked to remittances corroborating previous findings in the literature (Fromentin and Leon, 2019). However, we believe that we are the first to show that remittances do not seem to have a statistically significant effect on mortgage credit. Moreover, the literature has shown that household credit is associated with an expanding non-tradeable sector indicative of Dutch disease effects (Bahadir and Gumus, 2022). Since we find the effect of remittances on consumer credit to be economically large our results suggest that Dutch disease effects may result from a positive shock to remittances.

Next, we examine the role of dollarization and maturity of deposits for banks willingness to extend credit during a shock to remittances. Bannister et al. (2018) show in a cross-country study that deposit dollarization has a negative impact on credit on average. In contrast, our findings indicate that remittances have a positive and significant effect on credit only for banks with a higher level of deposit dollarization and share of short-term deposits.

Moreover, we explore how the impact from indirect remittance exposure on credit depends on economic development and financial sector depth. We document that remittances only have a significant and positive effect on total credit in regions that have a higher level of economic or financial development. This finding suggests that remittance inflows during the COVID-19 pandemic are likely to be associated with a deterioration in cross-regional inequality in terms of credit access.

Finally, the effect of remittances on credit risk and financial stability is ambiguous. A shock to remittances could lead to a "risk-inducing" effect with excessive credit growth and a deterioration of credit quality. On the other hand, remittances have an "income-stabilizing" effect by improving borrowers' incomes and hence their repaying capacity which is likely to decrease the riskiness of loans. Moreover, remittance inflows are likely to reduce credit riskiness since these inflows can serve as collateral, and in addition, reduce information asymmetries related to the credit worthiness of bank clients (Beaton et al., 2017). Our results

indicate that remittances are negatively linked to credit risk corroborating previous findings in the empirical literature (see for example Beaton et al., 2017; Ebeke et al., 2014; Jaume et al., 2022).

The remainder of the paper is organized as follows. Section 2 describes the data and sample construction. Section 3 presents the identification strategy and Section 4 documents the results. The robustness tests are reported in Section 5 and Section 6 concludes.

2 Data description and sample construction

The empirical approach in this study aims at examining whether an exogenous shock to remittances has an impact on credit via the deposit channel. For this purpose, we use unique and confidential regulatory data for the period 2017-2022 from different sources provided by the national financial supervision authority in Honduras (National Commission of Banks and Insurance Companies). We combine quarterly data on remittance inflows to each region with branch-level data from the deposit and credit registry and an administrative register of banks' balance sheets. The combined dataset makes it possible for us to investigate the link between remittances and credit controlling for bank specific characteristics.

The remittance database includes quarterly information on the accumulated flow of remittances paid and sent for the 18 departments (administrative region) of the country, differentiated by gender. These data are reported to the National Commission of Banks and Insurance Companies (CNBS) by the 15 commercial banks and the 2 remittance companies operating in the supervised system of Honduras.

Table 1 presents descriptive statistics for the variables included in our estimations. The normalized difference indicates whether the average treatment effect is biased in our regres-

Table 1 Descriptive statistics

	Observations	Mean	Std. dev.	Min.	Max.	Norm. Diff.
log of total credit	2389	17.349	3.026	11.310	23.256	0.201
capital-asset ratio	2389	0.083	0.021	0.037	0.140	-0.042
short-term deposit ratio	2389	0.113	0.057	0.042	0.647	-0.058
FX deposit ratio	2389	0.219	0.101	0.022	0.613	0.039
credit risk	2389	0.030	0.026	0	0.128	0.035
log of interest rate	2389	2.956	0.611	1.322	3.963	-0.087
log of C&I loans	2166	18.020	3.351	10.396	24.306	0.200
log of consumer loans	2046	15.552	2.324	10.976	21.407	0.166
log of mortgage loans	897	16.810	2.317	12.102	21.268	0.129
log of total deposits	4026	19.152	1.945	14.032	23.233	0.108
direct remittance exposure	2284	0.037	0.388	-2.779	2.117	-
remittance exposure	2284	0.074	0.645	-3.194	2.372	-

Notes: The table shows the number of observations, mean, standard deviation, minimum and maximum values, and the normalized difference. Variable definitions are reported in Table A.1.

sions (Imbens and Wooldridge, 2009)[3]. According to a rule of thumb suggested by Imbens and Rubin (2015) a linear regression can be sensitive to the specification if the normalized difference exceed one quarter. The results reported in Table 1 suggest that none of the variables seem to be affected by this bias.

Remittance inflows to Honduras between 2017 and 2022 are illustrated in Figure 1. The figure shows that remittances experienced a large increase during the first quarter of 2020 followed by a reversion in the second quarter. In addition, remittance inflows exhibited a faster growth during the two years after the onset of the COVID-19 pandemic compared to between 2017 and 2019.

Moreover, the evolution of aggregate deposits displayed in Figure A.1 points to that the growth rate of deposits was significantly higher after the beginning of the pandemic compared to the pre-pandemic period. The graphical evidence suggests that the increase in deposit growth after 2020 may be positively linked to the sudden influx of remittances.

[3]Normalized difference refers to the ratio of the difference in averages between treatment status and the square root of the sum of the variances (Imbens and Wooldridge, 2009) In this case the treatment is equal to one if remittances are above the median.

Figure 1 Evolution of remittance inflows

NOTES: The Figure shows the evolution of remittances to Honduras between 2017q2 and 2022q4 (in millions of Lempiras). The red vertical line indicates the beginning of the COVID-19 pandemic.

Figure 2 presents the change in credit for high and low indirect exposure to remittances. The series is indexed to zero for the first quarter of 2020. The figure suggests that the behavior of credit for low and high remittance exposure was similar before the pandemic. Nevertheless, once the pandemic started credit continued to increase for banks with high indirect remittance exposure while, on the contrary, credit growth dropped significantly for those with a low indirect exposure to remittance inflows. These results indicate that total outstanding credit may respond positively to higher remittance inflows in other regions.

Finally, remittance and credit intensity across regions in Honduras are illustrated in Figures A.2 and A.3. The regions with the highest level of remittances scaled by deposits before the pandemic were Choluteca, Olancho and Santa Bárbara shown in Figure A.2, whereas, the regions with the highest ratio of credit to deposits were Atlántida, Choluteca, Cortés, and Francisco Morazán (Figure A.3). From comparing Figures A.2 and A.3 it is noteworthy that the regions with the highest credit intensity are the ones with a low ratio of remittances

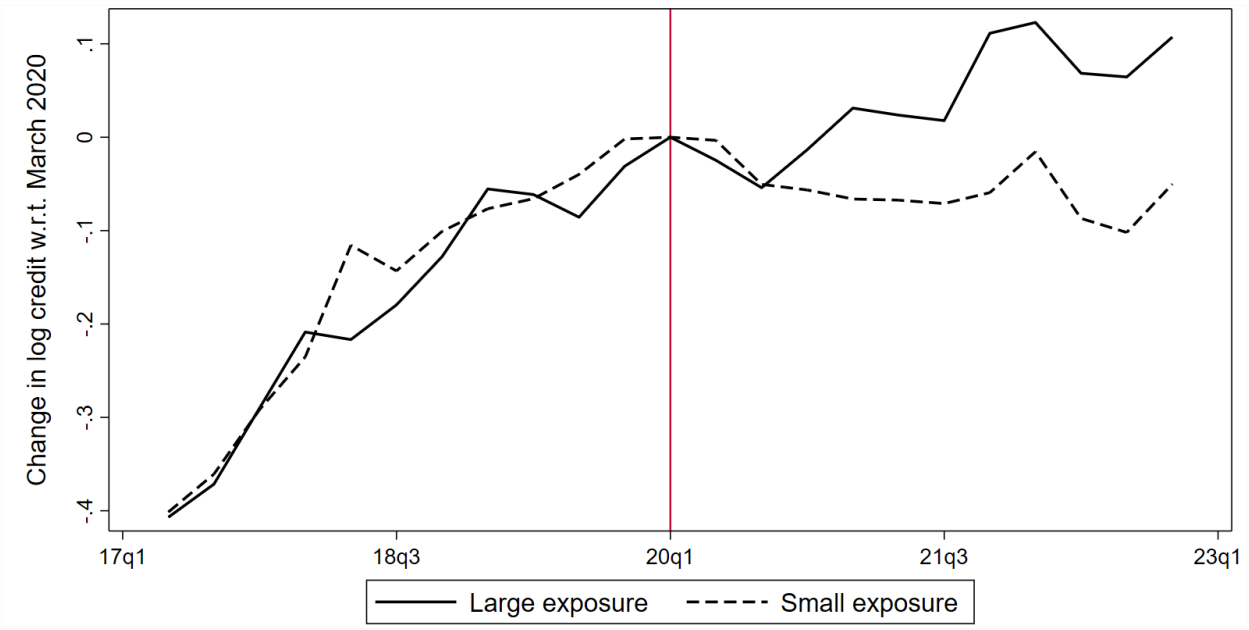

Figure 2 Change in credit for different remittance exposure

NOTES: The figure shows the change in log credit for regions with above median (large) versus below median (small) remittance exposure. The values for the change in log credit have been indexed to zero in 2020q1.

to deposits with exception for Choluteca. This finding suggests that bank branches outside the destination region of remittance inflows respond to remittance shocks by extending more credit.

3 Identification strategy

The COVID-19 pandemic started in the first quarter of 2020 with widespread consequences for economies across the world. Remittances to Honduras shown in Figure 1 increased in 2020 despite the World Bank's forecast of a substantial drop in remittance inflows worldwide in response to the pandemic. The exogenous, unexpected and sizeable shock to remittances provides a quasi-experimental setting allowing us to employ a difference-in-difference approach to identify the causal impact of remittances on deposit and credit variables.

We start by examining whether the shock to remittances during the pandemic had a significant effect on aggregate deposits. To do this, we estimate the direct effect of remittances on deposits for bank (i) in department (r) at time (t) shown in Equation 1. Coefficient β_3 represents the impact of direct remittance exposure during the pandemic on deposits. Direct remittance exposure refers to the effect remittances may have on deposits in the destination department. We assume that remittances primarily impacts bank deposits in the same region to which they are sent from abroad.

We include several bank-level controls capturing how well capitalized a bank is (capital-asset ratio), liquidity risk (short-term deposit ratio), exposure to exchange rate volatility (FX deposit ratio), and the proportion of risky credit over total outstanding credit (credit risk). In addition, we saturate the specification with quarter (α_t), department (μ_r) and bank (σ_i) fixed effects to account for any time-invariant unobserved characteristics that may influence our results.

$$\begin{aligned} Deposits_{i,r,t} = \beta_1 \Delta REM_{i,r,t-1} + \beta_2 Post_t + \beta_3 [\Delta REM_{i,r,t-1} \times Post_t] \\ + \gamma Controls_{i,t-1} + \alpha_t + \mu_r + \sigma_i + \varepsilon_{i,j,t} \end{aligned} \tag{1}$$

We next explore the causal impact of remittance inflows on credit supply characteristics, which is a challenging task given the limitations related to reverse causality, unobserved variables and measurement errors. First, remittance inflows to a country is likely to be influenced by an increase in economic growth or local demand for credit. Hence, we address the challenge of reverse causality by examining the impact of remittances during the COVID-19 pandemic.

Second, since the pandemic simultaneously affected financial markets in Honduras this

could lead to reverse causality concerns if, e.g., local demand for credit impacts remittance inflows. We address these concerns by treating changes in remittance inflows across departments in Honduras except for department j as exogenous. Thus, we capture the indirect effect of remittances in other departments on credit supply in department j. The identification strategy allows us to compare branches that are differentially indirectly exposed to remittance inflows. Figure A.4 shows that all departments in Honduras, with the exception for Islas de la Bahía, include branches with both high and low indirect remittance exposure. Our conjecture is that remittances to a department affect credit supply in other departments via banks' branch network. It is not plausible that credit demand in a department significantly affects remittance inflows to other departments.

Moreover, unobserved department characteristics could bias our findings, e.g., higher economic growth leads to both more remittance inflows and higher local credit demand. By saturating our specification with quarter-department fixed effects we account for time-variant unobserved department characteristics including changes in demand for credit and economic growth over time. We further control for branch characteristics such as size, business model and reliance on internal funding that could influence the supply of credit by including branch fixed effects.

Another important endogeneity concern when estimating the causal impact of remittances on credit is that informal remittances, not captured by official statistics, could lead to biased results due to measurement errors. Nevertheless, the COVID-19 pandemic lead to a complete shutdown of air traffic to Honduras effectively curbing the informal remittance channel. Thus, we do not believe that informal remittances to Honduras pose concerns for the validity of our findings.

The specification for the indirect remittance exposure is shown in Equation 2. This indirect measure gauges how total credit is affected by changes in remittances in all other

regions linked to j via bank networks. To assess each bank's exposure to remittance inflows we weight the inflows by the share of credit to each branch over total credit per bank.

$$REX_{i,j,t} = \sum_{r \in R, r \neq j} \Delta REM_{r,t} * \frac{Credit_{i,r,t}}{Credit_{i,t}} \tag{2}$$

$$\begin{aligned} y_{i,j,t} = \beta_1 REX_{i,j,t-1} + \beta_2 Post_t + \beta_3 [REX_{i,j,t-1} \times Post_t] \\ + \gamma Controls_{i,t-1} + \alpha_{t,j} + \mu_{i,j} + \varepsilon_{i,j,t} \end{aligned} \tag{3}$$

We conduct a difference-in-difference estimation including the indirect exposure measure for remittance inflows shown in Equation 3. The dependent variable $y_{i,j,t}$ denotes total credit, interest rate, C&I loans, consumer loans and mortgage loans (all in logs) for bank (i) in department (j) at time (t). Estimating the indirect effect allows us to include quarter-department $(\alpha_{t,j})$ and branch $(\mu_{i,j})$ fixed effects controlling for local credit demand and other time-variant unobserved department characteristics and time-invariant branch traits.

The identification strategy compares banks with higher indirect remittance exposure with those that have a lower exposure for each region. While we rely on a continuous measure of indirect exposure to remittances, a dichotomous distinction between branches with high versus low exposure as shown in Figure A.4 indicates that banks from both types are to be found in almost all regions across Honduras. To conclude, examining the indirect impact of remittance inflows on credit supply characteristics during an exogenous shock to remittances, while controlling for local credit demand, allows us to effectively address endogeneity concerns in this study.

$$Creditrisk_{i,t} = \beta_1 \Delta REM_{i,t-1} + \beta_2 Post_t + \beta_3 [\Delta REM_{i,t-1} \times Post_t] + \gamma Controls_{i,t-1} + \alpha_t + \sigma_i + \varepsilon_{i,t} \quad (4)$$

Finally, we investigate whether remittance inflows have an impact on credit risk. The measure for credit risk is constructed by first summing up credit that belongs to one of the categories arrear, foreclosure or overdue and then dividing by total outstanding credit. As illustrated in Equation 4, we estimate the direct effect of remittance inflows on credit risk at the bank-quarter level.

4 Results

4.1 Deposit channel of remittances

We begin by exploring the impact of remittance inflows on aggregate deposits at the bank-department-quarter level as shown in Equation 1. Deposits are expected to be positively associated with the sudden rise in remittances during the pandemic. One reason for this is that remittances are lumpy and the unexpected and sizeable inflows during the pandemic made remittance receivers more likely to keep their excess cash in a deposit account.

The results for the direct effect of remittance on deposits are shown in Table 2. We find that the coefficient for the interaction term with direct remittance exposure is positive and significant for the first two years of the pandemic. Nevertheless, the coefficient becomes insignificant when including all three years. The results suggest that remittance inflows have an immediate and short-term effect on deposits that fades out over time.

Table 2 The direct effect of remittances on deposits

	(1)	(2)	(3)
	Outcome: log of deposits		
capital-asset ratio	-0.233	-1.094	-0.078
	(0.398)	(1.054)	(1.399)
short-term deposit ratio	-0.257	-0.240	0.333
	(0.673)	(1.219)	(1.201)
FX deposit ratio	-0.497	-1.053	0.523
	(0.658)	(1.056)	(1.303)
credit risk	-0.948	-1.472	-1.856
	(0.551)	(1.328)	(1.400)
direct remittance exposure	-0.012	-0.012***	-0.013***
	(0.007)	(0.003)	(0.003)
post-period	0.000	0.000	0.000
	0.000	0.000	0.000
direct remittance exposure x post-period	0.018**	0.012**	0.016
	(0.007)	(0.005)	(0.013)
Observations	1918	2609	3307
Adjusted R-squared	0.802	0.799	0.795
Bank FE	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes
Region FE	Yes	Yes	Yes
Number of regions	17	17	17
Number of banks	15	15	15
Post-period	2020q1-2020q4	2020q1-2021q4	2020q1-2022q4

Robust standard errors in parentheses
***p<0.01, **p<0.05, *p<0.1

Notes: The table exhibits the direct effect of remittance inflows on the log of aggregate deposits. The pre-period is between 2018q1-2019q4. The post-period is 4 quarters (column 1), 8 quarters (column 2) and 12 quarters (column 3). All regressors are lagged one period. Standard errors are clustered at the bank and quarter level. Variable definitions are reported in Table A.1. *** p<0.01, ** p<0.05, * p<0.1.

4.2 Baseline results

In the previous section it was shown that remittances are positively linked to aggregate deposits. We next investigate whether remittance inflows have an effect on total outstanding credit. To do this, we estimate the specification for the measure of indirect remittance exposure and total credit shown in Equation 3. The results are reported in Table 3 and show

that for the baseline estimation (Column 4), including department-quarter and branch fixed effects, the indirect remittance exposure during the post-period is positively and significantly linked to total credit. Moreover, the results are economically significant, a one standard deviation increase in the measure for indirect remittance exposure is associated with a rise in total credit by 9 percent equivalent to 3 percent of the standard deviation of total credit.

The estimations provide unbiased results assuming that the change in credit before the beginning of the COVID-19 pandemic was following a similar trend for banks differentially exposed to remittances. In Figure A.5 we examine the parallel trend assumption by regressing the log of total credit against a binary variable capturing high/low remittance exposure. In general, the results suggest that the coefficient is not significant before the first quarter of 2020. Moreover, Figure 2 illustrates that the trend for total outstanding credit in regions with high or low indirect remittance exposure display a similar pattern up to the beginning of the pandemic. These findings attenuates concerns that our measure of indirect remittance exposure could capture other unobservable factors.

Next we examine whether remittance inflows have an effect on interest rates to be able to disentangle whether the increase in credit is on the extensive or intensive margin. Table 4 shows that the measure for indirect remittance exposure is not significant in any of the estimations. The results indicate that the effect from remittances on credit primarily is on the extensive margin which implies that credit is channeled mainly to new borrowers. However, an alternative possible explanation could be that remittances put downward pressure on interest rates for existing loans but not for new lending, thus leading to an insignificant coefficient on average. Finally, our results suggest that remittance inflows have a significant causal effect on the supply of credit which is consistent with the positive association between remittances and deposits.

Table 3 Remittances and total credit

	(1)	(2)	(3)	(4)
	Outcome: log of total credit			
capital-asset ratio	-9.639	-12.914**	-14.779***	-14.750***
	(20.357)	(4.401)	(4.795)	(3.861)
short-term deposit ratio	-6.049	-0.895	-1.179	-1.696
	(4.269)	(1.533)	(2.050)	(1.961)
FX deposit ratio	14.078***	-2.628**	-2.964	-2.712
	(3.476)	(1.030)	(2.230)	(2.167)
credit risk	10.349	-0.358	0.312	-0.361
	(9.148)	(2.228)	(2.255)	(2.790)
remittance exposure	-0.226	-0.097*	-0.150*	-0.108
	(0.419)	(0.049)	(0.072)	(0.061)
post-period	0.393	-0.115	0.000	0.000
	(0.257)	(0.116)	(0.000)	(0.000)
remittance exposure x post-period	0.297	0.148**	0.181**	0.142**
	(0.381)	(0.065)	(0.073)	(0.059)
Observations	1952	1952	1952	1933
Adjusted R-squared	0.172	0.931	0.931	0.930
Quarter FE	No	No	Yes	No
Branch FE	No	Yes	Yes	Yes
Quarter-region FE	No	No	No	Yes
Number of regions	18	18	18	17
Number of banks	13	13	13	13

Robust standard errors in parentheses
***p<0.01, **p<0.05, *p<0.1

Notes: The table exhibits the indirect effect on the log of total credit using different sets of fixed effects. The pre-period is between 2018q1-2019q4, and the post-period is between 2020q1-2022q4. The variable *remittance exposure* corresponds to the indirect effect of remittances shown in Equation 2. All regressors are lagged one period. Standard errors are clustered at the bank and quarter level. Variable definitions are reported in Table A.1. *** p<0.01, ** p<0.05, * p<0.1.

4.3 Heterogeneous effects across sectoral credit

We have shown that remittance inflows are positively linked to both aggregate deposits and total outstanding credit. Nevertheless, it is important to further examine whether remittances are likely to be benefical or disadvantageous for economic growth. The literature on remittances suggests that remittances could lead to higher inflationary pressures and an ap-

Table 4 Remittances and interest rates

	(1)	(2)	(3)	(4)
	Outcome: log of interest rate			
capital-asset ratio	-6.520	3.497**	3.499*	3.624**
	(5.170)	(1.337)	(1.611)	(1.447)
short-term deposit ratio	4.156	-0.988	-1.348	-1.436
	(3.008)	(0.824)	(0.824)	(0.829)
FX deposit ratio	-2.291**	0.189	1.509	1.265
	(1.039)	(0.796)	(1.111)	(1.027)
credit risk	1.052	2.084**	1.884*	1.950**
	(3.027)	(0.780)	(0.920)	(0.823)
remittance exposure	0.125	-0.040	-0.032	-0.033
	(0.214)	(0.042)	(0.027)	(0.027)
post-period	-0.044	0.076	0.000	0.000
	(0.100)	(0.060)	(0.000)	(0.000)
remittance exposure x post-period	-0.104	0.050	0.045	0.047
	(0.218)	(0.053)	(0.040)	(0.041)
Observations	1952	1952	1952	1933
Adjusted R-squared	0.148	0.947	0.951	0.948
Quarter FE	No	No	Yes	No
Branch FE	No	Yes	Yes	Yes
Quarter-region FE	No	No	No	Yes
Number of regions	18	17	17	17
Number of banks	13	13	13	13

Robust standard errors in parentheses
***p<0.01, **p<0.05, *p<0.1

Notes: The table exhibits the indirect effect of remittances on the log of interest rates using different sets of fixed effects. The pre-period is between 2018q1-2019q4, and the post-period is between 2020q1-2022q4. The variable *remittance exposure* corresponds to the indirect effect of remittances shown in Equation 2. All regressors are lagged one period. Standard errors are clustered at the bank and quarter level. Variable definitions are reported in Table A.1. *** p<0.01, ** p<0.05, * p<0.1.

preciation of the exchange rate implying lower competitiveness for the traded sector. This phenomenon is commonly referred to as the Dutch disease. According to a study by Acosta et al. (2009) the authors find that remittances to El Salvador are associated with lower labour supply and a higher consumption demand for goods from the non-traded sector. The authors identify Dutch disease effects of remittances as higher prices on non-traded goods induced a reallocation of labour away from the traded sector to the non-traded sector.

Bahadir and Gumus (2022) show that the tradeable sector contracts while the non-tradeable sector expands after a positive shock to household credit. This finding indicates that credit to the household sector is associated with Dutch disease effects, however, this is not the case for loans to the non-financial corporate sector. To explore if remittances may have Dutch disease effects in the case of Honduras, we examine the impact of remittances on sectoral credit categorized into commercial and industrial (C&I) loans, consumer loans and mortgage loans.

Table 5 shows that remittance inflows are positively and significantly associated with commercial and industrial (C&I) loans highlighting the importance of remittances in stabilizing economic growth during a crisis. Moreover, the results also indicate that consumer loans respond strongly to increases in remittances. However, we do not find that remittances have a significant impact on mortgage credit which could be due to households not having access to the down payment amount required to obtain mortgage credit. The economic magnitude of a shock to remittances is larger for consumer loans compared to for C&I loans. A one standard deviation increase in remittances is associated with a rise in C&I loans and consumer loans equivalent to 7 and 10 percent respectively relative to the standard deviation for each type of credit. These findings suggest that remittance inflows to Honduras potentially could have Dutch disease effects since remittances have an economically large effect on household credit.

4.4 The role of bank characteristics

In this section we investigate if deposit characteristics play a role for the transmission between remittance inflows and credit supply. First, we look at whether deposit dollarization is likely to enhance or attenuate the effect of remittances on total credit. Basso et al. (2011) show that access to foreign funds increases loan dollarization while it lowers deposit dollarization. Given that the pandemic was associated with an unexpected shock to remittance inflows, i.e.

Table 5 Remittances and sectoral credit

	(1)	(2)	(3)	(4)	(5)	(6)
	C&I loans		Consumer loans		Mortgage loans	
capital-asset ratio	-15.412*	-16.055**	0.649	1.266	-7.590	-6.859
	(7.089)	(6.260)	(5.612)	(4.530)	(5.601)	(5.068)
short-term deposit ratio	-1.616	-2.374	3.380*	3.001*	1.364	0.173
	(2.521)	(2.187)	(1.827)	(1.475)	(2.609)	(1.994)
FX deposit ratio	-4.445	-3.931	-2.201*	-3.378***	2.670	2.305
	(3.566)	(3.312)	(1.104)	(1.035)	(2.831)	(2.461)
credit risk	-1.228	-1.042	1.103	0.492	-7.304**	-8.191**
	(3.390)	(3.790)	(2.022)	(1.777)	(2.616)	(2.849)
remittance exposure	-0.326***	-0.283**	-0.326**	-0.332*	0.070	0.032
	(0.097)	(0.100)	(0.114)	(0.154)	(0.119)	(0.154)
post-period	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
remittance exposure x post-period	0.391***	0.360**	0.353**	0.364**	-0.064	-0.022
	(0.121)	(0.126)	(0.122)	(0.160)	(0.125)	(0.157)
Observations	1788	1769	1668	1649	737	664
Adjusted R-squared	0.925	0.924	0.952	0.953	0.957	0.965
Quarter FE	Yes	No	Yes	No	Yes	No
Branch FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter-region FE	No	Yes	No	Yes	No	Yes
Number of regions	18	17	18	17	13	9
Number of banks	13	13	12	12	11	11

Robust standard errors in parentheses
***p<0.01, **p<0.05, *p<0.1

Notes: The table exhibits the indirect effect on the log of C&I loans (columns 1-2), consumer loans (columns 3-4), and mortgage loans (columns 5-6) using different sets of fixed effects. The pre-period is between 2018q1-2019q4, and the post-period is between 2020q1-2022q4. The variable *remittance exposure* corresponds to the indirect effect of remittances shown in Equation 2. All regressors are lagged one period. Standard errors are clustered at the bank and quarter level. Variable definitions are reported in Table A.1. *** p<0.01, ** p<0.05, * p<0.1.

a large increase in foreign funding, banks were inclined to lend in dollars. Hence, banks that had a higher level of deposit dollarization before the pandemic are expected to extend more credit as they were less exposed to currency mismatch between loans and deposits.

We test the hypothesis that banks with a higher level of pre-pandemic deposit dollarization displayed a more elastic response to the increase in remittances. Table 6 shows the results for remittances and total credit supply for banks with high or low deposit dollarization. We

Table 6 The role of bank characteristics

	(1)	(2)	(3)	(4)
	Outcome: log of total credit			
	Deposit dollarization		Short-term deposit share	
	Low	High	Low	High
capital-asset ratio	-16.091	-13.946***	-3.230	-16.887
	(9.528)	(3.842)	(2.141)	(10.145)
short-term deposit ratio	-4.578	-0.563	-4.857	1.322
	(6.160)	(1.755)	(4.311)	(2.121)
FX deposit ratio	-8.774	-1.701	-2.927	-3.790
	(8.287)	(1.459)	(1.937)	(4.237)
credit risk	6.326	-4.505*	4.113*	-0.051
	(5.796)	(2.358)	(1.707)	(4.777)
remittance exposure	-0.101	-0.126	-0.001	-0.237*
	(0.186)	(0.082)	(0.107)	(0.107)
post-period	0.000	0.000		
	(0.000)	(0.000)		
remittance exposure x post-period	0.079	0.190***	0.008	0.273***
	(0.190)	(0.027)	(0.100)	(0.069)
Observations	665	1268	494	1281
Adjusted R-squared	0.775	0.946	0.969	0.935
Branch FE	Yes	Yes	Yes	Yes
Quarter-region FE	Yes	Yes	Yes	Yes
Number of regions	8	9	9	17
Number of banks	7	13	5	8

Robust standard errors in parentheses
***p<0.01, **p<0.05, *p<0.1

Notes: The table exhibits the indirect effect of remittances on the log of total credit accounting for different bank characteristics. The pre-period is between 2018q1-2019q4, and the post-period is between 2020q1-2022q4. The variable *remittance exposure* corresponds to the indirect effect of remittances shown in Equation 2. Deposit dollarization refers to deposits in foreign currency scaled by total deposits and the short-term deposit share is the ratio of short-term deposits over total deposits. Low (high) refers to below (above) the median of the sample in 2019 for each measure, respectively. All regressors are lagged one period. Standard errors are clustered at the bank and quarter level. Variable definitions are reported in Table A.1. *** p<0.01, ** p<0.05, * p<0.1.

find that remittances only have a positive and significant effect on credit for those banks with deposit dollarization above the median.

In a similar vein, we further explore whether the share of short-term deposits influences the effect of remittances on credit. We find that remittances have a positive and significant impact on credit only for banks with a high short-term deposit share shown in Table 6. This result is expected since banks with more short-term deposits in the beginning of the pandemic are financially constrained due to the maturity mismatch between shorter-term deposits and longer-term loans. The shock to remittance inflows reduced these banks' financial constraints thus triggering increased lending. Our findings show that currency and maturity mismatches between deposits and loans play an important role for the link between remittances and credit.

4.5 Implications for financial inclusion

Lack of access to credit is a major obstacle in developing countries hampering economic growth by limiting firms' investment opportunities and innovation. In previous sections, we show that remittances are positively linked to both aggregate deposits and credit to firms and households. However, our findings do not entail information on the distributional effects of remittances for credit access.

In this section, we explore the impact of remittances on cross-regional credit supply during the COVID-19 pandemic. We collect data on Gross National Income (GNI) and population size for all departments in Honduras for the year 2019 from the Global Data Lab's database. We use GNI per capita as a proxy for economic development and the credit-to-GNI ratio as a measure of financial sector depth.

The results shown in Table 7 indicate that the shock to remittances during the pandemic had a casual impact on credit supply only for departments that are more economically or financially developed (columns 2 and 4). Our findings suggest that even though remittance

Table 7 Implications for financial inclusion

	(1)	(2)	(3)	(4)
	Outcome: log of total credit			
	GNI per capita		Credit-to-GNI ratio	
	Low	High	Low	High
capital-asset ratio	-15.137*	-14.669***	-22.488**	-6.760
	(7.217)	(3.361)	(8.460)	(4.563)
short-term deposit ratio	-0.879	-2.575*	-3.983	-0.122
	(3.012)	(1.440)	(4.310)	(2.100)
FX deposit ratio	-4.658	-1.670	-7.900*	-0.847
	(3.371)	(1.751)	(3.872)	(1.680)
credit risk	2.020	-3.127	-0.018	1.388
	(4.180)	(2.143)	(5.329)	(2.916)
remittance exposure	-0.121	-0.098	-0.073	-0.140
	(0.084)	(0.101)	(0.113)	(0.086)
post-period	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
remittance exposure x post-period	0.143	0.145*	0.082	0.189**
	(0.080)	(0.077)	(0.116)	(0.078)
Observations	946	987	959	974
Adjusted R-squared	0.823	0.953	0.736	0.949
Branch FE	Yes	Yes	Yes	Yes
Quarter-region FE	Yes	Yes	Yes	Yes
Number of regions	10	7	11	6
Number of banks	9	13	9	13

Robust standard errors in parentheses
***p<0.01, **p<0.05, *p<0.1

Notes: The table exhibits the indirect effect of remittances on the log of total credit accounting for economic and financial development. The pre-period is between 2018q1-2019q4, and the post-period is between 2020q1-2022q4. The variable *remittance exposure* corresponds to the indirect effect of remittances shown in Equation 2. Economic development is measured as Gross National Income (GNI) per capita and financial development is proxied by credit as a percent of GNI. Low (high) refers to below (above) the median of the sample in 2019 for each measure, respectively. All regressors are lagged one period. Standard errors are clustered at the bank and quarter level. Variable definitions are reported in Table A.1. *** p<0.01, ** p<0.05, * p<0.1.

inflows help to support credit supply during a crisis this effect can only be found in wealthier regions potentially exacerbating cross-regional inequality.

4.6 The impact of remittances on credit risk

From a theoretical viewpoint, the impact from remittances on credit risk is ambiguous. According to Beaton et al. (2017) remittances can cause excessive credit growth thus having a "risk-inducing" effect. On the other hand, remittances can stabilize borrowers' balance sheets and incomes ("income-stabilizing" effect) which enhances borrower's payment capacity. Moreover, remittances are considered relatively stable flows and can be used as collateral which reduces credit risk.

We investigate the direct effect of remittances on credit risk defined as credit belonging to the categories arrear, foreclosure, or overdue scaled by total outstanding credit. To assess the effect of remittances on risky credit, we estimate the specification shown in Equation 4 at the bank-quarter level. The results shown in Table 8 indicate that remittances are negatively and significantly associated with credit risk when including bank fixed effects. Nevertheless, the coefficient is not significant when including both quarter and bank fixed effects. Consistent with previous literature showing that remittances have a negative link with non-performing loans (see for example Beaton et al., 2017 and Ebeke et al., 2014), the findings in this study suggest that remittances may help to attenuate the growth in risky credit indicating that the "income-stabilizing" effect dominates over the "risk-inducing" effect in our sample.

5 Robustness tests

We conduct a series of tests to assess the robustness of the results. We begin by investigating the impact of the direct effect of remittance inflows on total outstanding credit. Column 1 in Table A.2 shows that the coefficient for the interaction term between remittances to department j and the post-period is positive and weakly significant when controlling for

Table 8 Direct effect of remittances on credit risk

	(1)	(2)
	Outcome variable: Credit risk	
capital-asset ratio	2.914	3.130
	(1.784)	(2.154)
short-term deposit ratio	0.676	1.056
	(0.873)	(1.037)
FX deposit ratio	0.889	1.364
	(0.543)	(0.902)
direct remittance exposure	0.092**	0.067
	(0.031)	(0.232)
post-period	0.138**	0.000
	(0.064)	(0.000)
direct remittance exposure x post-period	-0.072**	-0.126
	(0.030)	(0.248)
Observations	285	285
Adjusted R-squared	0.816	0.816
Quarter FE	No	Yes
Bank FE	Yes	Yes
Number of banks	15	15

Robust standard errors in parentheses
***p<0.01, **p<0.05, *p<0.1

Notes: The table exhibits the direct effect of the log change in remittances on credit risk. Credit risk is the sum of risky credit (arrear, foreclosure, or overdue) scaled by total outstanding credit. The pre-period is between 2018q1-2019q4, and the post-period is between 2020q1-2022q4. All regressors are lagged one period. Standard errors are clustered at the bank and quarter level. Variable definitions are reported in Table A.1. *** p<0.01, ** p<0.05, * p<0.1.

time-invariant branch fixed effects. However, the results are not significant when including quarter and department fixed effects shown in column 2. Moreover, we conduct a horserace between the direct and indirect remittance exposure reported in columns 3 and 4. The results indicate that the interaction term with indirect remittance exposure remains signficant when controlling for direct remittance inflows.

We next verify if our findings are sensitive to excluding the departments in Honduras where financial centers are located. Figure A.4 illustrates that both the department Fran-

cisco Morazán and Cortés have a considerably larger number of bank branches compared to other departments. Hence, we run the estimation excluding only Francisco Morazán or both departments shown in Table A.3. The results indicate that the positive coefficient for the interaction term is positive and significant when excluding Francisco Morazán and weakly significant when excluding both departments. Since these departments include the financial and economic centers of the country, accounting for a large proportion of credit demand, this finding further supports the notion that we are capturing the impact of remittance inflows on credit supply.

Moreover, we run estimations for total credit with different length of the post-period reported in Table A.4. The results show that the interaction term is positive and significant for all different length of the post-period. In contrast to the results for deposits in Table 2, the interaction term has a larger magnitude for total credit when increasing the length of the post-period from one to two years. However, when we repeat the same exercise for interest rates shown in Table A.7 the coefficents of the interaction term remain insignficant irrespective of post-period length.

We further verify the validity of our difference-in-difference approach by performing a placebo test using an arbitrary starting date of the post-period. The results for the placebo test with the post-period starting in the first quarter of 2019 are shown in Table A.5. The coefficient for the interaction term in the placebo test (column 2) is negative and insignificant reinforcing the validity of our empirical approach. Finally, in Table A.6 we examine whether our results hold for alternative clustering of standard errors. The results show that the coefficient for the interaction term is significant for different combinations of bank, region and quarter clustering.

6 Conclusion

Remittances from abroad play a pivotal role for stabilizing economic growth in low- and middle-income countries during a crisis. Moreover, the literature shows that bank credit is the most important form of external financing for firms in developing countries and essential for economic performance. By leveraging unique and confidential regulatory data on remittances, deposits and credit from Honduras, this study examines whether remittances have an effect on bank credit. Our identification strategy allows us to address endogeneity concerns by exploiting the positive shock to remittances during the COVID-19 pandemic providing a quasi-experimental setting. In this study, we investigate if indirect exposure to an exogenous shock to remittance inflows is linked to bank credit supply.

We document that remittance inflows to Honduras during the COVID-19 pandemic had a positive causal impact on the volume of total bank credit. However, we do not find that remittances influence interest rates suggesting that bank loans primarily are extended to new borrowers. Moreover, the results show that remittances only have a significant effect on total credit in regions with a higher level of economic or financial development. Our results further support the notion that remittance are linked to credit via the deposit channel. In addition, the findings suggest that the impact of remittances on credit is primarily channeled via banks with higher deposit dollarization and share of short-term deposits.

Our study also shows that remittances have a positive effect on commercial and industrial loans as well as loans to consumers. The positive causal link between remittances and credit to firms highlights the importance of remittances in maintaining economic growth during a crisis. Nevertheless, the results indicate that remittance inflows have an economically large impact on consumer loans. This suggest that remittances could have Dutch disease effects weakening economic performance in the longer run. Finally, we find that remittance inflows during the pandemic may have been associated with lower credit risk.

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A Appendix: Additional figures and tables

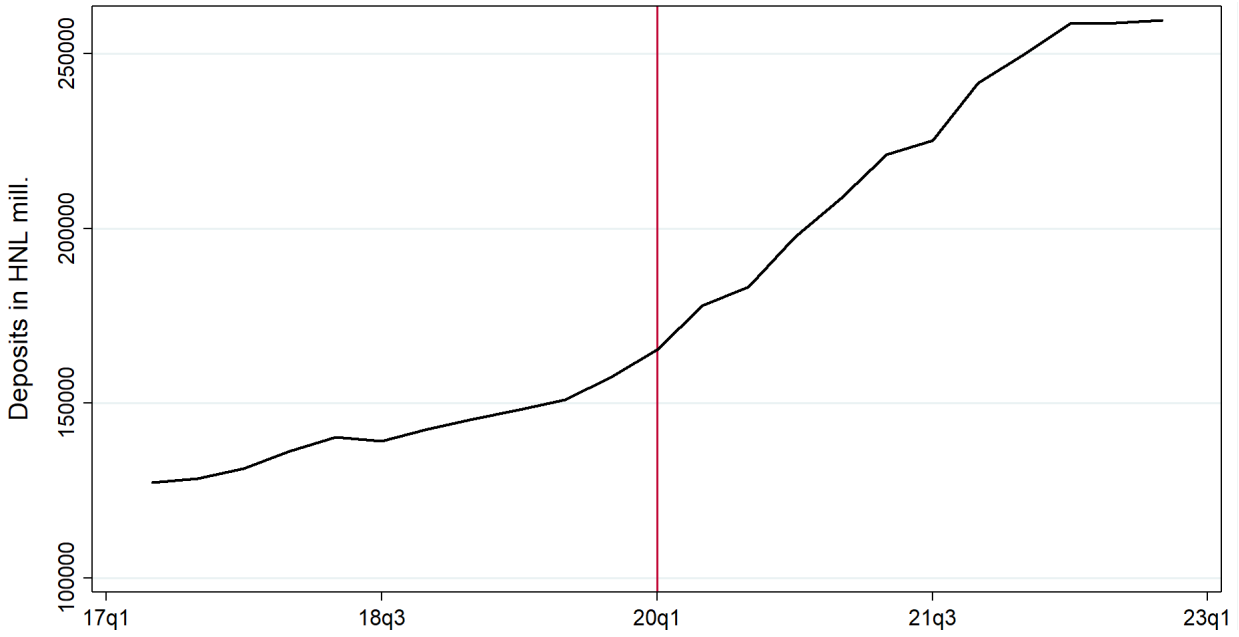

Figure A.1 Evolution of aggregate deposits

NOTES: The figure illustrates the evolution of aggregate deposits in Honduras between 2017q2 and 2022q4 (in millions of Lempiras). The red vertical line indicates the beginning of the COVID-19 pandemic.

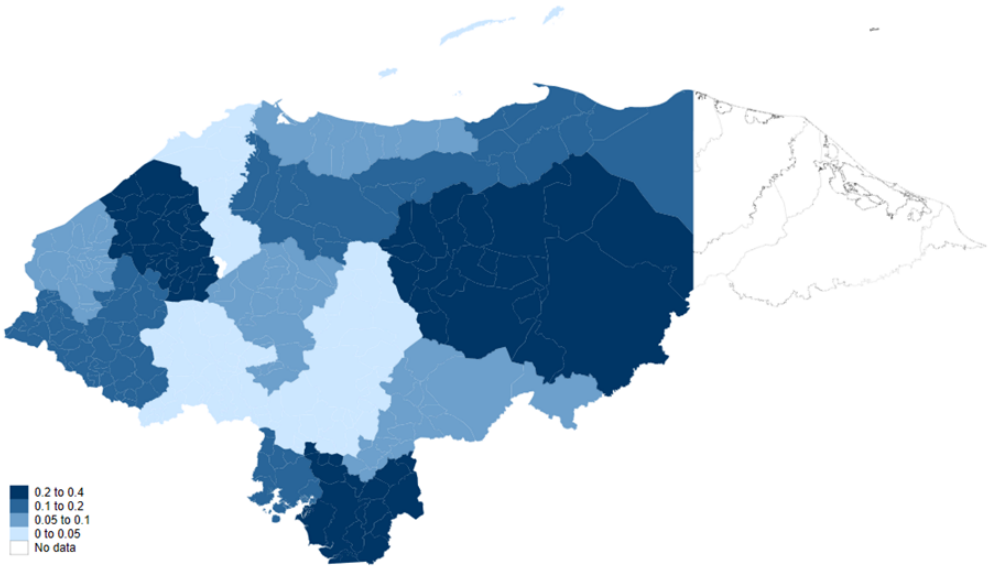

Figure A.2 Remittance inflows (% of deposits)

NOTES: The figure exhibits the ratio of remittances scaled by total deposits during the period 2018-2019. Darker blue indicates a higher remittance-to-deposit ratio.

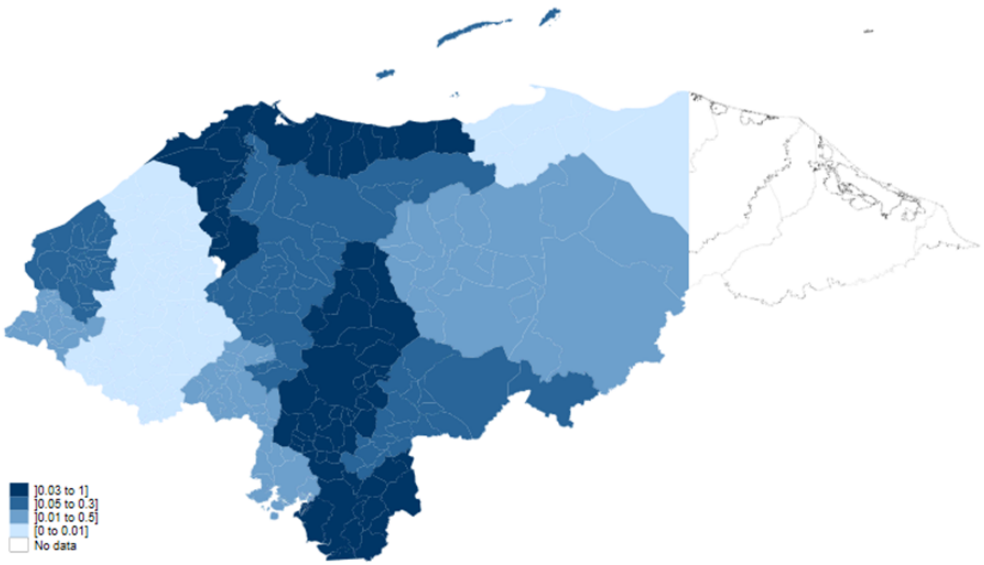

Figure A.3 Total credit (% of deposits)

NOTES: The figure illustrates the ratio of total credit over total deposits during the period 2018-2019. Darker blue indicates a higher credit-to-deposit ratio.

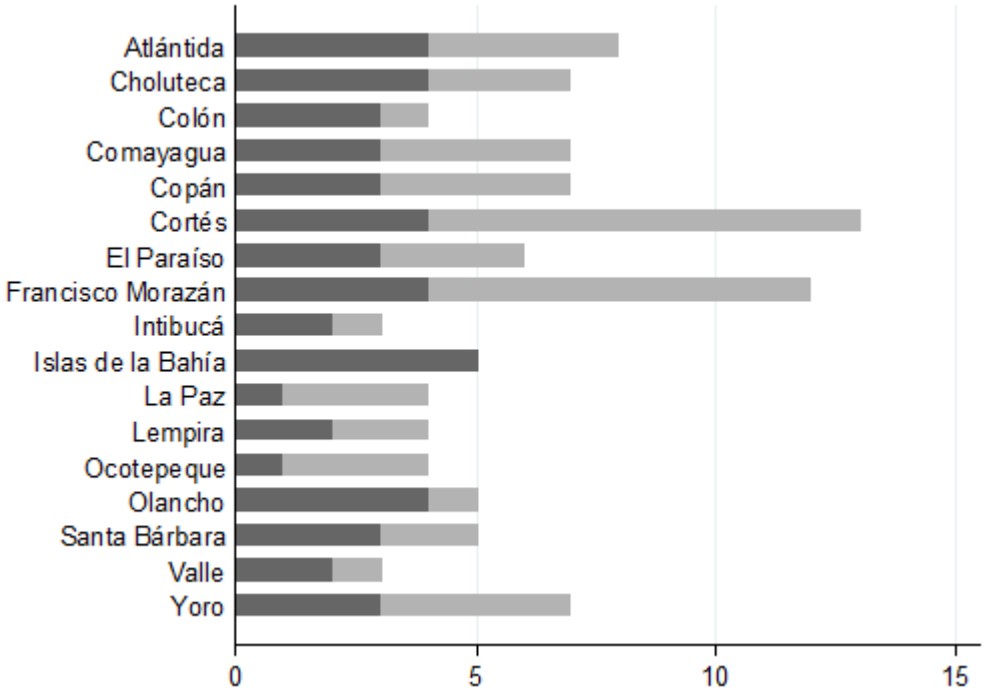

Figure A.4 Branches with high/low indirect exposure

NOTES: The figure shows the number of branches per department that have a high (or low) indirect exposure to remittances. High indirect exposure (above median) is highlighted in dark grey and low exposure (below median) in light grey.

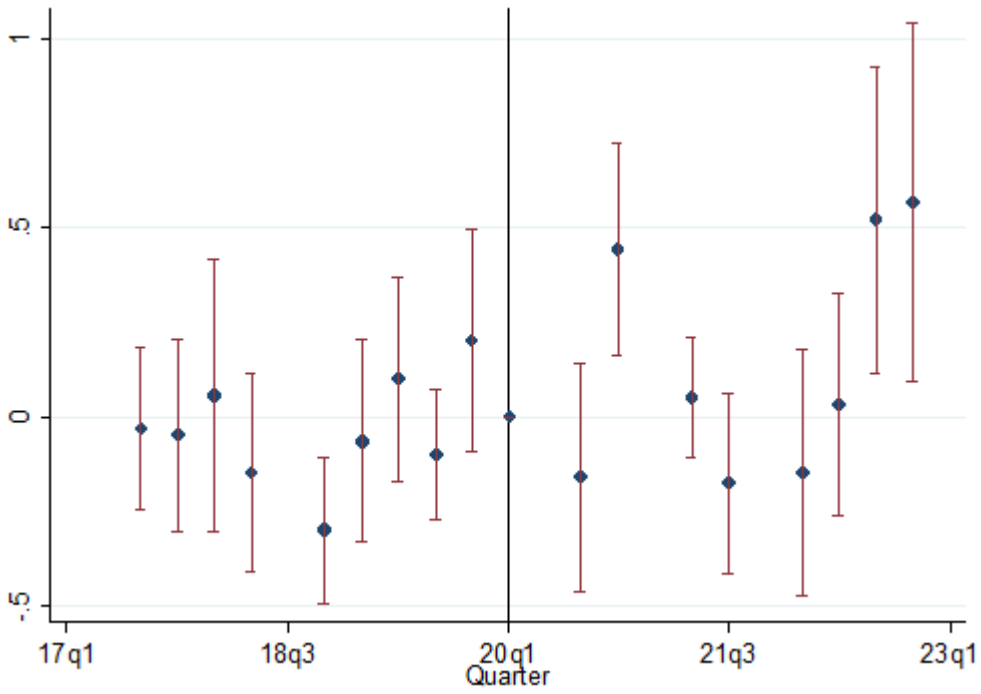

Figure A.5 Parallel trends

NOTES: The Figure depicts the effect on total credit three years before and after the beginning of the COVID-19 pandemic. Each coefficient results from a separate regression where the outcome is the log of total credit and the indirect exposure measure for remittances is captured by a binary variable indicating high or low exposure (above/below median). The graph displays 95% confidence intervals of the estimates.

Table A.1 Variable definitions

Variable	Definition	Source
Total credit	Total outstanding credit in Honduran Lempiras	Comisión Nacional de Bancos y Seguros
Capital-asset ratio	Bank capital scaled by assets	Comisión Nacional de Bancos y Seguros
Short-term deposit ratio	Short-term deposits scaled by total deposits	Comisión Nacional de Bancos y Seguros
FX deposit ratio	Ratio of FX deposits to total deposits	Comisión Nacional de Bancos y Seguros
Credit risk	Sum of credit belonging to the categories arrear, foreclosure, or overdue scaled by total outstanding credit	Comisión Nacional de Bancos y Seguros
Interest rate	Interest rate on total outstanding credit (in percent)	Comisión Nacional de Bancos y Seguros
C&I loans	Corporate and industrial credit in Honduran Lempiras	Comisión Nacional de Bancos y Seguros
Consumer loans	Credit to consumers in Honduran Lempiras	Comisión Nacional de Bancos y Seguros
Mortgage loans	Mortgage credit in Honduran Lempiras	Comisión Nacional de Bancos y Seguros
Total deposits	Total deposits in Honduran Lempiras	Comisión Nacional de Bancos y Seguros
Direct remittance exposure	The first difference of log remittances	Comisión Nacional de Bancos y Seguros
Remittance exposure	The first difference of log remittances to all other departments except j	Comisión Nacional de Bancos y Seguros

Table A.2 Robustness test - Horserace between direct and indirect exposure

	(1)	(2)	(3)	(4)
	Outcome: log of total credit			
	Direct effect		Joint	
capital-asset ratio	-13.091**	-14.894**	-13.115**	-14.910***
	(4.673)	(4.938)	(4.497)	(4.799)
short-term deposit ratio	-0.936	-1.176	-0.921	-1.143
	(1.566)	(2.123)	(1.561)	(2.070)
FX deposit ratio	-2.588**	-2.899	-2.599**	-2.915
	(1.015)	(2.211)	(1.060)	(2.199)
credit risk	-0.378	0.283	-0.266	0.351
	(2.308)	(2.313)	(2.270)	(2.303)
post-period	-0.105	0.000	-0.115	0.000
	(0.105)	(0.000)	(0.115)	(0.000)
direct remittance exposure	0.036	0.040	0.027	0.022
	(0.029)	(0.027)	(0.032)	(0.027)
remittance exposure			-0.091*	-0.142*
			(0.046)	(0.073)
direct remittance exposure x post-period	0.098*	0.094	0.084	0.115
	(0.053)	(0.086)	(0.083)	(0.090)
remittance exposure x post-period			0.115*	0.177**
			(0.064)	(0.073)
Observations	1952	1952	1952	1952
Adjusted R-squared	0.931	0.930	0.931	0.930
Quarter FE	No	Yes	No	Yes
Region FE	No	Yes	No	Yes
Branch FE	Yes	Yes	Yes	Yes
Number of regions	18	18	18	18
Number of banks	13	13	13	13

Robust standard errors in parentheses
***p<0.01, **p<0.05, *p<0.1

Notes: The table exhibits the direct and indirect effect of the log change in remittances on log credit. In columns 1-2 the results for the direct remittance exposure is shown. Columns 3-4 display results including both the direct and indirect remittance exposure. The pre-period is between 2018q1-2019q4, and the post-period is between 2020q1-2022q4. All regressors are lagged one period. Standard errors are clustered at the bank and quarter level. Variable definitions are reported in Table A.1. *** p<0.01, ** p<0.05, * p<0.1.

Table A.3 Robustness test - exclusion of financial centers

	(1)	(2)	(3)	(4)
	Outcome: log of total credit			
	Excluding Francisco Morazán		Excluding Francisco Morazán & Cortés	
capital-asset ratio	-16.443**	-16.553***	-16.268**	-16.224**
	(5.404)	(4.462)	(6.504)	(5.407)
short-term deposit ratio	-1.268	-1.731	-1.47	-2.231
	(2.151)	(2.162)	(2.698)	(2.859)
FX deposit ratio	-3.482	-3.182	-7.011**	-6.842*
	(2.574)	(2.385)	(2.952)	(3.084)
credit risk	0.865	0.179	1.633	0.968
	(2.328)	(2.882)	(3.061)	(3.709)
remittance exposure	-0.144*	-0.105	-0.173*	-0.137*
	(0.075)	(0.061)	(0.082)	(0.066)
post-period	0.004	-	-0.210**	-
	(0.247)	(-)	(0.089)	(-)
remittance exposure x post-period	0.186**	0.154**	0.186*	0.151*
	(0.08)	(0.063)	(0.083)	(0.071)
Observations	1724	1705	1479	1460
Adjusted R-squared	0.911	0.908	0.853	0.845
Quarter FE	Yes	No	Yes	No
Branch FE	Yes	Yes	Yes	Yes
Quarter-region FE	No	Yes	No	Yes
Number of regions	17	16	16	15
Number of banks	13	13	10	10

Robust standard errors in parentheses
***p<0.01, **p<0.05, *p<0.1

Notes: The table exhibits the indirect effect of remittances on the log of total credit. Columns 1-2 exclude the region Francisco Morazán and columns 3-4 exclude both regions Francisco Morazán and Cortés. The pre-period is between 2018q1-2019q4, and the post-period is between 2020q1-2022q4. The variable *remittance exposure* corresponds to the indirect effect of remittances shown in Equation 2. All regressors are lagged one period. Standard errors are clustered at the bank and quarter level. Variable definitions are reported in Table A.1. *** p<0.01, ** p<0.05, * p<0.1.

Table A.4 Robustness test - different post-periods for credit

	(1)	(2)	(3)
	Outcome: log of total credit		
capital-asset ratio	-16.124***	-24.645***	-14.750***
	(4.801)	(4.608)	(3.861)
short-term deposit ratio	-5.219*	-4.491**	-1.696
	(2.830)	(1.999)	(1.961)
FX deposit ratio	-1.114	-2.631	-2.712
	(2.536)	(2.789)	(2.167)
credit risk	-1.871	-1.567	-0.361
	(2.994)	(3.532)	(2.790)
remittance exposure	-0.022	-0.067	-0.108
	(0.052)	(0.080)	(0.061)
post-period	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
remittance exposure x post-period	0.100***	0.145***	0.142**
	(0.014)	(0.047)	(0.059)
Observations	1106	1522	1933
Adjusted R-squared	0.960	0.940	0.930
Branch FE	Yes	Yes	Yes
Quarter-region FE	Yes	Yes	Yes
Number of regions	17	17	17
Number of banks	13	13	13
Post-period	2020q1-2020q4	2020q1-2021q4	2020q1-2022q4

Robust standard errors in parentheses
***p<0.01, **p<0.05, *p<0.1

Notes: The table exhibits the indirect effect on the log of total credit using different sets of fixed effects. The pre-period is between 2018q1-2019q4. The post-period is 4 quarters (column 1), 8 quarters (column 2) and 12 quarters (column 3). The variable *remittance exposure* corresponds to the indirect effect of remittances shown in Equation 2. All regressors are lagged one period. Standard errors are clustered at the bank and quarter level. Variable definitions are reported in Table A.1. *** p<0.01, ** p<0.05, * p<0.1.

Table A.5 Robustness test - alternative beginning of post-period

	(1)	(2)
	Outcome: log of total credit	
	Baseline (2020q1-)	Placebo (2019q1-)
capital-asset ratio	-14.750***	-14.755***
	(3.861)	(3.927)
short-term deposit ratio	-1.696	-1.677
	(1.961)	(2.005)
FX deposit ratio	-2.712	-2.674
	(2.167)	(2.223)
credit risk	-0.361	-0.421
	(2.790)	(2.799)
remittance exposure	-0.108	0.028
	(0.061)	(0.042)
post-period	0.000	0.000
	(0.000)	(0.000)
remittance exposure x post-period	0.142**	-0.008
	(0.059)	(0.027)
Observations	1933	1933
Adjusted R-squared	0.930	0.930
Branch FE	Yes	Yes
Quarter-region FE	Yes	Yes
Number of regions	17	17
Number of banks	13	13

Robust standard errors in parentheses
***p<0.01, **p<0.05, *p<0.1

Notes: The table exhibits the indirect effect on the log of total credit using different sets of fixed effects. Column 1 displays the results for the baseline estimation where the start date (2020q1) corresponds to the beginning of the COVID-19 pandemic. In column 2 the start date is arbitrarily set to 2019q1 as a placebo test. The variable *remittance exposure* corresponds to the indirect effect of remittances shown in Equation 2. All regressors are lagged one period. Standard errors are clustered at the bank and quarter level. Variable definitions are reported in Table A.1. *** p<0.01, ** p<0.05, * p<0.1.

Table A.6 Robustness test - alternative clustering of standard errors

	(1)	(2)	(3)	(4)
	Outcome: log of total credit			
capital-asset ratio	-14.750***	-14.750***	-14.750***	-14.750***
	(3.861)	(4.438)	(4.379)	(4.183)
short-term deposit ratio	-1.696	-1.696	-1.696	-1.696
	(1.961)	(1.870)	(1.915)	(1.892)
FX deposit ratio	-2.712	-2.712	-2.712	-2.712
	(2.167)	(3.039)	(2.976)	(2.827)
credit risk	-0.361	-0.361	-0.361	-0.361
	(2.790)	(2.682)	(2.683)	(2.765)
remittance exposure	-0.108	-0.108	-0.108*	-0.108
	(0.061)	(0.063)	(0.058)	(0.081)
post-period	0.000		0.000	0.000
	(0.000)		(0.000)	(0.000)
remittance exposure x post-period	0.142**	0.142**	0.142***	0.142*
	(0.059)	(0.066)	(0.046)	(0.072)
Observations	1933	1933	1933	1933
Adjusted R-squared	0.930	0.930	0.930	0.930
Branch FE	Yes	Yes	Yes	Yes
Quarter-region FE	Yes	Yes	Yes	Yes
Number of regions	17	17	17	17
Number of banks	13	13	13	13
Clustering SE - Bank	Yes	No	No	Yes
Clustering SE - Region	No	Yes	Yes	Yes
Clustering SE - Quarter	Yes	No	Yes	No

Robust standard errors in parentheses
***p<0.01, **p<0.05, *p<0.1

Notes: The table exhibits the indirect effect on the log of total credit using different sets of fixed effects. The pre-period is between 2018q1-2019q4, and the post-period is varies from 2 to 12 quarters. The variable *remittance exposure* corresponds to the indirect effect of remittances shown in Equation 2. All regressors are lagged one period. Standard errors are clustered at the bank and quarter level. Variable definitions are reported in Table A.1. *** p<0.01, ** p<0.05, * p<0.1.

Table A.7 Robustness test - different post-periods for interest rate

	(1)	(2)	(3)
	Outcome: log of interest rate		
capital-asset ratio	1.873	4.273*	3.624**
	(1.298)	(2.156)	(1.447)
short-term deposit ratio	-2.356*	-2.215*	-1.436
	(1.101)	(1.023)	(0.829)
FX deposit ratio	0.434	0.204	1.265
	(0.795)	(0.705)	(1.027)
credit risk	-0.341	1.758	1.950**
	(1.164)	(1.201)	(0.823)
remittance exposure	-0.020	-0.028	-0.033
	(0.026)	(0.031)	(0.027)
post-period		0.000	
		(0.000)	
remittance exposure x post-period	0.037	0.042	0.047
	(0.039)	(0.048)	(0.041)
Observations	1106	1522	1933
Adjusted R-squared	0.975	0.952	0.948
Branch FE	Yes	Yes	Yes
Quarter-region FE	Yes	Yes	Yes
Number of regions	17	17	17
Number of banks	13	13	13
Post-period	2020q1-2020q4	2020q1-2021q4	2020q1-2022q4

Robust standard errors in parentheses
***p<0.01, **p<0.05, *p<0.1

Notes: The table exhibits the indirect effect of remittances on the log of interest rate. The pre-period is between 2018q1-2019q4. The post-period is 4 quarters (column 1), 8 quarters (column 2) and 12 quarters (column 3). The variable *remittance exposure* corresponds to the indirect effect of remittances shown in Equation 2. All regressors are lagged one period. Standard errors are clustered at the bank and quarter level. Variable definitions are reported in Table A.1. *** p<0.01, ** p<0.05, * p<0.1.

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