International trade and cross-border banking: a granular approach using bank specialization*

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March 2025

ABSTRACT:

Using a unique database, this paper provides new evidence on the complementarity between bilateral trade and cross-border lending at the micro level. This is a function of bank specialization, the sector and nationality of the loan counterparty, and the condition of the destination country. The results suggest that bank specialization introduces a comparative advantage that further reduces the information frictions already enabled by trade. Moreover, this specialization would help to cope with the information frictions involved in having a counterparty that is from a different sector or nationality. Finally, this paper considers the crisis as a source of information frictions and suggests that the crisis reduces the informational power of bilateral trade.

Keywords: international trade, international finance, bank, information asymmetry, geography of capital flows.

JEL classification: F36, F34, F10, C33, G21

*The views expressed here are those of the author and do not necessarily represent those of the Banque de France. The author is very grateful to Antoine Berthou, Nicolas Coeurdacier, Mathias Le and Baptiste Meunier for very helpful comments.

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1 Introduction

The portfolio theory introduced by Markowitz [1952] and extended to international portfolio theory by Levy and Sarnat [1970], Grubel [1968] and Lessard [1973] suggests that banks may have an incentive to invest in geographical location that are fare from the home country because of the diversification motive.[1]. However, Portes et al. [2001], Portes and Rey [2005] provide evidence that distance is a strong determinant of equity holding where the further away the destination, the less exposure the investor has. The most natural explanation is that information frictions are positively correlated with distance and are more important than motive of diversification in international asset choices. As argued in Aviat and Coeurdacier [2007], it follows that bilateral trade and asset holding are complementary because bilateral trade reduces information asymmetry in the flow of financial transactions. Alternatively, Lane and Milesi-Ferretti [2008] argue that larger bilateral positions are also associated with proxies for informational proximity.

The literature on this topic, including Portes and Rey [2005], Daude and Fratzscher [2008], has shown that information frictions depend on the type of asset. In particular, holding sovereign bonds or equity would be less sensitive to these frictions than FDI and cross-border loans. Thus, this paper focuses on cross-border loans with a granular approach using bank-level data. It attempts to confirm that the complementarity between bilateral trade and cross-border lending is present at both an aggregate and a micro level. Moreover, the granularity of the data allows us to extract characteristics that condition this relationship, including the geographical specialization of banks.

The main contribution of this paper is to consider the geographical specialization of banks - defined from domestic lending to national exporters as in Berthou et al. [2021] -

[1]Imbs [1999] provides direct evidence that correlations of business cycles decrease with distance.

in the relationship between bilateral cross-border lending and bilateral trade. Trade in the goods market reduces informational asymmetries in financial markets at the macro level. However, each bank has privileged access to this information through its relationship with its clients, including domestic exporters specializing in a given geographic market. Taking this comparative advantage of specialization into account at the micro level refines the analysis of the complementarity between trade and the international positions of banks.

Second, the granularity of the data at the bank level allows the identification of new sources of information friction. In particular, counterparty characteristics such as sector or nationality are dimensions that have not been studied in the literature so far. From a bank's point of view, a counterparty belonging to the non-financial sector may imply more information asymmetry than a counterparty sharing the same sector of activity. Similarly, whether or not a counterparty shares the same nationality as the bank may have consequences for information frictions (cultural affinities, similarity in official documents, language, etc.).

Third, this paper considers that information friction is state dependent as crisis imply a surge in information asymmetry. The results of Aviat and Coeurdacier [2007] are not related to the specific conditions that investors face during a crisis in the destination country. A crisis, whether economic, political or related to a natural disaster, implies a break in the functioning of the system known until then. It can be a source of uncertainty, risk, exceptional and temporary interventions and a generalized questioning of the system. If the crisis is generalized at the country level, the lack of visibility is common to all sectors. Thus, a crisis can lead to an increase in information friction such that bilateral trade become uninformative over this period. In this case, the complementarity between trade and cross-border lending would be lost during a crisis. This

paper contributes to this gap in the literature by considering periods of crisis.

Using unique data from French customs and the Banque de France, this paper builds a new database linking banks' cross-border lending to banks' geographic specialization due to the domestic lending market. It provides new evidence of the complementarity of bilateral trade and cross-border lending at a micro level, as a function of bank specialization, the sector and nationality of the loan counterparty, and the state of the destination country.

Consistent with Aviat and Coeurdacier [2007], Daude and Fratzscher [2008], the results - both aggregated and granular - confirm that trade reduces information friction for cross-border lending since bilateral trade and cross-border lending are complementary. This is particularly true for cross-border lending to the non-financial sector. Focusing on granular data, the results suggest that banks' specialization allows them to better exploit this mechanism, giving them a comparative advantage. However, the contribution of bank specialization seems to be specific to cross-border lending to the non-financial sector. Since the counterparty belongs to a different sector than the bank, this implies a higher screening cost for the bank and additional information asymmetry. Therefore, bilateral trade and specialization - two dimensions that link the bank to the non-financial sector - may be more relevant in this case than in cross-border lending to the financial sector.

Another point of the paper is to consider the nationality of the counterparty as a source of information friction at both the aggregate and the bank level. The results underlines that complementarity is invalidated when when the counterparty does not have the same nationality as the bank, except if the bank is specialized. In this case, granular data confirms that specialization is key to reduce information frictions. A dif-

ferent nationality implies additional information asymmetry for the bank compared to a counterparty that shares the same nationality. The bank's need for specific information is greater in this case. As domestic exporters trade with the destination country, they have access to a wider range of information and can share this information with the bank, making specialization a key determinant of complementarity between cross-border trade and lending.

The paper provides new evidence on the state dependency of the complementarity between bilateral trade and cross-border loans using data on crisis from Hassan et al. [2021]. It shows that crisis imply a surge in information friction such that bilateral trade becomes uninformative for cross-border loans. The most natural explanation is that information accumulated through bilateral trade concern general information that are continuous and stable in a good state of the economy (administrative, fiscal, and legislative systems, customs, language, etc.), while crisis introduces risks and uncertainty about the continuity of the system established so far. However, results confirm that specialization may still help to reduce information friction, introducing a strong back-up for complementarity in times of crisis.

Finally, this paper participates to the debate on fragmentation and the global financial architecture. In an environment of growing commercial uncertainty where political interventionism can lead to further fragmentation, the study of the complementarity between trade and cross-border banking is of the utmost importance. If trade relations are to be reshaped, the study of complementarity will help to understand the underlying changes in the global financial architecture.

The remainder of the paper is organized as follows. Section 2 presents a review of the literature, while section 3 presents the data. Section 4 introduces the complementarity of

trade and cross-border banking at the aggregate level. Focusing on granular data, section 5 details complementarity by introducing banking specialization. Section 6 concludes.

2 Related literature

This paper first builds on the empirical literature on informational frictions and cross-border shareholding introduced in Portes et al. [2001], Portes and Rey [2005]. They provide evidence of a negative relationship between asset holding and distance, using panel data aggregated over 40 countries. They conclude that a gravity model explains international financial asset transactions at least as well as good commercial transactions. Using distance as an indicator of informational friction, they show that geographic information is the main determinant of the structure of international transactions. Aviat and Coeurdacier [2007], Lane and Milesi-Ferretti [2008], Brei and von Peter [2018] use aggregate data and confirm the negative relationship between distance and portfolio investment. They introduce the notion of complementarity between trade flows and portfolio investments. In particular, Aviat and Coeurdacier [2007] suggests that causality between bilateral trade and bilateral investment runs from trade to bilateral assets. Following Brei and von Peter [2018], information friction is the common driver of trade and banking ties. However, they examine informational frictions side by side instead of simultaneously considering bilateral trade and banking links. This paper contributes to this literature by using microeconomic data on bilateral trade and banking positions in order to study the complementarity between bilateral trade and cross-border lending.

Coeurdacier and Rey [2012] confirms the complementarity between equity holding and bilateral trade using fund-level micro data on equity holding. They highlight heterogeneity in portfolio holding in terms of asset classes and the home bias. By focusing on the international position of banks, this paper contributes to this literature by proposing an alternative approach. In addition, it identifies heterogeneity within an asset class,

such as heterogeneity in counterparty nationality or counterparty sector.

By considering asymmetry in different states of the economy (i.e. in crisis and non-crisis periods), this paper is part of the literature on crisis and international financial investment. Theoretical papers including Caballero and Simsek [2020], Gourio et al. [2015], Tille and van Wincoop [2014] highlight the asymmetric exposure to uncertainty between domestic and foreign investors. This asymmetry explains the international patterns of capital flows. Banks retrench toward markets about which they have more information. Hale [2012], De Haas and Van Horen [2013] provide empirical proofs of this asymmetric response to shocks. In particular, Hale [2012] shows that crisis changes the structure of international banking system in addition to the volume of banking flows. Following a financial crisis, banks reduce credit less to markets that were geographically close. De Haas and Van Horen [2013] concludes that it is easier to overcome information asymmetry when banks are close to their borrowers. Although these papers use micro data, they do not consider trade flows in their analysis. This paper contributes to this paper by considering the complementarity between bilateral trade and cross-border loans during a crisis.

Focusing on financial market measures of stress, Dhim and Shin [2021], Wang [2018] show that stress in the receiving country explains financial retrenchment and confirm the asymmetry response to uncertainty. However, stress measures based on receiving country financial market are polluted by the perception of domestic investors. In this paper, the measure of uncertainty comes from Hassan et al. [2021] and only concerns the perception of international investors. Because this paper focuses on informational frictions that an international investor faces in a given market, this paper captures more accurately the perception of uncertainty and risk from an international point of view.

3 Data

This paper uses four different data sources to construct a comprehensive database that covers all bank-destination dimension.

The Banque de France provides the dependent variable called cross-border loans at the bank-destination level for each quarter. The data provide granular information on the counterparty of the loans, such as the nationality of the counterparty or the sector to which the counterparty is attached (financial or non-financial).

To construct the specialization index Spe, the paper uses domestic loans at the bank-firm level from the Banque de France credit register available since 2006 and destination exports of firms from French customs. For each firm, exports details at the NC8 level are aggregated at the destination level.

Bilateral trade flows data are from the gravity data base computed by the CEPII. Finally, the paper uses data on destination crisis from Hassan et al. [2021]. The local crisis variable is based on textual analysis of earnings conference calls held by publicly traded companies around the world. It reflects the perception of global investors and executives of the level of risk, uncertainty, and concern in a country. In particular, a local crisis is a peak in the relevant time series that is greater than two standard deviations above the sample mean. In other words, it captures the potential increase in information asymmetry and information friction associated to a crisis.

A continuity requirement of a minimum of two consecutive years of observation is implemented at the bank level. The entire database is on an annual basis from 2006 to 2019. It covers 271 banks and 163 countries, excluding European countries. However, information on counterparty nationality is only available since 2014 and information on

local crises involves a sub-sample of 43 countries.

{ *Insert Table 1 here* }

Table 1 provides summary statistics on the variable of interest for the period 2006-2019 while Figure 1 maps bilateral trade, cross-border loans and specialization in 2019. Looking at the different destinations for bilateral trade and cross-border lending, it is clear that the top destinations for bilateral trade are also the top destinations for cross-border lending. For example, the United States, Switzerland, Hong Kong, and Japan are all in the top five destinations in both rankings.

{ *Insert Figure 1 here* }

However, some countries - including Russia and Turkey - are important bilateral trade destinations, but do not appear in the top 10 cross-border lending destinations. Both destinations are also characterized by three years of local crisis according to Hassan et al. [2021]. Interestingly, the specialization of banks follows the mapping of bilateral trade, suggesting that banks have access to information from domestic exporters.

4 Aggregated complementarity of trade and cross-border banking

4.1 Bilateral trade and information frictions

In a theoretical point of view, the complementarity of asset holdings and trade in goods can be explained through three different channels, knowing as the consumption hedging story, the sovereign risk story and the information friction story. This paper focuses on the latter, however, this sections provides insights on the first two channels as well.

The consumption hedging story was introduced in Obstfeld and Rogoff [2000] which focuses on trade cost. Trade tariffs discourage investors from repatriating their dividends. As a result, investment flows more readily to destinations where there are no tariffs, thus explaining the home bias in asset portfolios and the complementarity between bilateral trade and cross-border investment.

The second channel is The sovereign risk story introduced by Rose and Spiegel [2004]. In this case, trade is seen as a possible means of pressure in the event of a default on financial assets such as sovereign bonds. This collateralization through trade makes trade and sovereign bond positions complementary. However, this assumption is more suited to macroeconomic reasoning and focuses on a single asset type (i.e. sovereign bond). At the bank level, it is unlikely that a single institution would have this bargaining power over a country.

The information friction story, that is at the center of this paper, as been introduced in Portes et al. [2001], Portes and Rey [2005]. International investments do not have a transportation cost, but they do involve an information cost. This cost arises from an asymmetry of information between the investor and the counterparty of the investment. In order to identify the risk underlying the investment, banks must screen the investment. The rarer the investment or the more distant it is from the domestic portfolio, the greater the information asymmetry and the more costly the transmission of information will be. The link with trade is introduced in Aviat and Coeurdacier [2007]. Because trade implies information transmission between the home country and the destination country, investors will benefit from this bilateral trade which reduces the information asymmetry. In this case, bilateral trade and asset holding are complementary.

Hypothesis 1 *Trade and cross-border banking are complementary.*

Figure 1 maps bilateral trade, cross-border loans and specialization in 2019. Look-

ing at the different destinations for bilateral trade (a) and cross-border lending (b), it is clear that the top destinations for bilateral trade are also the top destinations for cross-border lending. For example, the United States, Switzerland, Hong Kong, and Japan are all in the top five destinations in both rankings. This correlation seems less strong for some geographic areas including west and north Africa.

The paper first tests whether bilateral trade and cross-border loans are complementary at the aggregated level. Following a gravity equation, specification 1 links the French cross-border banking loans to destination j at time t with the bilateral trade between the home country (i.e. France) and the destination j at time t.

$$ln(x_{j,t}) = \alpha + \beta_1 \, ln(Trade_{j,t}) + \delta_t + \gamma_j + u_{j,t} \tag{1}$$

where x is total cross-border lending at the country level and $Trade$ is total bilateral trade flows at the country pair level. The paper uses a pseudo-fixed effects model with time fixed effects (δ_t) to control for any other determinants that may impact total cross-border lending at time t, and destination fixed effects (γ_j) to control for any time-invariant determinants linking the home country to the destination country.[2] According to hypothesis 1, the coefficient of trade β_1 should be positive.

Table 2 summaries results from specification 1. Column 1 focuses on the relationship between bilateral trade and aggregate cross-border loans to the total sector. The coefficient of trade is positive and significant confirming the complementarity between bilateral trade and cross-border banking at the aggregate level.

[2]As robustness tests, empirical exercises were carried out with a time-varying destination control, such as GDP. The results are robust and available on request. However, due to the risk of collinearity, the paper's analysis does not include destination GDP as a control variable. Other variables are under study.

4.2 The sector and the nationality of the counterparty: new information frictions

The complementarity of assets holding and trade in goods may depend on assets as informational costs differ for different types of assets (see Portes et al. [2001], Daude and Fratzscher [2008]). Although this paper focuses on cross-border lending, it also involves heterogeneous assets within this category, such as loans with counterparties in different sectors or of different nationalities. For a given geographic location, an asset whose counterparty has the same nationality as the investor may have lower information costs than an asset whose counterparty has a different nationality. Having the same nationality may mean that the investor has more information about the counterparty or that the investor and the counterparty have other commonalities that would reduce information costs (language, customs, paperwork, etc.).

Hypothesis 2 *The complementarity of assets holding and trade depends on the nationality (sector) of the counterparty as a different nationality (sector) increases information friction.*

Columns 2 and 3 of table 2 detail two sub-samples based on the sector of the counterparty, i.e the non financial sector (column 2) and the financial sector (column 3). The coefficient of trade is positive and significant when the counterparty is in the non-financial sector while it is insignificant for the financial sector. The complementarity of bilateral trade and cross-border loans is conditional to the sector of the counterparty and confirmed for the non-financial sector. One natural explanation for this result is that bilateral trade provides information primarily on the real sector, as services are not included in the data.

Finally, table 2 shows the results when the counterparty is either French (column 4) or foreign (column 5). The coefficient of trade is positive and significant only when

the counterparty is French, validating the complementarity of bilateral trade and cross-border loans to this specific population. This suggests that bilateral trade reduces information friction at the aggregate level when the counterparty is French. On the contrary, the same coefficient is insignificant when the counterparty is of a different nationality. A different nationality can amplify the information asymmetry to such an extent that information from commercial relations is no longer sufficient to ensure complementarity.

4.3 Exploring local crisis

The literature on the complementarity of trade and asset holding does not focus on periods of crisis. For example, bilateral trade allows investors and banks to acquire general information about the administrative, fiscal, and legislative systems, customs, and so on. This process of assimilating information is a slow one, but the elements are quite predictable. On the contrary, the occurrence of a crisis goes hands in hands with a surge in uncertainty about the system established so far. For example, a financial crisis may lead to exceptional and temporary measures introduced by governments, central banks and regulatory authorities. These will change the administrative, fiscal, legislative and banking system and question the information acquired through international trade until now. Likewise, a political crisis can call into question the very existence of a country's institutions. In other words, the crisis can act as a reset button on the knowledge accumulated through bilateral trade.

Hypothesis 3 *The complementarity between bilateral trade and cross-border lending is called into question during a crisis, because the crisis resets the information accumulated until then. Trade is no longer able to reduce the particularly high informational frictions during a crisis.*

This paper explores specific periods of crisis and the asymmetric exposure to uncertainty between domestic and foreign investors explained in De Haas and Van Horen

[2013]. The local crisis variable is based on the risk perception of worldwide investors and executives. It captures the potential increase in information asymmetry and information friction associated to a crisis. As the crisis resets the information accumulated until then, bilateral trade and cross-border lending may not be complementary in such an episode.

Table 3 details results as function of the global risk perception of the destination of bilateral trade and cross-border loans. The trade coefficient is positive and significant when the destination is not facing a local crisis.[3] In such an environment, information asymmetries are corrected by long-term trade relationships, making bilateral trade and cross-border lending complementary. However, when destinations face a local crisis, the trade coefficient becomes insignificant. Because a crisis implies uncertainty with an increase in information frictions, bilateral trade loses its informational power, which removes the complementarity of bilateral trade and cross-border lending.

This paper provides an initial analysis of the complementarity of bilateral trade and cross-border lending at the aggregate level. Complementarity is confirmed from a general point of view. However, this first exercise indicates that several sources of information friction may condition complementarity, including the nature of the counterparty or the state the recipient country.

[3]The results of 3 must be taken with caution, as the number of observations is very limited in the aggregate analysis. The granular analysis developed in the next section improves the quality of estimates and results.

5 A granular approach of bilateral trade and cross-border banking

This section provides new evidence of the complementarity of bilateral trade and cross-border lending at a micro level, as a function of bank specialization, the sector and nationality of the loan counterparty, and the state of the destination country.

5.1 Banking specialization and information friction

In addition to this public information received from trade, banks have a direct access to specific information on each destination thanks to their domestic clients such as national exporters. Therefore, the complementarity between bilateral trade and the cross-border assets of banks should be conditioned by this individual access to information. This access is defined through the geographical specialization of banks in the domestic credit market.

Hypothesis 4 *The complementarity of asset holding and trading depends positively on banking specialization because it further reduces the information frictions enabled by trading.*

The empirical analysis to test this hypothesis at the bank level consists of two parts. In the first part, the paper tests whether bilateral trade and cross-border loans are complementary at the bank level. Following a gravity equation, specification 2 links the cross-border loans of bank b to destination j at time t with the bilateral trade between the home country and the destination j at time t.

$$ln(x_{b,j,t}) = \alpha + \beta_1 \, ln(Trade_{j,t}) + \delta_{b,t} + \gamma_{b,j} + u_{b,j,t} \tag{2}$$

where x is total cross-border lending at the bank level and $Trade$ is total bilateral trade flows at the country pair level. The paper uses a pseudo-fixed effects model with bank-

time fixed effects ($\delta_{b,t}$) to control for any other determinants that may impact banks' cross-border lending at time t, and bank-destination fixed effects ($\gamma_{b,j}$) to control for any time-invariant determinants linking the bank to the destination country.[4] According to hypothesis 1, the coefficient of trade β_1 should be positive.

The second part of the empirical analysis introduces bank geographical specialization *Spe* to condition the complementarity of trade and cross-border loans. Therefore, specification 3 implies an interaction term between bilateral trade and bank specialization.

$$ln(x_{b,j,t}) = \alpha + \beta_1\ ln(Trade_{j,t}) + \beta_2\ ln(Trade_{j,t})\,\mathrm{x}\,Spe_{b,j} + \delta_{b,t} + \gamma_{b,j} + u_{b,j,t} \qquad (3)$$

where $Spe_{b,j}$ is the average geographic specialization of bank b with respect to destination j.[5] This paper focuses on the average geographic specification to limit the risk of endogeneity between cross-border lending and the geographic specialization from the national lending market. More precisely, the definition of the specialization index follows the methodology of Paravisini et al. [2021] used in Berthou et al. [2021], such that:

$$Spe_{b,j,t} = \frac{\sum_i L_{i,b,t} X_{i,j,t}}{\sum_{j'} \sum_i L_{i,b,t} X_{i,j,t}} \qquad (4)$$

where $L_{i,b,t}$ is the amount of loans between the lending bank b and the exporters i at time t and $X_{i,j,t}$ is the value of exports from firm i to destination j at time t.

Columns 1 and 2 of the table 4 show the results of specifications 2 and 3, respectively. The coefficient of trade in column 1 if positive and highly significant, confirming that

[4] It also controls for other time invariant determinant at the country level that are common to all banks like distance, time difference, language, etc.

[5] Bank-destination fixed effects control for all time-invariant bank-destination characteristics, including therefore the independent effect of geographic specialization.

bilateral trade and cross-border loans are complementary at the micro level. It suggests that bilateral trade helps reduce information frictions for a given destination country and facilitates cross-border lending at the banking level.

Column 2 tests hypothesis 4, introducing bank specialization as an interaction term with bilateral trade. Both the coefficient of trade and of the interaction term are positive and highly significant. It suggests that all banks benefit from information from bilateral trade, but that specialized banks have privileged access to it, which gives them a comparative advantage on information costs.

{ *Insert Table 4 here* }

5.2 Specialization: a comparative advantage for information asymmetry

As confirmed at the aggregate level, the complementarity of assets holding and trade in goods depends on assets as informational costs differ for different types of assets. On the one hand, having the same nationality may mean that the investor has more information about the counterparty or that the investor and the counterparty have other commonalities. On the other hand, a different nationality would increase information friction and make the specialization of the bank a major incentive to invest. Because of their specialization, banks acquire more specific information about each destination and nationality (i.e. information about the administrative and legislative system, customs, language, etc.). In this vein, the industry of the counterparty also defines the information asymmetry. Bilateral trade provides initial access to information on the non-financial sector in each destination; it reduces the information asymmetry for all banks at the aggregate level. However, specialization implies a comparative advantage - for each bank - in accessing this information. Thus, specialization should enhance the complementarity of cross-border trade and lending to the non-financial sector.

Hypothesis 5 *Bank specialization reduces information frictions, especially when the nationality (sector) of the asset counterparty is not the same as that of the bank. In this case, the comparative advantage of specialization is more decisive for the counterparty with a different nationality (sector) than for the domestic counterparty.*

Columns 3 through 6 of table 4 detail the results when the counterparty sector is identified. Columns 3 and 5 focus on the relationship between bilateral trade and cross-border lending for the non-financial and financial sectors, respectively. The coefficients on trade are positive and significant in both cases. However, the coefficient is less positive and significant for the financial counterparty than for the non-financial counterparty. A natural explanation for this result is that bilateral trade provides information primarily on the real sector, as services are not included in the data. However, domestic exporters may have links to banks in the destination country, which would explain the informational power of bilateral trade for cross-border financial lending at the bank level.

Bank specialization for financial and non-financial cross-border lending is introduced in columns 4 and 6, respectively. The coefficient on the interaction between bilateral trade and specialization is positive and highly significant for non-financial cross-border loans only. This indicates that specialization provides a comparative advantage in terms of access to trade information only when the counterparty to the cross-border loan is from a sector other than the bank. When the counterparty is financial, specialization does not provide additional information.

{ *Insert Table 5 here* }

The table 5 details the results when the nationality of the counterparty is specified. Columns 1 and 2 focus on the French counterpart. Whether specialization is included

(column 1) or not as an interaction term (column 2), the coefficient on bilateral trade is positive and significant, confirming the complementarity of bilateral trade and cross-border lending. This suggests that bilateral trade reduces information friction at the aggregate level when the counterparty is French. On the contrary, the same coefficient is insignificant when the counterparty is of a different nationality, as is the case in columns 3 and 4. This indicates that trade loses its aggregate informative power in this case. Regarding the interaction of bilateral trade and bank specialization, the coefficient is positive and significant the counterparty is of a different nationality, only. This indicates that specialization still provides some comparative advantage in this case. For the French counterpart, this could indicate that aggregate bilateral trade information is sufficient to reduce informational friction.

5.3 Specialization as a back-up for complementarity in times of crisis

Following previous results, crisis can act as a reset button on the knowledge accumulated through bilateral trade at the aggregate level. However, banks that have a direct access to information through their domestic network of exporters may be less sensitive to global information friction. In this case, specialization will be a back-up for complementarity in times of crisis.

Hypothesis 6 *Specialization provides a comparative advantage in terms of access to information, making specialization as a point of resistance for complementarity in times of crisis.*

The table 6 details the results according to whether the destination countries are experiencing a crisis or not. The coefficient on trade is positive and significant when destination countries do not face a crisis,either for total sector or the non-financial sector. This confirms that bilateral trade provides aggregate information that is available for all banks, reducing the friction of information at the bank level. However, this same

coefficient becomes insignificant when destination countries face a crisis. This suggests that the increase in information friction during a crisis is such that bilateral trade becomes uninformative at the aggregate level. The coefficient of the interaction between bilateral trade and cross-border loans is positive and significant for all sub-samples. It indicates that the specialization always offers a comparative advantage in the access of granular information.

6 Conclusion

Using a unique data base, this paper confirms that the complementarity of bilateral trade and cross-border lending is present at both an aggregate and a micro level. In both cases, several sources of information friction may condition complementarity, including the nature of the counterparty or the state of the recipient country.

Focusing on granular data, it indicates that bank specialization is a key determinant of the complementarity of bilateral trade and cross-border banking, as it further reduces the information frictions enabled by trading. This approach makes it possible to identify complementarity more precisely. While complementarity does not seem to be verified at the aggregate level when counterparties do not share the same nationality, or in times of crisis, the situation is quite different when banks' domestic relationships with national exporters are taken into account. Specialization - with the privileged access to information it implies - reduces information frictions and introduces complementarity between trade and cross-border banking at the granular level.

Finally and in an environment of growing commercial uncertainty where political interventionism can lead to further fragmentation, the study of the complementarity between trade and cross-border banking is of the utmost importance. If trade relations are to be reshaped, the study of complementarity will provide institutions to understand

the underlying changes in the global financial architecture.

References

A. Aviat and N. Coeurdacier. The geography of trade in goods and asset holdings. *Journal of International Economics*, 71:22–51, 2007.

A. Berthou, T. Mayer, and J.S. Mesonnier. Good connections : bank specialization and the tariff elasticity of exports. *CEPR Discussion Paper*, 2021.

M. Brei and G. von Peter. The distance effect in banking and trade. *Journal of International Money and Finance*, 81:116–137, 2018.

R. Caballero and A. Simsek. A model of fickle capital flows and retrenchment. *Journal of Political Economy*, 128:2288–2328, 2020.

N. Coeurdacier and H. Rey. Home bias in open economy financial macroeconomics. *Journal of Economic Literature*, 51:63–115, 2012.

C. Daude and M. Fratzscher. The pecking order of cross-border investment. *Journal of International Economics*, 74:94–119, 2008.

R. De Haas and N. Van Horen. Running for the exit? international bank lending during a financial crisis. *Review of Financial Studies*, 26:244–285, 2013.

I. Dhim and H. S. Shin. Financial distress in lender countries and capital outflows from emerging market economies. *Journal of International Money and Finance*, 113, 2021.

F. Gourio, M. Siemer, and A. Verdelhan. Uncertainty and international capital flows. *Federal Reserve Bank of Chicago, MIT working paper*, 2015.

H. G. Grubel. Internationally diversified portfolios: welfare gains and capital flows. *American Economic Review*, 58:1299–1314, 1968.

G. Hale. Bank relationships, business cycles, and financial crises. *Journal of International Economics*, 88:312–325, 2012.

T.A. Hassan, J. Schreger, M. Schwedeler, and A. Tahoun. Sources and transmission of country risk. *NBER Working Paper*, 2021.

J. Imbs. Co-fluctuations. *CEPR Discussion Paper*, 2267, 1999.

P. Lane and G.M. Milesi-Ferretti. International investment patterns. *The Review of Economics and Statistics*, 90:538–549, 2008.

D. Lessard. International portfolio diversification: a multivariate analysis for a group of latin american countries. *The Journal of Finance*, 28:619–633, 1973.

H. Levy and M. Sarnat. International diversification of investment portfolios. *American Economic Review*, 60:668–675, 1970.

H. Markowitz. Portfolio selection. *Journal of Finance*, 6:77–91, 1952.

O. Obstfeld and K. Rogoff. The six major puzzles in international macroeconomics: is there a common cause? *NBER Macroeconomics Annual*, 2000.

D. Paravisini, V. Rappoport, and P. Schnabl. pecialization in bank lending: Evidence from exporting firms. *Journal of Finance (forthcoming)*, 2021.

R. Portes and H. Rey. The determinants of cross-border equity flows. *Journal of International Economics*, 65:269–296, 2005.

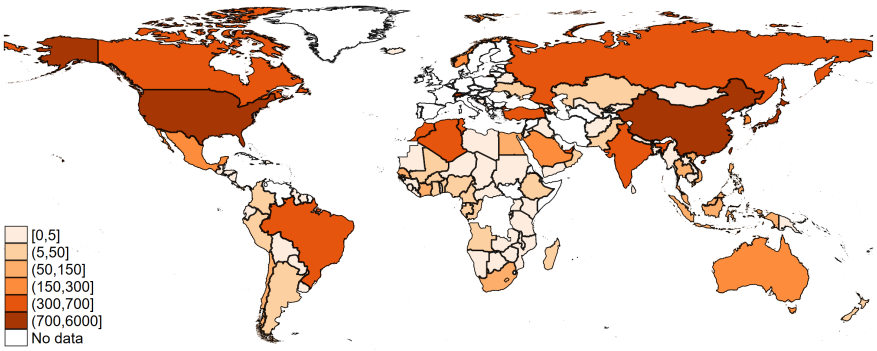
R. Portes, H. Rey, and O. Yonghyup. Information and capital flows: the determinants of transactions in financial assets. *European Economic Review*, 45:783–796, 2001.

A. Rose and M.M. Spiegel. A gravity model of sovereign lending: trade, default and credit. *IMF Staff Paper*, 51:50–63, 2004.

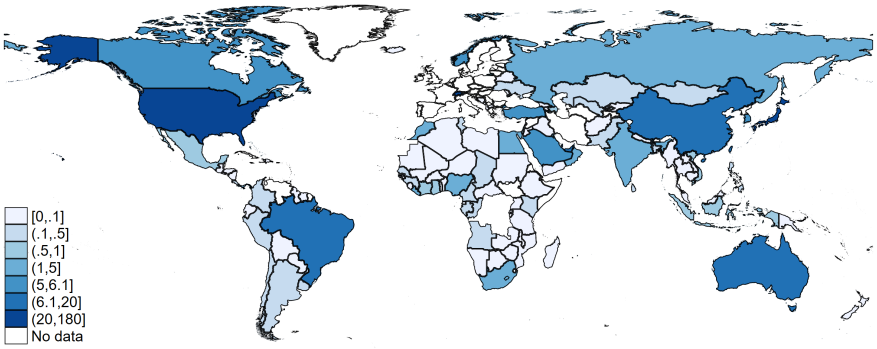
C. Tille and E. van Wincoop. International capital flows under dispersed private information. *Journal of International Economics*, 93:31–49, 2014.

Y. Wang. Fickle capital flows and retrenchment: evidence from bilateral banking data. *Journal of International Money and Finance*, 87:1–21, 2018.

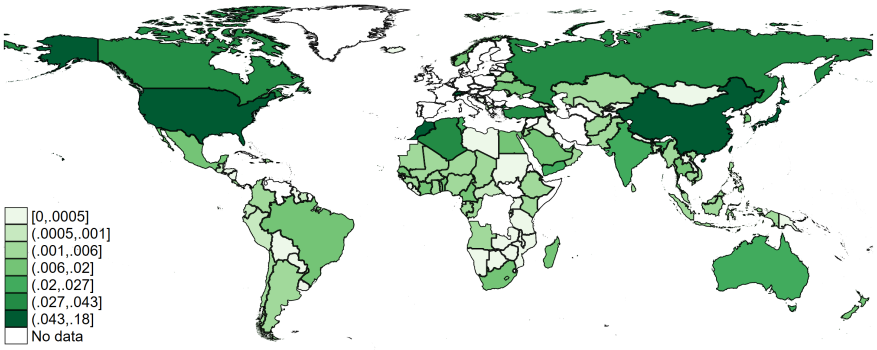
Figure 1: Heatmaps from French international trade and banking, 2019.



(a) International trade



(b) Cross-border loans



(c) Banking specialization

French exports and cross-border loans are expressed in EUR bn and USD bn, respectively. Sources: Banque of France, CEPII and French Customs.

Table 1: Summary statistics

Variable	mean	Std. Dev.	p25	p75	N
ln(Cross-border loans)	5.2188	3.0487	3.1355	6.8123	65651
ln(Trade flow)	13.965	1.8002	12.826	15.309	65651
Specialization	0.0219	0.055	0.00074	0.01703	65651
ln(Cross-border loans)					
Non-financial	5.0963	2.9082	3.091	6.6946	63151
Financial	5.9374	4.0993	2.5649	8.8589	11550

Table 2: Aggregagetd cross-border loans and international trade: a measure of complementarity

Dependent variable : Cross-border loans

	Total sector	N-Financial sector	Financial sector	French counterparty	Foreign counterparty
	(1)	(2)	(3)	(4)	(5)
Trade flow	12.600***	13.946***	1.859	3.571***	1.061
	[0.000]	[0.000]	[0.362]	[0.007]	[0.335]
Const.	40.458	12.313	28.603	104.928***	103.335***
	[0.293]	[0.762]	[0.289]	[0.000]	[0.000]
Observations	1675	1672	1290	835	1132
Year FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Adj. Between R2	0.96	0.95	0.90	0.99	0.99

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Standard errors are clustered at the country level.

Table 3: Aggregate complementarity in times of local crisis

Dependent variable : Cross-border loans

	No local crisis		Local crisis	
	Total sector	N-Financial sector	Total sector	N-Financial sector
	(1)	(2)	(3)	(4)
Trade flow	50.200***	45.469***	3.921	20.772
	[0.001]	[0.008]	[0.815]	[0.355]
Const.	-378.554*	-337.341	458.857	160.160
	[0.066]	[0.152]	[0.106]	[0.640]
Observations	527	531	24	24
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Adj. Between R2	0.96	0.94	0.99	0.99

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Standard errors are clustered at the country level.

Table 4: Cross-border loans and international trade: introducing banking specialization

Dependent variable : Cross-border loans

	Total sector		N-Financial sector		Financial sector	
	(1)	(2)	(3)	(4)	(5)	(6)
Trade flow	0.163***	0.137***	0.199***	0.171***	0.126*	0.127*
	[0.000]	[0.001]	[0.000]	[0.000]	[0.060]	[0.051]
Trade flow x Specialisation		4.239***		4.390***		-0.1
		[0.000]		[0.000]		[0.912]
Const.	2.976***	1.906***	2.363***	1.282**	4.122***	4.161***
	[0.000]	[0.003]	[0.000]	[0.038]	[0.000]	[0.000]
Observations	64096	64096	61653	61653	11063	11063
Bank x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank x Destination FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. Between R2	0.83	0.83	0.82	0.82	0.83	0.83

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Standard errors are clustered at the bank level.

Table 5: Specializaton channel and nationality of the counterparty

Dependent variable : Cross-border loans

	French counterparty		Foreign counterparty	
	(1)	(2)	(5)	(6)
Trade flow	0.067***	0.064**	-0.069	-0.092
	[0.009]	[0.016]	[0.246]	[0.113]
Trade flow x Specialisation		0.77		3.280**
		[0.478]		[0.042]
Const.	4.527***	4.386***	6.287***	5.234***
	[0.000]	[0.000]	[0.000]	[0.000]
Observations	36077	36077	25573	25573
Bank x Year FE	Yes	Yes	Yes	Yes
Bank x Destination FE	Yes	Yes	Yes	Yes
Adj. Between R2	0.88	0.88	0.83	0.83

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Standard errors are clustered at the bank level.

Table 6: Specialization channel and local crisis

Dependent variable : Cross-border loans

	No local crisis				Local Crisis			
	Total sector		N-Financial sector		Total sector		N-Financial sector	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Trade flow	0.296***	0.262***	0.325***	0.293***	0.069	-0.152	-0.014	-0.257
	[0.000]	[0.000]	[0.000]	[0.000]	[0.775]	[0.615]	[0.954]	[0.399]
Trade flow x Specialisation		3.015**		2.840**		6.053*		6.632**
		[0.012]		[0.012]		[0.060]		[0.044]
Const.	1.279	0.3	0.72	-0.182	5.076	4.265	6.189	5.283
	[0.171]	[0.770]	[0.427]	[0.854]	[0.179]	[0.231]	[0.104]	[0.140]
Observations	30434	30434	28829	28829	1399	1399	1352	1352
Bank x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank x Destination FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. Between R2	0.85	0.85	0.84	0.84	0.87	0.87	0.84	0.84

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Standard errors are clustered at the bank level.