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US Monetary Policy Spillovers to Emerging Markets: the Trade Credit Channel

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ABSTRACT

We analyze the effects of exogenous US monetary policy shocks on trade credit towards emerging markets, using a proprietary database on trade credit amounts. We show that a US monetary tightening leads to an increase in foreign-supplied trade credit in Mexico. Thanks to the granularity of our database, we are able to identify a stronger effect for trade credit in USD and trade credit to sectors with low export orientation. This effect is even larger for low-quality buyers, subject to larger financial constraints. In this latter case, distinguishing between the intensive and extensive margins, we show that the use of trade credit as a substitute only holds in a context of pre-existing relationships. This emphasizes the substitution role of trade credit when global financial conditions tighten due to US monetary policy shocks.

Keywords: US Monetary Policy, Spillovers, Capital Flows, Emerging Market, Trade Credit

JEL classification: E52, F14, F40, F44, L14

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NON-TECHNICAL SUMMARY

In the aftermath of the Covid-19 crisis, we have entered in a new monetary policy phase, with most of the major central banks increasing their policy rate. In this context, the question of spillovers from monetary shocks is back to the forefront. Emerging economies have been historically sensitive to changes in Fed's monetary policy because of their trade and financial links with the US. In this paper, we take a new perspective on this question, studying a financing tool at the crossing between trade and finance, namely trade credit. Trade credit takes the form of a credit made by the supplier to its client by paying for the production of the good and allowing the buyer to pay with some delay after delivery. Using an original proprietary database, we study the effect of US monetary policy shocks on those inter-firm credits, provided by foreign suppliers to buyers in Mexico. We take advantage of granular data to disentangle between the channels of impact. We highlight how trade credit can substitute to other financing tools and act as a partial financial buffer against the negative impact of US monetary policy tightening in emerging economies.

Looking at the relationship between trade credit and other sources of firms' financing (mainly bank credit), the literature has not reached consensus on the complementarity or the substitutability of the financing sources. Nilsen (2002), Minetti et al. (2019) and more recently Hardy et al. (2022) highlight how firms substitute bank credit with trade credit when the former becomes scarce. However, Love and Zaidi (2010) and Garcia-Appendini and Montoriol-Garriga (2020) show that, in times of crisis, trade credit is likely to dry out as suppliers become more financially constrained. In this paper, we contribute to this debate studying the specific reaction of trade credit in times of tighter global conditions triggered by shocks in US monetary policies.

To do this, we conduct a panel data analysis on trade credit amounts at the firm level, from July 2010 to June 2019. We use an original proprietary database from one of the top three trade credit insurers worldwide, named Coface. It records firm-to-firm insured trade credit from foreign suppliers to buyers in Mexico, on a monthly basis. We control for a trade effect to focus on the financial dimension of trade credit, while accounting for an insurance effect. We avoid potential endogeneity bias by studying the effect of unexpected changes in US monetary policy shocks, following Gürkaynak et al. (2005) and Jarocinski and Karadi (2020).

We find a positive and significant impact of an unexpected US monetary policy tightening on the amount of insured trade credit provided by foreign suppliers to buyers in Mexico. We identify a stronger impact for trade credit in US dollars and for trade credit towards sectors with low export orientation. We investigate further this financing role of trade credit and find a positive effect for low credit quality buyers, attesting that more financially constrained firms tend to request additional trade credit to face adverse shocks. When separating across intensive and extensive margins, we find that this positive effect for low credit quality buyers only holds at the intensive margin, namely for pre-existing relationships, a necessary condition for suppliers to accept providing more trade credit to their constrained buyers. Finally, we test for the effects using ECB monetary policy shocks and do not find a similar pattern of results.

Figure 1. The Impact of US MP shocks on Trade Credit depending on Buyer's Credit Quality

	Log of Trade Credit
MP Surprise - 3-month lag	0.009***
	(0.003)
High buyer's quality	0.154***
	(0.020)
Medium buyer's quality	0.106***
	(0.016)
Mexican Policy Rate - Lag	0.003
	(0.005)
Mexican Sector Imports (log) - Lag	0.022***
	(0.006)
MP Surprise - 3-month lag * high buyer's quality	−0.008***
	(0.003)
MP Surprise - 3-month lag * medium buyer's quality	−0.005**
	(0.003)
Fixed effects supplier-buyer	Yes
Fixed effects supplier-time	Yes
Buyer country controls	Yes
Global controls	Yes
Supplier country controls	Yes
SE clustered at	Buyer sector level
N	441,753
Adjusted R^2	0.949
Residual Std. Error	0.319
Notes:	***Significant at the 1 percent level. **Significant at the 5 percent level. *Significant at the 10 percent level.

Note: A one standard deviation shock in US monetary policy results in an increase equal to 0.1% of the average insured trade credit provided to good buyers, 0.3% for medium buyers, compared with an increase equal to 0.9% of the average amount provided to bad buyers.

Les effets de débordement des politiques monétaires US sur les économies émergentes : le canal du crédit commercial

RÉSUMÉ

Nous analysons les effets de chocs exogènes de la politique monétaire américaine sur le crédit commercial vers les marchés émergents, en utilisant une base de données non publiques sur les montants du crédit commercial. Nous montrons qu'un resserrement monétaire américain entraîne une augmentation des crédits commerciaux fournis par des fournisseurs étrangers au Mexique. Grâce à la granularité de notre base de données, nous pouvons identifier un effet plus important pour les crédits commerciaux libellés en dollars et dirigés vers des secteurs peu orientés vers les exports. Cet effet est encore plus important pour les acheteurs de faible qualité, soumis à des contraintes financières plus importantes. Dans ce dernier cas, en distinguant les marges intensive et extensive, nous montrons que l'utilisation du crédit commercial comme substitut n'est possible que dans le contexte de relations déjà existantes. Cela souligne le rôle de substitution du crédit commercial lorsque les conditions financières mondiales se resserrent suite à un choc de politique monétaire aux États-Unis.

Mots-clés : politiques monétaires US ; effets de débordement ; flux de capitaux ; marché émergent ; crédit commercial

1 Introduction

At a time of ongoing tightening in US monetary policy (MP), the question of spillovers to foreign economies is once again back to the forefront. Emerging markets are primarily concerned by these spillovers, with tightening in US MP historically leading to abrupt capital flow reversals in those countries. Besides financial flows movements, in these emerging economies, trade dependence toward the US has also been identified as a key spillover channel. At the intersection of these two types of flows, financial and real, lies trade credit, a specific trade financing tool, sparsely studied due to data gaps. In this paper, we study the effect of US MP shocks on those inter-firm credits, provided by foreign suppliers to emerging buyers. We take advantage of granular data to disentangle between different channels of impact, that we can not distinguish in the aggregate. We highlight how, in case of pre-existing relationships, trade credit can act as a partial financial buffer against the negative impact of US MP tightening in emerging economies.

Trade credit takes the form of a credit made by the supplier to its client or buyer by paying for the production of the good, delivering it and allowing the buyer to pay with some delay. This type of inter-firm financing is a key component of global value chains (GVC), 'gluing' together buyers' and suppliers' balance sheets as Kalemli-Ozcan et al. (2014) describe. Because of a greater comparative advantage of suppliers over banks to provide credits when financial information are scarce, suppliers' trade credit is widely used in emerging economies where financial markets are less developed as highlighted in Demirguc-Kunt and Maksimobic (2001). The literature has shown that trade credit is counter-cyclical, used by firms as substitute when other sources of financing dry out (banking loans mostly, see Nilsen (2002)). However, Love et al. (2007) and Garcia-Appendini and Montoriol-Garriga (2013) show that in cases of large crisis affecting suppliers, the latter will not be able to play this role of liquidity providers. In these specific conditions, trade credit can also be affected by the economic downturn, drying up as other financing sources do, as a complement rather than a substitute. Changes in the US monetary policy represent a global shock to emerging markets, through movements in capital flows and lower external demand. Therefore, in this paper, we study the impact of US monetary policy changes on trade credit provided to emerging markets. We want to know whether it complements other transmission channels and deepens the crisis or whether it can act as a buffer and attenuate the shock.

The literature has highlighted how both trade (demand and exchange rate) and financial channels coexist as transmission channels of US monetary shocks (Degasperi et al. (2020)). By nature, trade credit covers both. In this paper, while we control for a trade effect, we focus on the financial dimension, in order to contribute to the above-mentioned debate on the complementary or substituability of trade credit. From this financial perspective, several mechanisms could frame a reaction of trade credit towards emerging buyers to US MP changes. On the buyers' side in emerging markets, capital outflows that follow Fed's tightening, usually translate into more constraints to access bank financing. This is even more the case when domestic central banks react by increasing their own policy rate to dampen such a capital reversal and avoid large changes in their own currency. Therefore, in order to substitute for the loss of bank financing, emerging buyers could request more trade credit. Then, on the suppliers' side, an unexpected tightening in the Fed's monetary policy will also increase firms' financial constraint

in the US as interest rate on banking loans will increase. This is likely to reduce US suppliers' ability to extend trade credit to their buyers domestically and abroad. A US MP tightening could also influence worldwide financial conditions: as a driver of the Global Financial Cycle, it could lead to a global rise of interest rate, influencing worldwide suppliers' liquidity conditions.

A key contribution of this paper is to use granular data on trade credit to unravel mechanisms at play. We take advantage of available information in the data on the credit quality of the buyer and the currency used to explore the financial channel on the demand side, while controlling for trade effects. We contribute to the literature on US MP spillovers on emerging markets (see section 2.1) by identifying how trade credit can act as a buffer against the adverse consequences of the shock. We also contribute to the trade credit literature (see section 2.2) by studying the impact of a new shock on trade credit and looking into the complement or substitute debate. We show that the use of trade credit as a substitute to other financing sources for most financially-constrained firms is restricted to already-existing trade relationships.

To do this, we conduct a panel data analysis on trade credit amounts at the firm level. We use an original proprietary database from one of the top three trade credit insurers worldwide, named Coface. It records firm-to-firm insured trade credit from foreign suppliers to buyers in Mexico, on a monthly basis, from July 2010 to December 2019. We chose to focus on this emerging market for three reasons. First, it presents a high share of manufacturing[1] and a high degree of trade openness,[2] two key components for GVC participation within which trade credit financing takes place. Thus, the country presents a high trade credit intensity as a source of trade financing. 76% of Mexican firms used trade credit from their suppliers in 2019.[3] Finally, Coface data are also more comprehensive in this country. We use the panel characteristics of our data to estimate the effects of US MP shocks in the country while controlling for unobservables at the supplier-buyer level. We also take advantage of the existence of several buyers per supplier to control for supplier - year fixed effects and better identify demand-driven mechanisms. We control for alternate determinants of trade credit at the country and global levels, such as the country's economic outlook, exchange rates, Coface risk strategy or import flows to account for a potential trade channel. We avoid potential endogeneity bias by studying the effect of unexpected changes in US monetary policy shocks, which are not already priced by the market. To do this, we follow Gürkaynak et al. (2005) and Jarociński and Karadi (2020), and use state-of-the-art high-frequency identification to obtain US monetary policy shocks.
We find a positive and significant impact of a US monetary policy tightening on the amount of trade credit provided by foreign suppliers to buyers in Mexico. This impact is significant despite controlling for a trade effect with Mexico's monthly sectoral imports. This effect is also robust to various empirical specifications as well as to the inclusion of valuation effects and changes in Coface risk strategy. We explore the hetereogenity of the impact based on the currency used and the sector of the buyer. We identify a stronger impact for USD trade credit and

[1] Between 15 and 19% of the total value added to GDP has been generated by the manufacturing sector during the last decade in Mexico. This share is larger than for other emerging economies such as Brazil (around 10%), Chile (10%) or South Africa (13%) (source: World Bank's statistics).

[2] Trade openness before the pandemic (in 2019) reached 78% in Mexico, compared to 28% in Brazil, 57% in Chile or 59% in South Africa (source: World Bank's statistics).

[3] See *Evolución del Financiamiento a las Empresas durante el Trimestre Octubre – Diciembre de 2019*, Banco de Mexico

for trade credit towards sectors with low export orientation. To investigate further a financing channel in the impact, we distinguish across financial qualities of buyers using Coface credit quality. We find a positive effect for low credit quality buyers, i.e. more financially-constrained, compared to good and medium ones. When separating across intensive and extensive margins, we find this positive effect for low credit quality buyers only at the intensive margin. This is in line with an increase in buyers' demand for trade credit within already-existing relationships with higher levels of trust. This highlights how trade credit can be used as a substitute to other sources of funding, but only within existing relationships. Finally, we test for similar patterns using ECB monetary shocks and we do not find such an effect of ECB surprises on trade credit to emerging buyers.
From these results, we see how trade credit can act as partial buffer against the negative financial impact of US monetary policy tightening on emerging economies.

The rest of this article is organized as follows. Section 2 reviews the related literature. Section 3 details the data and the identification strategy to have an exogenous shock. Section 4 describes the empirical specifications used. Section 5 presents the results and section 6 some robustness tests, before concluding in section 7.

2 Literature Review

2.1 US Monetary Policy and Financial Spillovers to Emerging Markets

This paper is at the crossroads of several strands of literature. First, it relates to papers that study the spillover effects of US monetary policies on emerging economies. While papers generally intend to analyse the consequences of US monetary policy shocks on portfolio or banking flows, we contribute to this literature by analysing the response of one largely ignored macroeconomic variable, namely trade credit. Besides, as this literature usually shows that financial conditions tend to tighten in emerging markets after such a tightening in the US, we further ask whether trade credit can act as a substitute to other traditional financing tools and therefore as a partial buffer against contractionary US monetary policy shocks.

2.1.1 US monetary policy and capital flows in emerging markets

Since the seminal paper by Calvo et al. (1993), the notion has emerged that expansionary US monetary policy plays a major role in driving capital flows to emerging market economies (EMEs thereafter). This issue has received renewed interest since the introduction of unconventional monetary policies following the 2007 crisis and the "Taper Tantrum" episode of May 2013. At that time, large and volatile capital flow movements were observed in EMEs after a change of anticipations regarding regarding the Large Scale Asset Purchases in the US. (Mishra et al. (2014), Aizenman et al. (2014), Ahmed et al. (2017), Lim et al. (2014)).[4]

[4]This has fuelled the debate on the determinants of these large reversals of flows, or "Sudden Stop" episodes. Some papers study their deleterious consequences, while others have emphasized on their determinants, looking at the well-known "push" and "pull" factors (see Koepke (2019) for a literature review on the subject. Contrary to these papers, we do not restrict our question on "Sudden Stop" episodes and study the reaction of trade credit following more frequent US monetary policy shocks.

Recent papers generally intend to measure the movements in capital flows that have been triggered by these unconventional US monetary decisions. They broadly conclude that these policies did alter the magnitude of such flows and (or) their composition, especially for flows to (and from) emerging economies (Fratzscher et al. (2018), Koepke (2018), Ahmed and Zlate (2014), Rai and Suchanek (2014), Tillmann (2016), Dahlhaus and Vasishtha (2014), Anaya et al. (2017)). For instance, Fratzscher et al. (2018) focus on the Fed's LSAP announcements and actual balance sheet changes to study the international spillovers of US unconventional policies on both advanced and emerging markets. They show that Fed policies resulted in large rebalancing towards non-US assets; magnifying the pro-cyclicality of flows, especially to EMEs. Most of these studies focus on the impact on portfolio flows, with some of them even restricting their analysis to bond and equity from mutual funds (Fratzscher et al. (2018), Lo Duca (2012), Dahlhaus and Vasishtha (2014), Friedrich and Guérin (2020), Bhattarai et al. (2021)).
We contribute to this literature by focusing instead on the reaction of trade credit, an alternate source of funding for firms.

2.1.2 Transmission of US MP shocks to the financial conditions in EMEs

Some papers focus more precisely on the implications in terms of financial conditions in emerging markets.
A growing literature shows that US MP affect financial conditions in EMEs through cross-border lending of global banks (Rey (2015), Miranda-Agrippino and Rey (2020)). For instance, Bruno and Shin (2015b) and Albrizio et al. (2020) find that a contractionary shock to US monetary policy leads to a decrease in cross-border banking capital flows. Elaborating on this, Avdjiev and Hale (2019) show that the relationship between the federal funds rate and cross-border bank lending is time-varying and depends on whether the main drivers of the policy rate are related to changes in US macroeconomic fundamentals or to changes in the US monetary policy stance. Some other papers use granular data to clearly identify the role of these global banks as spillover channels. For instance, using firm-bank loan data, Morais et al. (2019) find that an expansion in foreign monetary policies increases the supply of credit of foreign banks to Mexican firms, which in turn implies strong real economic effects. Baskaya et al. (2017) examine this role for Turkey and show that higher capital inflows lead to a large decline in real borrowing rates, and to a sizeable expansion in credit supply, mainly through a subset of the local biggest banks. Extending this analysis to bond and equity flows, Anaya et al. (2017) show that part of these US MP shocks are also transmitted through portfolio in addition to banking flows.

Besides, some papers also show how financial conditions in EMEs may be directly affected by US MP shocks through changes in the domestic monetary policy (Calvo and Reinhart (2002), Anaya et al. (2017) or Miranda-Agrippino et al. (2015)). This is in line with the 'fear of floating channel', whereby central banks in emerging markets facing large capital flow movements may try to reduce the interest rate differential with the core country. This is done in order to limit the pass-through effect from exchange rate to inflation (Rey (2016), Montes and Ferreira (2020) or da Silva and Vernengo (2008)).[5] For instance, Anaya et al. (2017) show that

[5]Notice that the literature also points to reasons that can generate a specific fear of appreciation, so that

on average, EMEs tend to react with an easing of their MP stance in response to US MP easing shocks.

Finally, some recent papers study how US MP shocks may transmit to financial conditions in EMEs through their impact on firms' balance sheets. Indeed, an unexpected rise in the US interest rates tends to trigger an appreciation of the dollar (Eichenbaum and Evans (1995)), which may have large financial repercussions because of its dominant currency statute [6]. In particular, it tends to trigger large valuation mismatches in borrowers' balance-sheets (who borrow in dollars but do not have corresponding dollar revenues), increasing the tail risk for creditors and therefore reducing the supply of banking credit (Bruno and Shin (2015a), Arbatli et al. (2022), Aguiar (2005) or Kalemli-Ozcan et al. (2016) among others). For instance, using quarterly firm-level data for 63 advanced, emerging and developing economies over 1996-2016, Arbatli et al. (2022) confirm that US monetary policy shocks have larger effects on investment for firms that have a higher share of debt in foreign currency. [7]

We contribute to this literature by exploring whether trade credit can help alleviating the negative impact of US MP tightening on financial conditions in EMEs, acting as a substitute to other traditional financing tools.

2.2 Trade credit: complement or substitute in the business cycle

Our work is also closely related to the literature on trade credit as a financing tool available to firms as well as a source of linkages across firms. We contribute to the literature that questions the counter-cyclical use of trade credit and their complement or substitute relationship with other financing tools. By looking at the effects of US MP, we broaden the scope of the analysis to other types of shocks and relationships to non-banking financing tools through capital flows.

Some researchers have explored the country determinants of trade credit use. For instance, Fisman and Love (2003) describe a stronger trade credit use in countries with relatively small and less developed financial markets. Demirguc-Kunt and Maksimobic (2001) show that the use of trade credit is higher in countries with less-developed legal system making it a widespread tool for financing in emerging markets. This more intensive use of trade credit financing by firms in emerging markets is confirmed by Hill et al. (2017) who show that in such markets, firms with better access to financial credit use relatively less trade credit. The counter-cyclical nature of trade credit, as described by Nilsen (2002) and Burkart and Ellingsen (2004), has been mainly explored through the relationship between trade credit use and other financing tools, mainly the banking sector. Meltzer (1960) was the first to suggest a substitution effect between trade

exchange rate devaluations would be more tolerable than exchange rate appreciations (Obstfeld and Rogoff (1995), Pontines and Siregar (2012), Aizenman and Sun (2012), Levy-Yeyati et al. (2013)), especially through the potential pressures on the balance of payments.

[6] This *dominant currency statute* may refer to several related facts: especially a large share of invoicing of international trade, bank funding, corporate borrowing or Central Bank reserve holdings. See Gopinath and Stein (2021) for a more exhaustive view on this issue.

[7] Banks themselves may be undermined when they borrow overseas in dollars while advancing credit to domestic firms in the non-tradable sectors (Calvo et al. (2004)). This is particularly the case in emerging economies (Bräuning and Ivashina (2020), Mohanty and Banerjee (2021). See Gopinath and Stein (2018) for a theoretical view of the 2-way feedback between trade invoicing and banking structure.

credit and banking loans, with a redistribution happening through large liquid firms that behave as net suppliers of credits to smaller firms through their better access to bank finance. Fisman and Love (2003) and Danielson and Scott (2004) empirically document the increase in demand for trade credit when bank loans become scarce. Molina and Preve (2012) show that firms demand more trade credit when they are in financial distress to substitute to other sources of financing. Minetti et al. (2019) highlight how firms with restricted access to banking loans tend to participate more to global value chains to benefit from trade credit from their suppliers. Hill et al. (2017) also find that trade credit financing is chosen by firms that have more restricted access to financial credit. Quite close to our analysis, Hardy et al. (2022) study the interplay between bank and trade credit, starting from the Mexican case. They highlight how in Mexico, small and medium-sized firms use trade credit as a substitute to bank credit. They show that trade credit is an economic stabilizer for firms in emerging markets with firms obtaining more trade credit the less bank credit is available and the more debt-constrained they are relative to their partner.
We complement these last papers by showing that more financially constrained buyers will request higher trade credit amounts from their supplier in response to US monetary shocks compared to less-financially constrained one.

From the supplier's side, Cuñat (2007) shows that suppliers have an interest in insuring their customers against liquidity shocks through trade credit provision because of the fixed cost associated to the establishment of a trade relationship. Providing such trade credit terms will ensure the continuity of the relationship. Garcia-Appendini and Montoriol-Garriga (2020) go further and show that, when facing high switching costs, suppliers will continue to extend trade credit to their clients approaching bankruptcies. However, this substitution effect can be mitigated in the context of systemic financial crises. Love and Zaidi (2010) examine the role of trade credit during the financial crises in Thailand, Philippines, Indonesia and Korea in the late 1990s. They find evidence against the premise that trade credit can act as a substitute to bank credit in those particular episodes. During such events, suppliers of financially constrained firms themselves suffer from negative liquidity shock, impeding the insurance mechanism normally in place. Studying a different type of financial shock, Swanson (2019) favors the complement hypothesis with trade credit flowing out of emerging markets affected by a sudden stop episode. We complement these studies by showing how the substitution role of trade credit mostly applies to already existing relationships, rather than for newly created ones.

3 Data

3.1 Trade credit

In this article, we introduce a novel proprietary database on firm-to-firm trade credit from one of the top-three trade credit insurers worldwide, named Coface. Trade credit is a specific financing tool for inter-firm trade in goods or services.

3.1.1 Trade credit as a trade financing tool

Trade involves high capital needs for firms to face the different types of costs. In order to bear such costs, several options are available to firms. They can use bank intermediation with letters of credit, factoring of invoices, or invoice discounting, among others. With letters of credit, the bank guarantees the supplier that the buyer's payment for the purchase will be received on time and for the correct amount. In case the buyer is unable to pay, the bank will cover the due amount. However, these terms involve quite high intermediation costs. A second option are cash-in-advance terms, where the buyer finances the purchase of the good without requesting intermediation. This allows the supplier to be paid prior to the shipment of the good. In this case, the buyer bears the risk in case of damages to the shipment. A third option are open-account terms, also called trade credit. According to Antras and Foley (2015) using the case of a poultry exporter, and in line with numbers by the International Credit Insurance & Surety Association, around 41% of international trade is done under trade credit terms. Under such terms, suppliers pay for the production of the good or service and allow buyers to defer payment until the end of a grace period defined contractually. This grace period can go from 1 month to 2 years, with a median usually around 2 or 3 months (60 net days for Klapper et al. (2012) and 86 days in Chile according to Alfaro et al. (2021)). However, there is strong heterogeneity depending on the sector, with much longer terms for capital goods, as well as on the length of the relationship. Offering such financing terms is very attractive for buyers as opposed to cash-in-advance options for which they have to provide the necessary financing before receiving the product. It also allows to save on fees requested by banks in cases of bank intermediation through letters of credit. The supplier bears some accounting and management fees but the way those trade credit costs are handled is strongly relation-specific. The supplier might transfer part of it to the buyer. Nonetheless, it is likely not to be fully transferred as trade credit is also a way for suppliers to be more competitive (Demir and Javorcik (2018)).

3.1.2 Trade credit insurance

Trade credit involves some risks for suppliers in case the buyer defaults on its credit and fails to repay the supplier. To protect themselves from such a risk, suppliers might request insurance from trade credit insurers such as Coface. Coface will reimburse the supplier of the due amount in case of default from the buyer in exchange of an insurance premium. Around 13% of international trade is covered by trade credit insurance, with a strong heterogeneity across regions. Latin America and the Caribbean is the region with the highest share of imports covered by trade credit insurance with 15.4% in 2020, followed by Europe (14.3%) according to Berne Union. It is important to note that Coface trade credit data do not cover *intra-group* trade. Indeed, trade between a head-quarter and its subsidiary cannot be covered by insurance as the risk is very different than with an external buyer and fraud would be too easy. Therefore, our database cover inter-firm trade credit sales between a supplier and its external buyers with which it trades under trade credit terms.

The data we use correspond to the *monthly maximum amount of insured trade credit sales* from foreign suppliers towards Mexican firms that import from those suppliers. The variable is a stock and the data do not provide information on the exact sale nor on the payment timing nor on the payment due date. A supplier might use each month the full amount of insured trade credit to trade with its buyer, but it can also use only part of it. The use of the coverage is

not recorded in the data and strongly varies between suppliers. Most of its insurance premium is indeed computed as a percentage of the realized sales rather than the amount of insurance obtained. However, the amount of insurance requested will still matter in the negotiation to set the exact percentage of the premium and coverage requests have to be motivated by existing turnover or future sales with the buyer. Importantly, the supplier is required by Coface to declare *all its buyers* under trade credit terms in the market insured (domestic or export) to avoid moral hazard. This means the supplier cannot choose to insure only the worst quality buyers, nor can it ask for more coverage for those buyers as it has to declare the amount of sales it plans to do under trade credit terms every month. When asking for coverage the supplier has to justify it based on the amount of turnover made on this specific buyer or any addition sales to come. Coface will then decide which amount to cover. If Coface refuses to insure sales towards a specific buyer, then the supplier can get insurance with another insurer, or provide trade credit terms at its own risk, or trade with the buyer under cash-in-advance terms. Only in this case of Coface refusal the buyer will not appear in the data. Otherwise, once the supplier bought insurance all its buyers under trade credit terms are recorded in the data.

This means that insured trade credit volume can vary along various channels in our database. First, trade credit amounts can vary following trade flows. If more trade, more trade credit is required. We will control for this channel in our empirical analysis by including the import flows at the sectoral level in Mexico. Then, they can vary according to the willingness of firms to use more or less open account terms to finance their trade, as compared to other financing tools. Firms can ask a greater share of their trade to be done under trade credit terms. This is the substitution channel we are interested in. Finally, amounts can vary based on changes in insurance decisions. Demand of insurance from firms that provide trade credit may change due to changes in risk aversion or insurance costs for instance.[8] However, as explained previously, trade credit volumes cannot change based on suppliers' decisions to insure more or less some specific trade credit sales because of the moral hazard safeguards detailed above. At the same time, the trade credit insurer may alter its decision to insure based on its perception of risk on a buyer or on a market. To control for the insurer change in risk perception, we will include in our analysis Coface acceptance rate. It is the ratio of insurance obtained over the amount requested by suppliers at the national level. If Coface becomes more strict to insure a specific country, the ratio will decrease.

3.1.3 Trade credit database

The data we use in this paper are trade credit amounts provided by foreign suppliers to Mexican buyers and insured by Coface. We decided to focus on firms in Mexico for several reasons. First, this country is a large emerging market, with high trade openness and a high manufacturing share. Second, trade credit use is widespread in this market. According to a report by Banco de Mexico, 76% of firms in Mexico used credit from their suppliers as financing tools in the fourth quarter of 2019, before the pandemic crisis.[9] This share reached 81% in the man-

[8] Notice, however, that changes in insurance costs will primarily reflect changes in realized sales given that the premium is computed as a percentage of turnover.

[9] See *Evolución del Financiamiento a las Empresas durante el Trimestre Octubre – Diciembre de 2019*, Banco de Mexico

ufacturing sector over the same period.[10] Finally, Coface data are quite comprehensive in the country compared to other emerging economies.

Our level of observation is the supplier-buyer pair at month t, with buyers in Mexico and suppliers in a foreign country. For each pair, we have the amount of insured trade credit sales converted to US dollars, on a monthly basis, between July 2010 and December 2019. Sectors of buyers and suppliers are recorded following the NACE Rev.2 classification, covering both goods and services. The database also contains the supplier's origin country as well as the currency of the trade credit. Finally, Coface also produces assessment of the credit quality of buyers for which it provides insurance on a monthly basis. These assessments are based on a combination of fiscal data, experts opinions and external assessments. They mirror Coface perception of payment default risk on this buyer and follow a 0 to 10 scale. A assessment of 0 is the lowest possible, for firms that halted their activity, 1 is for very weak firms in financial terms while 10 reflects undoubted performance solidity. In the rest of the paper, when we talk about buyers' quality we refer to their credit risk assessment made by Coface.
When including import data as detailed in section 4, we restrict our sample to trade in goods and exclude services. Table 1 presents the descriptive statistics on trade credit from foreign suppliers to buyers based in Mexico used in our baseline estimation. Section C in appendix provides the descriptive statistics on the sample encompassing goods and services. Descriptive statistics are provided by origin of suppliers - US, Euro zone, UK and other sources - as well as for the entire sample. The statistics are provided for supplier-buyer pairs per period. To control for potential valuation effects, we take trade credit amounts denominated in their initial currency. Then, we convert these amounts into US dollar using a fixed exchange rate. This exchange rate is computed as the mean over the sample period. We will control for the effect of such choice in section 6.

Figure 1 gives a first overview of the distribution of our interest variable, trade credit exposure. It plots the density of the log-transformed variable that is used in our baseline estimation. We can see that the distribution is not symmetric and quite skewed, with some very large amounts.

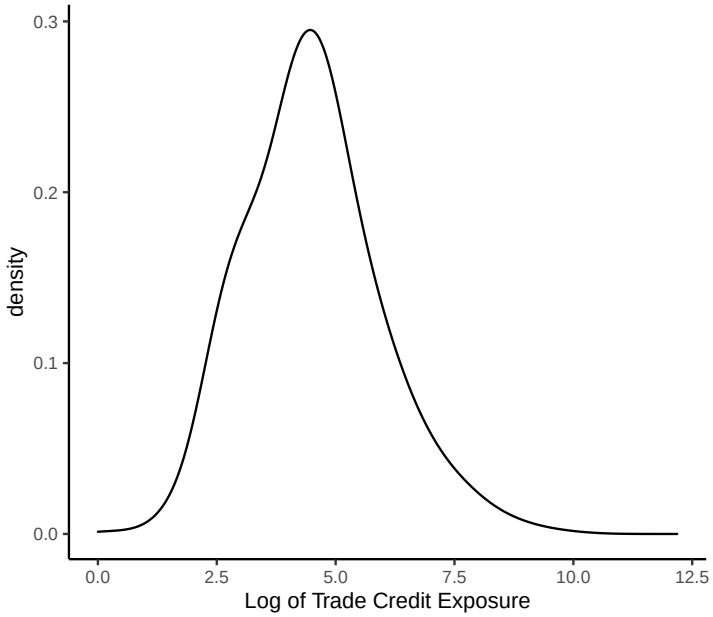
In table 1, we present the origin split. Each observation is at the supplier-buyer level. We see that trade credit from US and Euro zone suppliers represent respectively 37.2% and 50.4% of our Mexican sample. Medians are quite comparable across sub-samples of suppliers, however the distribution of trade credit amounts is even more skewed for US suppliers than for the rest of the sample. Looking at trade data, the US amounted to 45% of total Mexican imports in goods and main Eurozone partners to 9%.[11] There is a bias in the data in favor of European suppliers due to the origin of the French insurer and to the large share of the European market in trade credit insurance (Europe represents 50% of insured trade credit worldwide according to Berne Union). Nonetheless, in the trade credit data we use, the US remain one of the key partners.

Then, table 2 presents the descriptive statistics based on the currency used. Each observation is at the supplier-buyer-currency level. A small number of supplier-buyer pair uses two

[10] It concerned around 80% of the firms in the service and trade sector and 31% of the firms in the rest of the economy. Banco de Mexico data.

[11] WITS data, see Mexico

Figure 1: Log of Trade Credit Exposure



Origin of suppliers	N	Median	Mean	Sd
Eurozone	274635	61.2	237.6	941.2
Other	55284	100.0	342.4	1038.6
US	200005	75.0	328.7	1331.8
UK	11257	51.1	163.9	676.7
all	541181	61.2	280.4	1107.8

Table 1: Trade credit by suppliers' origin for Mexico (in thousands of dollars)

currencies in their trade explaining the difference in the total number of observations from the previous table. We see that the share of locally denominated trade credit is close to 0. This likely reflects both suppliers' and Coface decision to avoid taking a foreign currency risk by providing local currency trade credit. We also notice that the sample is almost equally divided in trade credit amounts in euros and US dollars. Comparing the shares with the ones presented in table 1, we see that some Eurozone suppliers decided to provide trade credit in USD, reflecting the role of the dollar as the global currency.

Then figure 2 presents the distribution of buyers' credit quality assessments, as well as the

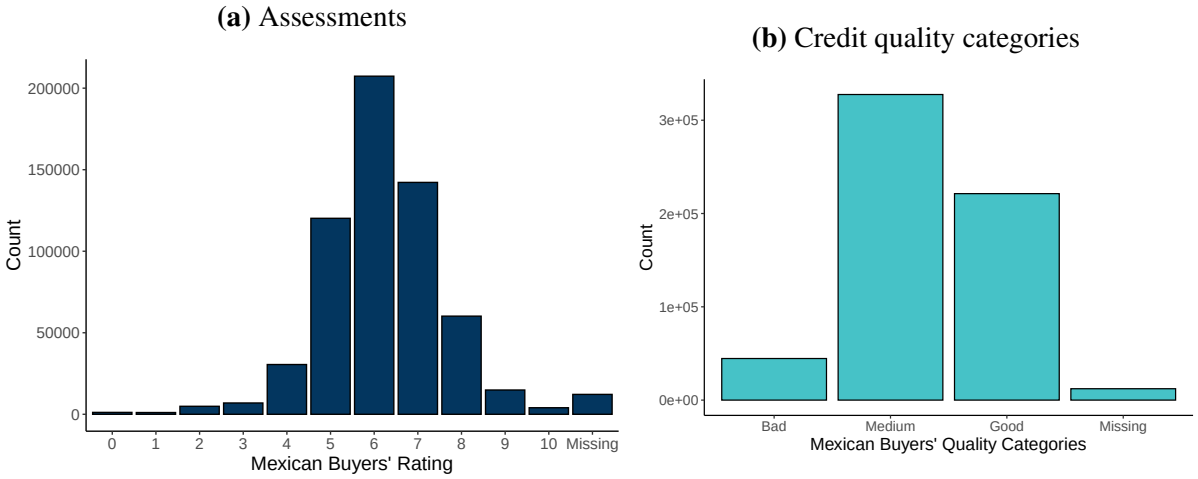
Currency used	N	Median	Mean	Sd
Euro	272598	61.2	195.4	765.4
USD	250461	90.0	372.6	1366.4
Other	9155	50.7	201.2	502.0
British pound	9489	43.8	97.0	574.1
Mexican Peso	789	847.0	3088.4	4622.5
all	542492	61.2	279.8	1103.2

Table 2: Trade credit by currency for Mexico (in thousands of dollars)

three categories built on the basis of these assessments. Based on discussions with Coface operational staffs, assessments from 10 to 7 are considered as good, while 5 and 6 are medium,

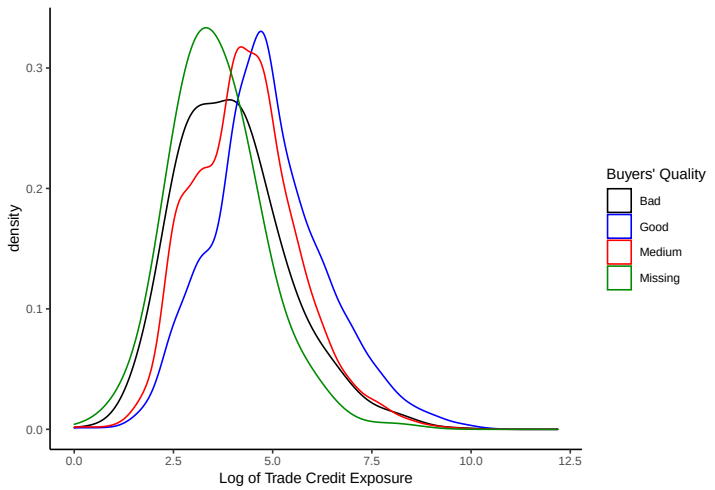
and assessments equal to 4 or below are considered as bad. Comparing the composition of the sample, we see that medium buyers dominate in Mexico. Using the same categories, from figure 3, we can also see how the logarithm of trade credit amounts varies across credit quality categories. As we could expect, good buyers have the distribution that is the most shifted towards the right, receiving in average higher trade credit amounts. Then, comes the medium and the bad credit quality ones in the expected order.

Figure 2: Buyers assessment and credit quality categories in Mexico



NOTE: Assessments reflecting Coface perception of the firm's financial soundness. assessments from 7 to 10 are considered as good buyers, 5 and 6 are medium quality buyers while assessments equal to and below 5 are bad credit quality buyers.

Figure 3: Log of Trade Credit Exposure by Buyers' Credit Quality Categories



3.2 Identifying Monetary Policy Shocks

As our baseline, we use an updated version of the Gürkaynak et al. (2005) monetary policy shock series. This data provides measures of unanticipated monetary policy shocks by looking

at changes in a policy indicator in a short period of time surrounding FOMC (Federal Market Open Committee) policy announcements. The general idea of this measure is the following: assuming that the only substantive macroeconomic 'news' within the announcement window pertains to monetary policy, the difference between the value of the policy indicator just after and the value just before the announcement would capture unanticipated monetary policy shocks. By using monetary policy surprises, rather than policy rates, we avoid endogeneity issue. This means we can more correctly identify and estimate a causal impact (Ramey (2016)). In our case, while reverse causality is a priori not a question, omitted variable bias is. Indeed, global economic conditions can influence both trade credit and monetary policy actions. In addition, with a raw policy rate measure, we would not be able to determine when the information regarding monetary policy actions is integrated and priced by the market. We follow Hanson and Stein (2015), Swanson and Williams (2014) and Gilchrist et al. (2015) among others for the choice of a policy indicator able to capture news about the expected medium-term path. We select the 2-year Nominal Treasury yield,[12] based on their arguments that the Federal Reserve's forward guidance strategy operates with a roughly two-year horizon. We show in section 6 that our results are robust to other policy indicators, using both shorter and longer-term surprise indicators, taking changes in the 6-month ahead Fed funds futures, the 1-year ahead futures on the 3-month Eurodollar deposits (one of the instrument used by Gürkaynak et al. (2005)), as well as in the 5-year Nominal Treasury yields.

Finally, to be even more confident on the exogeneity nature of our shock, we control for the Fed's private information about the future state of the economy, which might be driving its policy changes (Nakamura and Steinsson (2018) and Jarociński and Karadi (2020)). We thus purge our monetary policy shocks from potential informational shocks. We do this by excluding announcements that reveal Central Bank's private information, based on the sign of co-movements of interest rates and stock prices (See Appendix A for further details on the methodology).

We finally end up with an unanticipated and exogenous measure of "pure" monetary policy shocks, simply called monetary policy shocks thereafter.[13]

Data are available until June 2019. Combined with the availability of our trade credit data set and country controls, we get a final sample of 53 announcements from July 2010 to June 2019. Two thirds of them are negative surprises,[14] reflecting a more accommodating monetary policy stance than expected, as shown in Table 3. In our estimation, we include the sum of these surprises at the monthly level.

Jul. 2010 - Jun. 2019	**N**	**Min**	**Mean**	**Median**	**Max**	**Sd**
Monetary Policy Ann.	53	-0.0949	-0.0087	-0.0040	0.0608	0.0362

Table 3: Descriptive Statistics for US Monetary Policy shocks (in pp)

Figure 4 displays these changes depending on the date of the FOMC announcements.

[12] More precisely, we use on-the-run Treasury securities, which are - for each maturity - the ones being most recently auctioned by the US Treasury. These securities are more actively traded in the secondary market than their off-the-run counterpart.

[13] See Figure 5 and table A in Appendix A for further statistics on this distinction.

[14] More precisely, 31 surprises have negative values, while 7 equal zero, meaning no change in the 2-year Treasury yield during the narrow window surrounding the announcements.

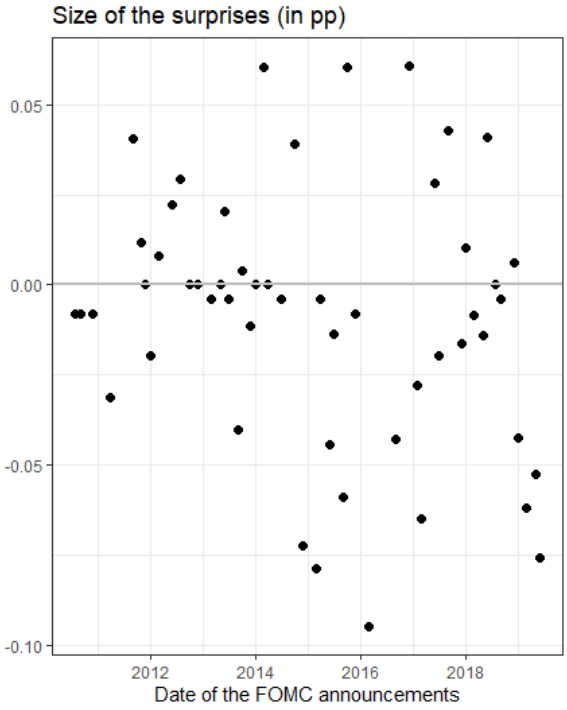


Figure 4: Monetary policy surprises

NOTE: Surprises are computed through changes in the 2-year Nominal Treasury yields surrounding FOMC announcements and are then aggregated at the monthly frequency to be included in the estimation.

4 Empirical strategy

In this paper, we want to estimate the impact of US monetary policy shocks on trade credit amounts provided by foreign suppliers to Mexican buyers. We define a US monetary shock as defined in section 3.2 and estimate the impact of such shock on trade credit while controlling for other determinants of trade credit amounts. To do so, we estimate the following equation for each supplier-buyer pair $s-b$ at month t:

$$Log(TC_{s,b,t}) = \alpha_{s,b} + \beta \texttt{MP}^{US}_{t-k} + \lambda Log(\texttt{Import}_{n,t-k}) + \gamma X_{t-k} + \nu S_{f,t-k} + \mu Z_{t-k} + \epsilon_{s,b,t} \quad (1)$$

$Log(TC_{s,b,t})$ refers to the logarithm of the amount of insured trade credit, also called trade credit exposure, for the supplier-buyer pair $s-b$ at month t. Given the fat-tail characteristic of our trade credit exposure presented in 1, we log-transform our main variable of interest. We will test the robustness of this empirical choice in section 6.3. $\texttt{MP}^{US}_{t-k}$ refers to our measure of monetary policy surprises as described in section 3.2. We scale it for an easier and more direct interpretation of our results (in terms of standard deviation). The key coefficient of interest in this paper is β. It represents the impact of unexpected changes in US monetary policy on trade credit provision towards the Mexican market. We start by considering all lags from k=1 to k=6 months in order to capture the effect of the shock in the short-term. Indeed, given that a trade credit expires usually in a 60-to-90 days period (median of 86 days in Chile as described by Alfaro et al. (2021)), we focus on the effect on a short time window of two quarters following the shock. A lag of three means the shock occurred three months before the month when we measure the amount of insured trade credit.

A key focus of this paper is also to make use of the disaggregated nature of the data and study the heterogeneity in the response to these US monetary shocks to disentangle the different mechanisms at play. After estimating our baseline, we will focus on estimating the heterogeneity in the response by including some interaction terms based on the currency used, the sector of the buyer or the credit quality of the latter.

To clearly identify the impact of US monetary shocks on trade credit, we need to isolate the financial dimension from the trade dimension, as both co-exist within trade credit stocks. We therefore include monthly imports by Mexican firms by sector as a way to capture the effect of changes in trade on trade credit amounts. $Log(Import_{n,t-k})$ is the log-transformed amount of goods imports by Mexican firms in the buyer's sector n at month $t-k$. Notice that trade and trade credit may influence each other (Auboin and Engemann (2014), Jinjarak (2007)). Thus, to avoid endogeneity problems while controlling for the trade effect, we lag the import variable and take it at the time of the shock. If changes in trade flows were to drive all the response of trade credit to US monetary shocks, this import variable would capture all the effect. Import data are obtained from the Mexican Statistical office from January 2010 to December 2019 using the HS 2017 sector classification and converted to NACE Rev.2 sectors. We loose about 40% of the sample when adding trade flows as we restrict to trade credit for trade in goods and exclude services. We loose an additional 3% because of partial correspondence between the two sector classifications at our level of aggregation. We test for the impact of such data losses in section 6 in the first column of the table 12, by repeating the analysis on the sample covering goods and services while excluding the import variables.

To properly identify our effect, we also need to control for other potential determinants of trade credit at the supplier-buyer, country and global levels.
We account for micro-level specificities by including supplier-buyer pair fixed effects, $\alpha_{s,b}$, that will control for time-unvarying determinants such as their sector of activity, or the substituability of their relationships.
Then, we include a set of macroeconomic controls on a monthly basis to reflect the economic outlook in Mexico that could weigh on buyers' demand for trade credit. We include the Banco of Mexico's policy rate at the time of the US shock $t-k$ as an extra-instrument to test for the substitution between trade credit and banking finance, the latter being strongly dependant on the policy rate. We also include the amount of foreign currency reserves (log-transformed), the real effective exchange rate (log-transformed), the volatility of the peso against the USD,[15] and inflation (log-transformed) at the time of the shock $t-k$. Finally, and as mentioned before, we also account for a potential effect of Coface risk aversion by including *Coface acceptance rate* at the time of the shock, namely the ratio of insurance obtained over requested by suppliers in the emerging market. All these indicators are grouped in vector X_{t-k}, the controls at the buyer country level.
Moreover, we control for other sources of variations on the supplier side by including the industrial production indices in the US and in the Eurozone, the two main source regions, that we log-transform. We group these two indicators in vector $S_{f,t-k}$, the controls at the supplier country level. As a robustness check, we alternatively use time-varying supplier country fixed effects instead of these two indicators and show that our results are broadly not affected by this

[15] Volatility is measured using the standard deviation computed on a twelve-month window.

change.
Then, we control for alternate sources of variations affecting emerging countries at the global level. We account for global factors using the Emerging markets bond index (EMBI) spread (log-transformed) and for other changes in monetary policies looking at unexpected changes in ECB monetary surprises as reflected by movements in the one-year OIS yield following Altavilla et al. (2019). We group all those indicators in vector Z_{t-k}, the controls at the global level. Section E in the appendix provides the description of all indicators and their sources.

5 Results

In this section, we present the main results of our analysis. In section 5.1, we detail our baseline result on the positive impact of US MP on foreign-supplied trade credit in Mexico. In section 5.2, we highlight the specific role of US dollar in this effect as well as the impact of sectors' export orientation. Then, in section 5.3, we underline how trade credit can substitute to other financing sources for most credit-constrained firms. Finally, in section 5.4, we show that this substitution effect of foreign-supplied trade credit is specific to the response to US monetary policy shocks.

5.1 A positive impact of US monetary policy on foreign-supplied trade credit

Table 4 synthesizes the results of the estimation of equation 1. Each column presents the result of the estimation with a different lag for the FOMC monetary surprise variable, from 1 to 6 months. Changes in US monetary policy have a positive and significant effect on trade credit with a delay of three to six months. We interpret the coefficient for lag 3 as follows: An increase of one standard deviation in the 2-year-bond yield around a FOMC announcement that took place 3 months ago leads to a 0.3% increase in the average trade credit provided by a foreign supplier to a Mexican buyer.
This positive albeit small significant effect should be understood in the context of overall low level of surprises during the period, characterized by few movements in Fed interest rates. Nonetheless, our results highlight the existence of a spillover channel from US MP on emerging markets on trade credit, which will be key to account for in other periods characterized by less stable monetary policy, as the one we are currently entering. With this result, we complement the findings of Elliott et al. (2023) on the increase of non-bank lending to non-US firms following a US monetary shocks. We show that, after a US monetary shock, bank lending is also substituted by supplier financing.

As expected, an increase in import flows leads to an increase in trade credit stocks, mirroring the trade dimension in trade credit. The positive impact of US MP we obtain holds even though we control for this trade dimension with import flows. This allows us to highlight the financial dimension of our effect. Besides, we obtain a positive coefficient for the Mexican Central bank's interest rate. This highlights a counter-cyclical use of trade credit in times of tighter financial constraints in Mexico, pleading once again for a financial channel of impact.
Therefore, an unexpected tightening in the US monetary policy increases with some delay the

amount of trade credit provided to Mexican buyers. For the rest of the paper, we will focus on the effect with a three-month lag, given that this is the lag with the highest coefficient and the first significant one. In section 6, we check these results using alternative specifications (table 12) and alternative measures of shocks (see table 13). This choice of a three-month lag is also in line with what we see in the literature on the delays of transmission of international monetary policy shocks on banking flows (as shown for Mexico by Morais et al. (2019)).

Table 4: Trade credit in Mexico and US MP Surprises - Baseline

	Log of Trade Credit					
	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5	Lag 6
FOMC MP Surprise - lag	0.0000	0.0003	0.003***	0.003***	0.001**	0.002***
	(0.0003)	(0.0004)	(0.001)	(0.001)	(0.001)	(0.001)
Mexican Policy Rate - lag	0.01	0.01	0.01**	0.01***	0.02***	0.02***
	(0.01)	(0.01)	(0.005)	(0.005)	(0.004)	(0.004)
Mexican Sector Imports (Log) - lag	0.03**	0.03***	0.03***	0.03***	0.02**	0.02**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Fixed effects supplier-buyer	Yes	Yes	Yes	Yes	Yes	Yes
Buyer country controls	Yes	Yes	Yes	Yes	Yes	Yes
Global controls	Yes	Yes	Yes	Yes	Yes	Yes
Supplier country controls	Yes	Yes	Yes	Yes	Yes	Yes
SE clustered at	Buyer sector level	Buyer sector level	Buyer sector level	Buyer sector level	Buyer sector level	Buyer sector level
N	455,340	452,078	448,727	445,562	442,370	439,127
Adjusted R^2	0.93	0.93	0.93	0.93	0.93	0.93
Residual Std. Error	0.39	0.39	0.38	0.38	0.38	0.38

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

NOTE: The coefficients reported correspond to the estimation of equation 1 with alternative lag k, from 1 to 6 month. The dependant variable is the log of trade credit exposure. All controls are taken at the time of the shock, i.e. with a k-month lag. Controls are in log except otherwise specified in section 4. Standard errors are clustered at the buyer's sector level.

Given the nature of the shock and the importance of the US as a trade partner for Mexico, one could think our previous result is mainly driven by changes in the US macroeconomic context that drive the supply of trade credit by US suppliers. To dig into this question, we use the information we have in the data set on the origin of the supplier. We distinguish between US and non US suppliers and build a sub-sample for non-US suppliers. In table 5, we estimate our baseline on this sub-sample. We observe very similar results to our baseline. Therefore we can conclude that our baseline result is not driven by a US-driven supply effect.

5.2 A specific role for the dollar and for the export orientation of the sector

To go further in the description of our results and associated mechanisms, we start looking at the heterogeneity of our effects, allowing for the existence of several β in equation 1, based on different trade credit characteristics. We do this by adding interaction terms to our baseline, interacting the US MP and the characteristics under studied. In order to apart supply-driven effects for all suppliers and not only US suppliers, we add supplier-year fixed effects. The identification is possible thanks to the existence of several buyers per supplier in a high number of cases.

We first study the heterogeneity based on the currency used for the trade credit. As reported

Table 5: Trade credit in Mexico and US MP Surprises - Non US suppliers

	Log of Trade Credit Non-US suppliers
FOMC MP Surprise - lag	0.003**
	(0.001)
Mexican Policy Rate - lag	0.014**
	(0.007)
Mexican Sector Imports (Log) - lag	0.038***
	(0.013)
Fixed effects supplier-buyer	Yes
Buyer country controls	Yes
Global controls	Yes
Supplier country controls	Yes
SE clustered at	Buyer sector level
N	281,348
Adjusted R^2	0.919
Residual Std. Error	0.395
Notes:	***Significant at the 1 percent level. **Significant at the 5 percent level. *Significant at the 10 percent level.

NOTE: The coefficients reported correspond to the estimation of equation 1 on a sub-sample of non US suppliers. The dependant variable is the log of trade credit exposure. All controls are taken at the time of the shock, i.e. with a three-month lag. Controls are in log except otherwise specified in section 4. Standard errors are clustered at the buyer's sector level.

in table 2, our sample is characterized by the predominance of foreign currency trade credit, quite balanced between EUR and USD. We take advantage of the use of different currencies to investigate whether the US dollar, as the global currency, plays a specific role in such demand for funds. We add a dummy equal to 1 if the trade credit between a buyer and a supplier is in USD and we interact it with our US MP surprise variable. Given the currency used is stable across time for a supplier-buyer pair, we cannot use a supplier-buyer fixed effects and include instead both cross-sector fixed effects (supplier sector - buyer sector) and supplier-year fixed effects. We conduct the estimation on two samples: the entire sample and a sample restricted to non-US suppliers. We do this to be sure we identify a specific effect of the currency and not a mixed effect of the currency and the supplier's origin.

We report the coefficients associated with the estimation of the currency heterogeneity in table 6. We find a positive and significant effect for the interaction term in both samples (with and without US suppliers). This means that USD trade credit increases more in response to an exogenous US monetary tightening than trade credit denominated in other currencies (mostly euro here), and this is not due to the origin of the supplier but to the currency used.

Several hypothesis could explain this USD specificity. Since we put supplier-year fixed effects, we should control for mechanisms on the supply side. From the buyer's perspective, one explanation could be the valuation mismatch that affects many importing firms in emerging markets which sell on the domestic market. For those firms, when there is an appreciation of the global USD index, as often in case of US monetary policy tightening, it means higher costs for the same revenues. Therefore, this might result in higher financial constraints, forcing them to request more USD trade credit as a substitute. While our data are not comprehensive enough to be able to validate this valuation mismatch hypothesis, our results points quite clearly towards

a specific role of the US dollar in the spillover of US MP to emerging markets through trade credit, independent from a US-driven supply effect. We highlight here another dimension in the USD dominant currency status, through trade credit stocks.

Table 6: Currency type

	Log of Trade Credit	
	All suppliers	Non-US suppliers
FOMC MP Surprise - lag	0.003***	0.003***
	(0.001)	(0.001)
USD TC	0.38*	0.24
	(0.20)	(0.20)
Mexican Policy Rate - lag	0.001	0.005
	(0.01)	(0.01)
Mexican Sector Imports (Log) - lag	0.05***	0.04**
	(0.01)	(0.02)
FOMC MP Surprise x USD TC	0.003***	0.003**
	(0.001)	(0.001)
Fixed effects supplier-time	Yes	Yes
Fixed effects sector f * sector j	Yes	Yes
Buyer country controls	Yes	Yes
Global controls	Yes	Yes
Supplier country controls	Yes	Yes
SE clustered at	Buyer sector level	Buyer sector level
N	449,042	281,663
Adjusted R^2	0.64	0.66
Residual Std. Error	0.85	0.81
Notes:	***Significant at the 1 percent level.	
	**Significant at the 5 percent level.	
	*Significant at the 10 percent level.	

NOTE: The coefficients reported correspond to the estimation of an enhanced equation 1, with a 3-month lag for the US Monetary Policy surprises. The dependent variable is the log of trade credit exposure. The interaction term interacts a dummy variable equal to 1 if the trade credit is denominated in USD and the US MP surprises. In the first column the estimation is conducted on the full sample while in the second column it is done only on the sub-sample of trade credit agreements with non-US suppliers. Standard errors are clustered at the buyer's sector level. All controls are taken at the time of the shock, i.e. with a lag of three months. We include both cross-sector fixed effects as well as supplier-year fixed effects.

Based on our results on currency and the valuation mismatch hypothesis mentioned above, a natural next step is to look at whether the impact of US MP on trade credit varies across sectoral dimensions and particularly across sectors' export orientation.
In our analysis, we control for trade variations across sectors as the result of the US MP shocks by accounting for sector imports. Therefore, we should not observe a higher effect of the shock on trade credit made to buyers in sectors strongly export oriented. However, two reasons could explained a stronger effect in sectors with low export orientation. First, as explained by Arbatli et al. (2022), the US MP shock results into an appreciation of the dollar and a depreciation of the local currency. This increases the financial constraint of firms that import from abroad while selling in local currency because of a valuation mismatch. At the same time, we know from the trade literature (Melitz (2003) and many others) that only the most productive firms can exports. Therefore, we expect to see more financially constraints firms in sectors with lower

export orientation. For those firms that are more financially constraints, the negative shock on bank financing following the US MP shock will be stronger. Therefore, trade credit could act for them as an alternative financial source to face the additional financing need.

We measure a sector's export orientation as the ratio between its exports and its total output. We use data from ICIO 2021 release, from 2010 to 2018 on an annual basis. Then we create a dummy variable indicating whether the sector has a low export orientation. The dummy will be equal to 1 when the ratio of exports to output of the sector is lower than the first quartile of the overall trade export orientation, i.e. less than 11.6% of output are exports. We interact this dummy variable with the US MP shock to see whether export orientation changes the impact of US MP on trade credit.

Results are presented in table 7. We see that, in sectors with a low export orientation, the effect of US MP on trade credit is higher. For this type of low-export sector, a one standard-deviation shock in US MP shock leads to a 0.6% increase in trade credit amounts. For sectors with higher export orientation the effect is lower, with only a 0.2% increase. Given that we control for supply side effects, we can think that this results are demand driven based on higher financial needs in low-export sectors.

We will now further investigate this demand-driven increase in trade credit based on buyers' financial needs using the granularity of our data on the buyer side.

Table 7: Export Orientation of Sectors

	Log of Trade Credit
FOMC MP Surprise - 3-month lag	0.002***
	(0.001)
Buyer's Sector Low Export Orient.	−0.08
	(0.10)
Mexican Sector Imports (Log) - 3-month lag	0.03***
	(0.005)
MP Surprise x Low Export Orient	0.004***
	(0.001)
Fixed effects supplier-buyer	Yes
Fixed effects supplier-year	Yes
Buyer country controls	Yes
Global controls	Yes
Supplier country controls	Yes
SE clustered at	Supplier sector level
N	340,578
Adjusted R^2	0.95
Residual Std. Error	0.32
Notes:	***Significant at the 1 percent level.
	**Significant at the 5 percent level.
	*Significant at the 10 percent level.

NOTE: The coefficients reported correspond to the estimation of an enhance equation 1, with a 3-month lag for the US Monetary Policy surprises. The dependant variable is the log of trade credit exposure. We interact with the US MP a dummy equal to 1 if a sector is weakly export oriented. Low export orientation corresponds to a share of output exported lower than the first quartile in the distribution (less than 11% of output being exported). We add supplier-year fixed effects in addition to supplier-buyer year. Standard errors are clustered at the sector's sector level. All controls are taken at the time of the shock, i.e. with a lag of three months.

5.3 Credit quality: trade credit as a financial substitute for most-constrained buyers

We now want to dig further into this financing role of trade credit, in order to contribute to the substitution debate that we introduced in section 2.2.
According to the literature, firms that are more financially constrained are the ones requesting more trade credit to face adverse shocks. Thus, Minetti et al. (2019) show that firms more exposed to bank credit rationing and with weaker relationships with banks are more likely to participate in supply chains to overcome liquidity shortages through trade credit from their suppliers. If this were to be true in our analysis, it would point towards a demand-driven mechanism through request for funding from the most financially constrained buyers.
To verify this, we construct three categories of buyers' credit quality, "Good", "Medium" and "Bad", using Coface internal assessment. Assessments from 10 to 7 are considered as good, 6 and 5 as medium and 4 to 0 as bad. Such assessments are available on a monthly basis to reflect the buyer's level of financial vulnerabilities. We construct a ranked categorical variable classifying each buyer in one of the three categories on a monthly basis. Then, we interact it with our US MP shock to see whether β in equation 1 varies according to the credit quality of the buyers. To be sure to capture a demand-driven mechanism, we control for any supplier-driven mechanisms by including supplier-year fixed effects.

Table 8 synthesizes the results for this enhanced baseline. We see that interaction terms are negative for both good and medium-quality buyers. This means that the increase in trade credit is higher for low-quality buyers than for good and medium buyers in response to an exogenous tightening in US MP. When looking at the coefficients, we see that most of the positive effect we find in our baseline is explained by the impact on low credit quality buyers. If we compare these coefficients to the average amount of trade credit to buyers in each credit quality category, we get even larger discrepancies as good and medium buyers receive more trade credit in average.[16]
Thus, one standard deviation shock in US monetary policy results in an increase equal to 0.1% of the average trade credit provided to good buyers, 0.3% for medium buyers, compared with an increase equal to 0.9% of the average amount provided to bad buyers.
This result on credit quality — obtained by controlling for the supply side with fixed effects — tends to confirm our demand-driven mechanism through a financing substitution channel. Trade credit appears to be used as a substitute to other sources of financing tools when firms in emerging markets face increasing funding constraints, which is the case for low credit quality buyers. This is consistent with Nilsen (2002)), Burkart and Ellingsen (2004), or Molina and Preve (2012) among others.

A substitution possible only for pre-existing relationships

In our previous specifications, an increase in trade credit after a US monetary policy shock may be caused alternatively by a rise of trade credit amounts for pre-existing trade credit partnerships (intensive margin) as well as by new trade credit relationships (extensive margin).

[16]The fact that good and medium buyers tend to receive larger trade credit in average than bad buyers (independently from the response to the monetary policy changes) is itself quite intuitive from the supplier's perspective as it is safer to provide trade credit terms to the healthiest firms. It is even more the case for insured trade credit, where the insurer will also limit its coverage for risky firms.

Table 8: The Impact of Buyer's Credit Quality

	Log of Trade Credit
MP Surprise - 3-month lag	0.009***
	(0.003)
High buyer's quality	0.154***
	(0.020)
Medium buyer's quality	0.106***
	(0.016)
Mexican Policy Rate - Lag	0.003
	(0.005)
Mexican Sector Imports (log) - Lag	0.022***
	(0.006)
MP Surprise - 3-month lag * high buyer's quality	−0.008***
	(0.003)
MP Surprise - 3-month lag * medium buyer's quality	−0.005**
	(0.003)
Fixed effects supplier-buyer	Yes
Fixed effects supplier-time	Yes
Buyer country controls	Yes
Global controls	Yes
Supplier country controls	Yes
SE clustered at	Buyer sector level
N	441,753
Adjusted R^2	0.949
Residual Std. Error	0.319
Notes:	***Significant at the 1 percent level.
	**Significant at the 5 percent level.
	*Significant at the 10 percent level.

NOTE: The coefficients reported correspond to the estimation of equation 1 with a 3-month lag for the US Monetary Policy surprises, in which we allow β to vary across credit quality of buyers by interacting the US MP variable to a credit quality categorical variable. The dependant variable is the log of trade credit exposure. We add supplier-year fixed effects to the supplier-buyer FE to control for the supply dimension. Standard errors are clustered at the buyer's sector level. The reference category is the "low-quality" buyers, to be compared with medium and good buyer categories. All controls are taken at the time of the shock, i.e. with a lag of three months.

To distinguish both effects, we first re-estimate our enhanced baseline equation at the intensive margin by keeping in our sub-sample only supplier-buyer relationships that have existed for more than six months at time t. Results for the intensive margin appear in table 9. We confirm our results in this sub-sample of pre-existing relationships and we find even stronger coefficients. The negative effect is higher for good than for medium buyers as we could have expected. Then, we explore the possibility that some effects might come from new trade credit relationships. We do this by estimating a probit model of the probability of starting a trade credit.[17] We define a new relationship as a relationship for which trade credit exposure is missing or null for at least six months before. In table 10, we present the partial average effect from the estimation of the probit model.[18]

[17] See estimated models in appendix D

[18] As noted by Karaca-Mandic et al. (2012), in non-linear model, partial average effects can be biased for interaction terms using common computation tools. To account for this possibility, we also computed the reported partial effects using Williams (2012) method, excluding fixed effects in the computation. We found similar signs

Interestingly, while we do find a negative interaction terms for good and medium-quality buyers at the intensive margin, this interaction is positive but not significant for the extensive one. This means that trade credit to low credit quality buyers increases the most after a US monetary policy shock only in a context of a pre-existing relationships. As they are more financially constrained, those buyers tend to ask for more trade credit, and suppliers tend to meet this demand by offering more trade credit to save the trade relationships. This reaction from the suppliers is consistent with the literature: once the trade credit has started, the supplier may accept to provide more trade credit if: i/ it has information and leverage on its buyer, in an established trust relationship (see Cuñat (2007)); ii/ this buyer is of crucial importance because of high specificity of the product sold for instance; hence the need to maintain the trade relationship to compensate for the different fixed costs incurred when establishing the partnerships (see Garcia-Appendini and Montoriol-Garriga (2020)).
For new trade credit relationships, however, the supplier may not have all these elements and will be more cautious on the credit quality of its buyer. It appears that trade credit can only be an partial buffer against economic downturn in already-existing relationships.

5.4 An effect specific to the US MP shocks

Our focus in this article is to understand whether trade credit towards buyers in emerging markets can be affected by US monetary policy surprises, given the already long list of spillovers identified in emerging markets when US monetary policy shocks occur. Spillovers from ECB monetary policy on emerging markets are much more limited. Therefore, we would like to know if the effect we highlighted in the previous sub-sections are specific to the US monetary policy shocks or if other monetary policy shocks have a similar effect. To verify this, we focus on ECB monetary surprises that we had already included as supplier-country controls in our baseline equation 1. We apply the same type of reasoning and make ECB monetary surprises our key variable of interest while US FOMC surprises become simple controls. As explained in section 4, for those ECB monetary surprises we follow Altavilla et al. (2019) and use the change in the 1-year OIS around Monetary Policy Announcements and focus on "pure" monetary announcements (using a similar method as described in appendix A). Here a again we scale the variable and interpret the shocks in terms of standard deviation changes.
We reproduce three analyses we presented earlier for the US MP shocks: our baseline on the whole sample, the baseline on a restricted sample excluding eurozone suppliers and our enhanced baseline that allows for varying effect according to the buyer's quality. In the later, as in section 5.3, we add supplier-year fixed effects to control for supplier-side dynamics. We do this using a lag of three months. [19]

Table 11 presents the results. In the first column, we see that the coefficient for ECB surprises is negative, while our US MP coefficient is still positive. The negative impact coming from ECB shocks remains observable when considering only non-Eurozone suppliers. This point towards a supply-side effect (as suppliers may be negatively affected by unexpected tightening shocks), while the rise in demand on the Mexican side is likely to be much more limited than in our baseline, given the much smaller impact of ECB monetary policy on emerging mar-

and very similar numbers, within their respective 95% confidence intervals.
[19] Notice that we also tested for other lags. Our main message remains unchanged.

Table 9: Intensive Margin

	Log of Trade Credit
MP Surprise - 3-month lag	0.010***
	(0.003)
High buyer's quality	0.164***
	(0.024)
Medium buyer's quality	0.118***
	(0.021)
Mexican Policy Rate - Lag	−0.004
	(0.004)
Mexican Sector Imports (log) - Lag	0.022***
	(0.006)
MP Surprise - 3-month lag * high buyer's quality	−0.010***
	(0.003)
MP Surprise - 3-month lag * medium buyer's quality	−0.006*
	(0.003)
Fixed effects supplier-buyer	Yes
Fixed effects supplier-time	Yes
Buyer country controls	Yes
Global controls	Yes
Supplier country controls	Yes
N	371,698
Adjusted R^2	0.953
Residual Std. Error	0.307
Notes:	***Significant at the 1 percent level.
	**Significant at the 5 percent level.
	*Significant at the 10 percent level.

NOTE: The coefficients reported correspond to the estimation of equation 1 with a 3-month lag for the US Monetary Policy surprises, in which we allow β to vary across credit quality of buyers by interacting the US MP variable to a credit quality categorical variable. The dependant variable is the log of trade credit exposure. The estimation is conducted on a sub-sample of supplier-buyer pairs that display a positive trade credit exposure for at least six month, as a proxy for ongoing relationships. We add supplier-year fixed effects to the supplier-buyer FE to control for the supply dimension. Standard errors are clustered at the buyer's sector level. The reference category is the "low-quality" buyers, to be compared with medium and good buyer categories. All controls are taken at the time of the shock, i.e. with a lag of three months.

kets compared to Fed MP's impact. In the third column, we also see that the effect of ECB monetary shocks does not vary according to quality as opposed to what we observed for US MP shocks. Indeed, neither of the two coefficients of the interaction terms nor the one on ECB surprises are significant. This is not completely surprising if the demand-side effect is quite limited, as suggested by the first 2 columns.

All in all, these results show that the role of financial buffer associated with trade credit after US MP tightening is not observable for ECB shocks. This is explained by the much more limited impact of ECB monetary decisions on emerging markets' financing conditions.

Table 10: Extensive Margin

	Probability of starting TC
MP Surprise - 3-month lag	0.0038***
	(0.0009)
Mexican Policy Rate - Lag	−0.0588***
	(0.0011)
Mexican Sector Imports - Lag	0.0000***
	(0.0000)
Good quality buyer - Lag	−0.0259***
	(0.0015)
Medium quality buyer - Lag	−0.0239***
	(0.0015)
MP Surprise - Lag x Good	0.0003
	(0.0010)
MP Surprise - Lag x Medium	0.0005
	(0.0010)
Supplier-Buyer FE	Yes
Supplier-Year FE	Yes
Buyer country controls	Yes
Supplier country controls	Yes
Global controls	Yes
Deviance	53436.5549
Num. obs.	175974.0000

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

This probit model estimates the probability of starting trade credit, which we proxy with the probability of having a positive trade credit exposure for a supplier-buyer pair, following at least six months of null or missing TC exposure. The coefficients reported correspond to the average partial effects, to which we apply (Fernández-Val and Weidner, 2016)'s method to correct for the so-called incidental parameter bias problem. See section D in appendix for the model estimated. We include both supplier-buyer and supplier-year fixed effects.

Table 11: The Effect of ECB Monetary Surprises

	Log of Trade Credit		
	Full Sample	Non-EZ suppliers	Full Sample
ECB MP Surprise - 3-month lag	−0.002***	−0.002***	−0.001
	(0.0003)	(0.0005)	(0.001)
High buyer's quality			0.185***
			(0.019)
Medium buyer's quality			0.133***
			(0.016)
Mexican Policy Rate - lag	0.012**	0.007	0.004
	(0.005)	(0.005)	(0.005)
FOMC MP Surprise- 3-month lag	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)
Mexican Sector Imports (Log) - 3-month lag	0.030***	0.039***	0.021***
	(0.009)	(0.011)	(0.006)
ECB Surprise - 3-month lag * high buyer's quality			−0.0004
			(0.002)
ECB Surprise - 3-month lag * medium buyer's quality			−0.001
			(0.001)
Fixed effects supplier-buyer	Yes	Yes	Yes
Fixed effects supplier-year	No	No	Yes
Buyer country controls	Yes	Yes	Yes
Global controls	Yes	Yes	Yes
Supplier country controls	Yes	Yes	Yes
SE clustered at	Buyer sector level	Buyer sector level	Buyer sector level
N	449,042	221,419	448,907
Adjusted R^2	0.926	0.935	0.949
Residual Std. Error	0.386	0.371	0.321

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

NOTE: In this table the dependant variable is the log of trade credit exposure. The coefficients reported in the first column correspond to the estimation of an equation similar to equation 1 but looking at ECB surprises. We take a lag of three month for both the surprises and the control variables. The estimation is conducted on the full sample. In the second column, we estimate the same equation but this time on a sub-sample excluding Eurozone suppliers. In the third column, we allow β to vary across credit quality of buyers by interaction the ECB MP shock with a credit quality categorical variable. We add supplier-year fixed effects to the supplier-buyer FE to control for the supply dimension. The reference category is the "low-quality" buyers, to be compared with medium and good buyer categories. In all cases, standard errors are clustered at the buyer's sector level and all controls are taken at the time of the shock, i.e. with a lag of three months.

6 Robustness Tests

6.1 Alternative specifications

As first robustness tests, we conduct several concurring estimations to confirm that our main results are not driven by empirical choices. We use the baseline estimation with three-month lag described in equation 1. In the first column of table 12, we repeat the estimation on a wider sample of trade credit exposure encompassing goods and services, excluding the import variable that restricted our sample. Our coefficient is still positive, significant and of similar magnitude (although, quite intuitively, larger as we do not control for trade effects anymore) as those in table 4. Therefore, our result is not restricted to trade credit that finances trade in goods.
In the second column, we check that our result is not driven by a valuation effect due to our choice for currency conversion. In our baseline specification, trade credit amounts are converted to USD using the average foreign exchange rate of the currency used against the USD over the whole period. In the second column, we use the contemporaneous exchange rate each month to convert the amount. Our coefficient for the three-month lag of the US MP surprises remains significant and positive.
In the third column, we control that our key effect at the three-month lag is not in fact a sum of smaller effects of previous lags, potentially contradicting one another. We include all the lags from 1 to 3, all together in the estimation. We do not have multicolinearity issues as our shocks are independent by nature, given that they measure the surprise of the market following a policy decision. We see that our coefficient for the third lag remains strongly significant and of a similar magnitude.
Finally, we check that our control variables at the supplier country level correctly control for changing conditions in the supplier country. We, therefore, replace our supplier country control variables by time-varying supplier-country fixed effect. We see once again that our effect of US MP on trade credit is robust.

6.2 Alternative Policy Indicators

In our baseline analysis, we chose to identify unexpected shocks in US monetary policy using movements in the two-year Nominal Treasury yield, due to the specificity of the period we analyze, mainly a period of unconventional monetary policy with interest rates close to zero. As a robustness check, we do the same analysis as in table 4, with a lag of three months, but we change our referential indicator -using both shorter and longer maturities - to measure the surprise following the FOMC announcement (see table 16 in appendix B for statistics on these alternative indicators of surprises).
Results are reported in table 13. In the first column, we use changes in yield around the FOMC announcement for the six-month ahead Fed's Fund Future (FF6). In the second column, we use surprises in the year ahead future for the three-month EuroDollar deposits (ED4). The third column uses a longer-term indicators, with surprises in the five-year Nominal Treasury bond yield. We see that despite some limited changes in magnitude, all the coefficients are positive and significant, confirming the positive impact of the US monetary policy tightening on foreign-supplied trade credit in Mexico.

Table 12: Controlling for empirical choices

	Goods and Services Sample	Converted at contemp. FX	Combining several lags	Supplier country * year FE
	(1)	(2)	(3)	(4)
FOMC MP Surprise - 1-month lag			0.001*	
			(0.001)	
FOMC MP Surprise - 2-month lag			0.002***	
			(0.001)	
FOMC MP Surprise - 3-month lag	0.004***	0.004***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
Mexican Policy Rate - 3-month lag	0.01***	0.01**	0.01***	0.01
	(0.003)	(0.005)	(0.005)	(0.01)
Mexican Sector Imports (Log) - 3-month lag		0.02**	0.03***	0.03***
		(0.01)	(0.01)	(0.01)
Fixed effects supplier-buyer	Yes	Yes	Yes	Yes
Buyer country controls	Yes	Yes	Yes	Yes
Global controls	Yes	Yes	Yes	Yes
Supplier country controls	Yes	Yes	Yes	No
Fixed effects supplier country * year	No	No	No	Yes
N	838,753	448,727	448,727	448,727
Adjusted R^2	0.93	0.92	0.93	0.93
Residual Std. Error	0.38	0.39	0.38	0.38

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

NOTE: The coefficients reported correspond to the estimation of equation 1 in the Mexican case with a lag of 3 months, using slightly different specifications in each column as robustness for the controls and the dependant variable. Standard errors are clustered at the buyer's sector level. The dependant variable is always the log of trade credit exposure.

6.3 Different Variable of Interest: Growth rate

Finally, we test for the robustness of our empirical modelling by challenging our choice of logging our variable of interest. In our baseline analysis, we decided to log our variable of interest for interpretability purposes, as well as to lower the impact of the fat tail distribution of trade credit exposure. However, this comes at the cost of eliminating all zeros in our analysis that are in fact valuable information. A trade credit exposure will be zero when, during a year, Coface stops insuring a trade credit for a specific supplier-buyer pair. This might be either because the supplier stops trading with the buyer under trade credit terms or because the insurer believes the risk is too high with the buyer. To account for those zeros, we change our strategy and instead of logging our variables of interests and most controls, we take the Haltiwanger growth rate. As described by Bricongne et al. (2022), mid-point growth rates are handy as they are well-defined in cases of high turnover and entry and exit. We compute the Haltiwanger growth rate over a year for our trade credit exposure as follows:

$$x_t = \frac{(X_t - X_{t-12})}{(0.5 * (X_t + X_{t-12}))} \tag{2}$$

We also take the mid-point growth rate for the controls we were logging in the baseline (industrial production for Mexico, the US and the Eurozone, inflation, imports, real effective exchange rate, EMBI spread, Mexican foreign reserves) and take the value of the growth rate at the time of the shock, i.e. three months before. We estimate our baseline with this new transformation of the variables, including supplier-buyer fixed effects and clustering standard errors at the buyer sector level. Results are presented in table 14. We confirm that, even when taking into account entry and exit, US monetary policy surprises have a significant and positive effect on the growth

Table 13: Different Measures of Surprises

	Log of Trade Credit		
	FF6 MP surprises	ED4 MP surprises	5y yield MP Surprises
MP Surprise FF6 - lag	0.002***		
	(0.001)		
MP Surprise ED4 - lag		0.001*	
		(0.0005)	
MP Surprise 5y yield - lag			0.002***
			(0.001)
Mexican Policy Rate - lag	0.01**	0.01**	0.01**
	(0.005)	(0.005)	(0.005)
Mexican Sector Imports (Log) - lag	0.03***	0.03***	0.03***
	(0.01)	(0.01)	(0.01)
Fixed effects supplier-buyer	Yes	Yes	Yes
Fixed effects supplier-year	No	No	No
Buyer country controls	Yes	Yes	Yes
Global controls	Yes	Yes	Yes
Supplier country controls	Yes	Yes	Yes
SE clustered at	Buyer sector level	Buyer sector level	Buyer sector level
N	448,727	448,727	448,727
Adjusted R^2	0.93	0.93	0.93
Residual Std. Error	0.38	0.38	0.38

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

NOTE: The coefficients reported correspond to the estimation of equation 1 with k=3 months, using alternative indicators for the US Monetary Policy surprises. Column 1 uses the six-month ahead Fed's Funds Future (FF6). Column 2 uses the surprises in the year ahead future on three-month EuroDollar deposit (ED4). Column 3 uses the five-year yield. All shocks are pure monetary shocks, identified using the method described in appendix A. Descriptive statistics can be found in table 16 in appendix. Standard errors are clustered at the buyer's sector level and fixed effects at supplier-buyer level are included.

rate of trade credit, albeit small. For one standard deviation surprise the growth rate of trade credit is 0.02 higher.

Table 14: Haltiwanger Growth rate

	Trade Credit 1year HW Growth Rate
FOMC MP Surprise - 3-month lag	0.016***
	(0.002)
Mexican Policy Rate - Lag	−0.020***
	(0.005)
HW 1y Growth Mexican Sector Imports- Lag	0.025
	(0.029)
Fixed effects supplier-buyer	Yes
Buyer country controls (1y HW Growth)	Yes
Global controls (1y HW Growth)	Yes
Supplier country controls (1-y HW Growth)	Yes
SE clustered at	Buyer sector level
N	357,026
Adjusted R^2	0.286
Residual Std. Error	0.702
Notes:	***Significant at the 1 percent level.
	**Significant at the 5 percent level.
	*Significant at the 10 percent level.

NOTE: Here we estimate a variant of equation 1, with different forms of our control and dependant variables. The dependent variable is Haltiwanger mid-point growth rate of trade credit exposure over a year. Controls are taken as Haltiwanger growth rates of the different macroeconomic variables over a year. There are taken with a three month lag as the shock. The estimation is performed with supplier-buyer fixed effects. Standard errors are clustered at the buyer sector level.

7 Conclusion

In this article, we identify new spillovers from US monetary policy shocks to emerging markets through an effect on foreign-supplied trade credit.

To do so, we use a panel data analysis on proprietary firm-to-firm data from a trade credit insurer, Coface. We show that with a quarter lag, trade credit towards Mexican buyers increase after an unexpected tightening in US monetary policy. We identify a larger increase in trade credit denominated in US dollar, as compared to other currencies (mostly EUR), even for non-US suppliers. Moreover, the effect is larger in sectors with low export orientation, potentially pointing towards valuation mismatch and a financing dimension in this effect. To investigate the latter further, we distinguish across financial qualities of buyers and show that the effect is larger for low quality buyers, i.e. more financially-constrained. When separating across intensive and extensive margins, we confirm this positive effect for low quality buyers only at the intensive margin. This means that trade credit is used as a substitute to other sources of funding, but only within pre-existing relationships. Finally, when changing our focus to the effect on ECB monetary policy we do not find a similar pattern of results, showing the specificities of the US monetary policy spillovers. These results tend to show that trade credit can act as a partial buffer against the negative financial spillovers from US monetary policy tightening on emerging economies.

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APPENDIX

A Disentangling "pure" monetary policy and Central Bank Information shocks

The identifying assumption underlying the high frequency indicator approach is that the variations measured in a narrow window surrounding announcements are predominantly due to the news provided by these announcements. However, part of these variations may be due to changes in the private information held by the Central Bank on the economic outlook rather than the monetary policy change per se (Nakamura and Steinsson (2018) and Jarociński and Karadi (2020)).
To disentangle between pure monetary shocks and information shocks, we follow Cieslak and Schrimpf (2019) and Jarociński and Karadi (2020) among others and rely on the high-frequency co-movement of interest rates and stock prices. In case of a "pure" restrictive monetary policy shock, the contraction of the economy is associated with lower share prices (lower present value of future returns due to higher discount rates and lower future economic performance due to monetary tightening); hence a negative co-movement between interest rates and stock prices. Conversely, in case of an informational shock, a tightening in monetary policy is seen as good news (better economic situation than expected to motivate the increase in rate) and is therefore associated with an increase in stock prices; hence a positive co-movement. We therefore use these sign restrictions to identify both types of shocks. Only surprises with a negative co-movement between interest rate and stock prices are considered as "pure" monetary policy shocks. Others are seen as informational shocks and are therefore excluded from our sample.[20] Table A provides descriptive statistics on the two types of shocks (pure monetary and informational) while figure 5 provides an overview of the co-movement identification.

Jul. 2010 - Jun. 2019	Nber	Min	Mean	Median	Max	Standard Deviation
All announcements	72	-0,0992	-0.0071	-0,0039	0.0608	0.0349
"Pure" Monetary Policy Ann.	53	-0,0949	-0.0087	-0.0040	0,0608	0.0362
Central Bank Information Ann.	19	-0.0992	-0.0027	0.0039	0.0363	0.0312

Table 15: Descriptive Statistics for US Monetary Policy and Central Bank Information shocks (in pp)

[20] This simple identification corresponds to what Jarociński and Karadi (2020) call "Poor man's sign restriction". They get similar results with a more complex decomposition, allowing for both kinds of shocks to be present in a certain proportion at each event.

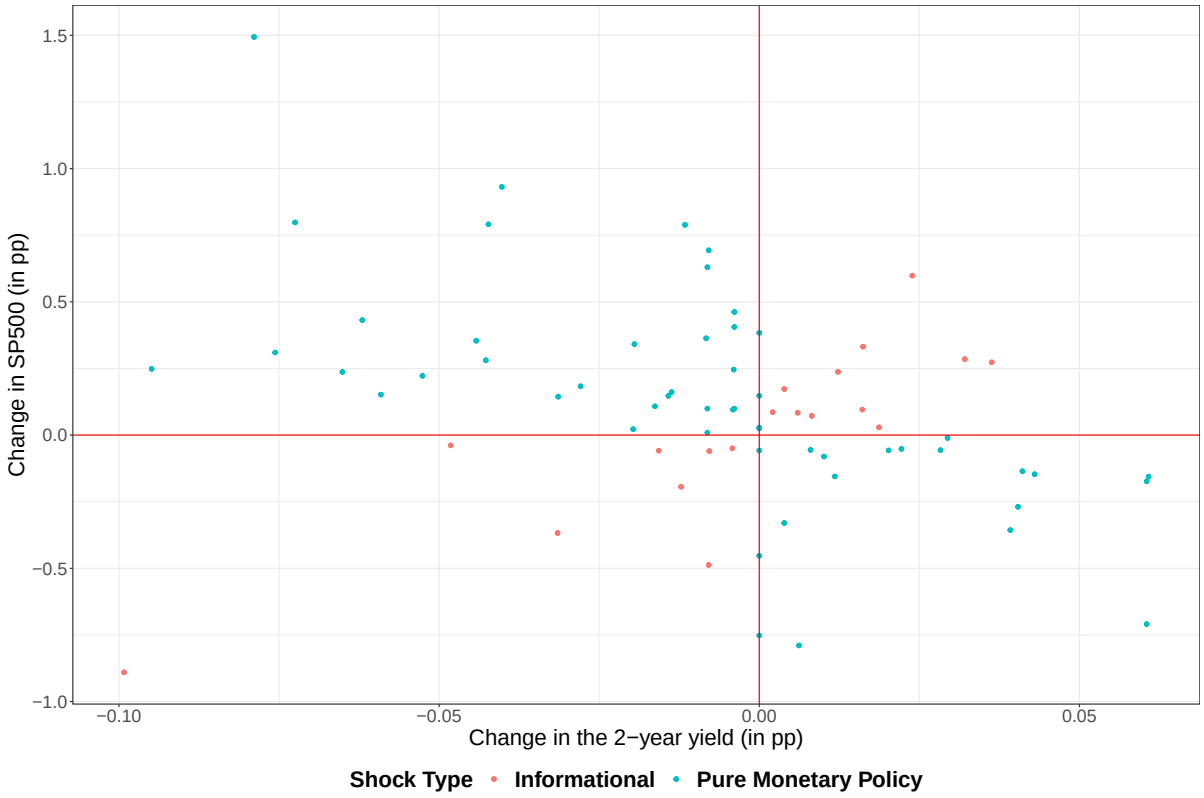

Figure 5: Change in the 2-year Nominal Treasury yield and the S&P 500 index around FOMC announcements in pp

B Descriptive statistics for 'pure' ECB and US monetary policy shocks with alternative indicators

This table presents the descriptive statistics for ECB and US monetary policy shocks, using alternative monetary policy indicators in this latter case (as described in Section 6).

Jul. 2010 - Jun. 2019	N	Min	Mean	Median	Max	Sd
ECB 1-year OIS	51	-0.1250	0.0003	-0.0002	0.1630	0.0418
FF6	59	-0.1100	-0.0048	0.0000	0.0350	0.0225
ED4	53	-0.1200	-0.0101	-0.0050	0.0800	0.0422
US 5-year	47	-0.1385	-0.01133	0.0363	0.09270	0.0489

Table 16: Descriptive Statistics for ECB shocks and alternative policy indicators (in pp)
NOTE: ECB 1-year OIS records percentage point changes on the 1 year OIS rate around ECB announcements (see Altavilla et al. (2019)). FF6 records percentage point changes on the 6-month ahead Fed funds futures, ED4 on the 1-year ahead futures on three month Eurodollar deposits and US 5-year on the five-year Nominal Treasury bond yield around FOMC announcements (see Gürkaynak et al. (2005)). We consider only "pure" monetary policy shocks and remove "CBI" shocks using the same methodology as in Appendix A

C Sample spanning goods and services

Origin of suppliers	N	Median	Mean	Sd
Eurozone	501149	61.2	197.4	794.3
Other	126871	80.0	281.8	1024.8
US	382895	60.0	268.4	1114.7
UK	18922	51.1	160.3	591.2
all	1029837	61.2	233.5	952.0

Table 17: Trade Credit by Suppliers' Origin for Mexico (in thousands of dollars

D Intensive and Extensive Margins

At the **intensive margin** we estimate:

$$ln(TC_{s,b,t}) = \alpha_{s,b} + \omega_{s,year} + \beta_0 \texttt{US MP}_{t-k} + \beta_1(\texttt{US MP}_{t-k}\texttt{Quality}_{b,t-k}) + \beta_2 \texttt{Quality}_{b,t-k} + \lambda \texttt{ln(M)}_{j,t-3} + \nu S_{f,t} + \gamma X_t + \mu Z_t + \epsilon_{s,b,t} \quad (3)$$

At the **extensive margin**, we estimate the following:

$$PosTC_{s,b,t} = \mathbf{1}(\beta_0 \texttt{US MP}_{t-k} + \beta_1(\texttt{US MP}_{t-k} x \texttt{Quality}_{b,t-k}) + \beta_2 \texttt{Quality}_{b,t-k} + \lambda \texttt{M}_{j,t-3} + \nu S_{f,t} + \gamma X_t + \mu Z_t + \alpha_{s,b} + \omega_{s,year} - \epsilon_{s,b,t} > 0) \quad (4)$$

With $PosTC_{s,b,t}$ =1 if the condition is satisfied.

E Data Sources

Table 18: Description of the variables

Short Name	Description	Source	Start	End
US MP shocks				
FF6	6-month ahead federal funds futures contract	Gurkaynak's database	Jan-10	Jun-19
ED4	1-year ahead futures on the 3-month Eurodollar deposits	Gurkaynak's database	Jan-10	Jun-19
US 2-year	On-the-run US 2-year Treasury yield	Gurkaynak's database	Jan-10	Jun-19
US 5-year	On-the-run US 5-year Treasury yield	Gurkaynak's database	Jan-10	Jun-19
Global-level controls				
EMBI spread	Emerging Markets Bond Index (EMBI) spread	JP Morgan	Jan-10	Jun-19
USD FX	USD exchange rate for each currency used	Central Banks	Jan-10	Jun-19
Country-level controls - Mexico				
IP	Industrial Production Index - VOLA	Inegi	Jan-10	Jun-19
CPI	Consumer Price Index - NADJ	Inegi	Jan-10	Jun-19
Rate	Target Overnight Interbank Funding rate NADJ	Banco de Mexico	Jan-10	Jun-19
FX Reserves	Foreign currency reserves	Banco de Mexico	Jan-10	Jun-19
REER	Real Broad Effective Exchange Rate Index - CPI	JP Morgan	Jan-10	Jun-19
Acceptance Rate	Ratio of insurance obtained over requested by suppliers	Coface	Jul-10	Jun-19
Imports	Sectoral Imports	Inegi	Jan-10	Jun-19
Supplier-level controls				
IP US	US Industrial Production Index - VOLA	Federal Reserve	Jan-10	Jun-19
IP EZ	EZ Industrial Production Index - VOLN	Eurostat	Jan-10	Jun-19
ECB MP shocks				
ECB Surprises	1-year OIS	Altavilla et al. (2019)	Jan-10	Jun-19